Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

Ref No : Reg/Notification/73/57 Dated : 05-01-2018

NOTIFICATION

Consequent upon the approval of the Competent Authority and in accordance with the decision of Board of Governors of the University in its 6th meeting held on 25-07-2017 vide item no. 6.12, the following Academic Council for the University is hereby constituted:

S. No.	Nomenclature	Designation	Proposed Academic Council	
1.	The Vice-Chancellor:	Chairman	Vice-Chancellor, Maharaja Ranjit Singh Punjab Technical University, Bathinda-151001(Pb.)	
2.	The Dean of Faculties:	Member (One Member)	1.	Dean Faculty (Engineering & Technology)
			2.	Dean Faculty (Pharmacy)
			3.	Dean Faculty (Commerce & Business Management)
			4.	Dean Faculty (Sciences)
			5.	Dean Faculty (Hospitality & Tourism Management)
			6.	Dean Faculty (Architecture & Planning)
			7.	Dean Faculty (Humanities & Social Sciences)
3.	The Heads of the Departments/Schools of the University:	Members		Directors/Heads of Departments/Schools of the University and Constituent Colleges/Campuses
4.	The Principals of ten Colleges affiliated to the University by rotation (Provided that no Principal shall be nominated again unless all others have been nominated at least once) :	Members	1.	Asra College of Engineering & Technology, NH-64, Patiala Sangrur Highway, Villege Rajpura, Tehsil Bhawanigarh, Distt. Sangrur, Pincode-148026 (Pb)
			2.	Baba Farid College of Engineering and Technology, Village Deon, Muktsar Road, Distt. Bathinda, Pincode-151001 (Pb)
			3.	Bahra Faculty of Information & Technology & Business Management, Patiala-Sangrur National Highway-64, Village Bhedpura, Distt. Patiala, Pincode-147201 (Pb)
			4.	Bhai Gurdas Institute of Engineering & Technology, Main Patiala Road, National Highway-64, Sangrur, Pincode-148001 (Pb)
			5.	Bharat Group of Colleges, Village KheraKhurad, Delhi Road, Tehsil Sardulgarh, Distt. Mansa- 151507 (Pb)
			6.	Adesh Institute of Engineering & Technology, Sadiq Road, Faridkot-151203 (Pb)
			7.	DeshBhagat Foundation Group of Institutions, Ferozpur Road, Moga- 142048 (Pb)
			8.	Dr. I.T Institute of Management & Technology, Village Jalalpur, PO Jansla, Near Banur, Tehsil Rajpura, Distt. Patiala, Pincode-140601 (Pb)
			9.	LalaLajpat Rai Institute of Engineering & Technology, Moga-Ferozepur G.T. Road, Moga, Pincode-142001 (Pb)
			10.	S.D College of Pharmacy, KC Road, Barnala, Distt. Sangrur, Pincode-148101 (Pb)

5	Two Eminent Industrialists (to be nominated by the Board):	Members	**1.**	Chief Engineer Guru Gobind Singh Refinery, HPCL-Mittal Energy Limited, Vill: Phulokhari, The: Talwandi Sabo, Distt. Bathinda
			2.	General Manager (Production) Sportking Industries, Vill: Jeeda, Kotkapura Road, Bathinda
6	Two Eminent Technologists(to be nominated by the Board):	Members	**1.**	Dr. Yogender Kumar Yadav Director General (Former), Sardar Swaran Singh National Institute of Renewable Energy, Jalandhar-Kapurthala Road, Wadala Kalan,Kapurthala-144601
			2.	Dr. M.P.Punia Vice Chairman, All India Council of Technical Education, Nelson Mandela Marg, Vasant Kunj, New Delhi-110067
7	Registrar	Secretary (Ex-Officio)		Registrar, Maharaja Ranjit Singh Punjab Technical University, Bathinda-151001(Pb.)

The tenure for the nominated members at Sr. No. 4, 5 and 6 shall be 2 years from the date of notification.

In addition to the above, the following members shall be co-opted members of the Academic Council

1. Dean, Academic Affairs;
2. Dean, Research & Development;
3. Dean, Student Welfare;
4. Dean, Planning & Development;
5. Director, College Development Council;
6. Controller of Examination.

Registrar

Copy to

1. The Additional Chief Secretary to Govt. of Punjab,
   Department of Technical Education & Industrial Training, Punjab-cum-
   Chairman, Board of Governors, Maharaja Ranjit Singh Punjab Technical University, Bathinda.
2. All concerned.

Registrar

Deans Faculty of MRSPTU, Bathinda 2017

Sr. No.	Name	Designation	Department	Appointment	Contact No.	E-mail
1	Prof. (Dr.) Paramjeet Singh	Former Registrar	Panjab University, Chandigarh. H. No. 2921, Phase-7, Mohali	Dean, Faculty of Engg. & Technology	9814469688	pjsingh8399@gmail.com
2	Prof. (Dr.) Sanjeev Kumar Sharma	Director	University Institute of Applied Management Sciences, Punjab University, Sec-14, Chandigarh-160014	Dean, Faculty of Commerce & Management	0172 2780125, 253, 9814487217	sksharma@pu.ac.in
3	Prof. (Dr.) Parikshat Singh Manhas	Director	School of Hospitality and Tourism Management, University of Jammu, Jammu (J&K)	Dean, Faculty of Hospitality and Tourism Management	9419188260	psmanhas@hotmail.com
4	Prof. (Dr.) Paramjit Singh Judge	Professor	Department of Sociology, Guru Nanak Dev University, Amritsar-143005,	Dean, Faculty of Humanities and Social Sciences	9417007828, 0183-2258802,09	paramjit.judge@gmail.com,paramjitjudge@yahoo.co.uk
5	Prof. (Dr.) Karamjit Singh Chahal	Professor & Head	Department of Architecture, Guru Nanak Dev University, Amritsar-143005	Dean, Faculty of Architecture	9417107403 +91 183 2450601-15	kschahal@rediffmail.com
6	Prof. (Dr.) Ashish Baldi	Professor & Head	Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda	Dean, Faculty of Pharmacy	+91-81250-72348, 8968423848	baldiashish@gmail.com
7	Prof. (Dr.) Geeta Hundal	Professor	Department of Chemistry, Guru Nanak Dev University, Amritsar-143005	Dean, Faculty of Sciences	+91-9888232619, +91-'9501114469 +91-183-22558803	geetahundal@yahoo.com

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY,
DABWALI ROAD, BATHINDA-151001
[Established by Govt. of Punjab vide Act No. 5 of 2015, UGC Act 2(f)]
DEAN ACADEMIC AFFAIRS
Ph. 0164-2284298, 8725072488
www.mrsptu.ac.in **daa.mrsstu@gmail.com, daa@mrsptu.ac.in**

FACULTY OF ENGINEERING & TECHNOLOGY
(01.10.17 to 30.09.19)

Faculty of Engineering & Technology is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Prof. (Dr.) Paramjeet Singh,** H. No. 2921, Phase-7, Mohali (Ph. 9814469688) pjsingh8399@gmail.com	Chairperson
02	All Heads of University Dept. of various branches of the faculty in the University	**1. Dr. Ashok K. Goel,** Professor, Dept. of Electr. & Comm. Engg, GZS Campus CET, Bathinda (8872500259) ashokkgoyal1@gmail.com **2. Dr. Balwinder Singh,** Professor, Department of Mech. Engg. GZS Campus CET Bathinda (8872500275) drbwssidhu07@gmail.com **3. Dr. Manjeet Bansal,** Professor, Department of Civil Engineering, GZS Campus CET, Dabwali Road, Bathinda-151001 (9815126102) push_kar5@yahoo.com. **4. Dr. Naresh Kumar Garg,** Professor & Head, GZSCCET, Dabwali Road, Bathinda (8725072422, 9463077886) cse.gzscet@gmail.com **5. Dr. Sarabjeet Kaur Bath,** Professor and Head, Department of Electrical Engineering, GZS Campus CET Bathinda (9463836070, 8725072420) skbath77@gmail.com **6. Dr. Devanand Uttam,** Associate Professor, Department of Textile Engineering, GZS Campus College CET, Bathinda-151001 (9417233925) d_a_uttam@yahoo.com **7. Dr. Gurpreet Singh,** Associate Professor Department of CSE & Director, PIT Rajpura (8195965203) myselfgurpreet@gmail.com **8. Dr. Amit Kumar Manocha,** Associate Professor, Department of EE, PIT GTB Garh Moga (9996800758) manocha82@gmail.com	Members

03	All Professors in Faculty from University Deptts./ Constituent /Affiliated Colleges	**1. Dr. Savina Bansal,** Professor, Dept. of Electr. & Comm Engg, GZS Campus CET, Bathinda. (8146600954) savina.bansal@gmail.com **2. Dr. Rakesh Kumar Bansal,** Professor, Dept. of Electr. & Comm. Engg, GZS Campus CET, Bathinda. (9463000954) drrakeshbansal@gmail.com **3. Dr. Jyoti Saxena,** Professor, Department of Electronics and Communication Engineering, GZS Campus CET Bathinda (8725072489) jyotianupam@yahoo.com **4. Dr. Rajeev Kumar Varshney,** Professor, Dept. of Textile Engineering, GZS Campus CET, Bathinda (8872500271) textilegzscetbti@gmail.com **5. Dr. Sanjiv Kumar Aggarwal,** Prof., Deptt. of Civil Engg. GZS Campus CET, Bathinda (9478022281) sanjiv_aggarwal@rediffmail.com **6. Dr. Rakesh Kumar Singla,** Prof., Deptt. of Civil Engg., GZS Campus CET, Bathinda (Structural Engg.) (7589196148) rkumar_s@rediffmail.com **7. Dr. Paramjit Singh,** Professor CSE Dept. GZSCCET, Bathinda (8725072459) param2009@yahoo.com **8. Dr. Shaveta Rani,** Professor CSE, GZSCCET, Bathinda, (8284011796) garg_shavy@yahoo.com **9. Dr. Bal Krishan,** Professor, Deptt. of Civil Engg., GZS Campus CET, Bathinda (Structural Engg.) (8872320600) balkrishandr@yahoo.com **10. Dr. Kewal S. Panesar,** Professor, Dept. of Mech Engg, North West Institute of Engineering & Technology, Dhudike Takhanwadh Link Rd., Dhudike, Punjab 142053 (9417472592) kewal_me@northwest.ac.in **11. Dr. Lakhwinder Singh,** Professor, Department of Electrical Engineering, BBSB CET Fatehgarh Sahib (9814508213, 8872007780) b_lakh@yahoo.com, **12. Dr. Anupam Kumar** Professor, Department of Textile Engg GZSCCET, Bathinda, (9417025296) anup28298@yahoo.com **13. Dr. Balraj Singh,** Professor ECE deptt, GZSCCET, Bathinda & Director Academics (On Deputation) PSBTE &	Members

		IT, Chandigarh (9781649000) drbss.sidhu@gmail.com 14. **Dr. Rajesh Gupta,** Professor, Deptt. of Mech. Engg., GZSCCET, Bathinda (8872500261) rg91@rediffmail.com **15. Dr. Rajiv Arora,** Head, Dept. of Chemical Engineering SBS State Technical Campus, Moga Road (NH-95), Ferozepur-152004 (Punjab) (9463385619) rajiv_fzr@yahoo.com **16. Dr. Manoj Mittal,** Professor, Dept. of Production Engineering, Bhai Maha Singh College of Engg. & Tech, Sri Muktsar Sahib-152026 (Punjab) (9216502012) manojmittal74@yahoo.com **17. Dr. Atul Khurana,** Professor, Dept. of Computer Science & Engineering, Aryabhatta Group of Institutes, NH-71, Bajakhana Road, Barnala-148101 (Punjab) (9872677011, 9781804634) drmittalajay@gmail.com **18. Dr. Umesh Kumar Garg,** Professor, IT, Guru Tegh Bahadur Khalsa Institute of Engineering & Technology, V.P.O. Chhapian Wali, Distt. Muktsar, Malout-152107 (Punjab) (9317945008) gtbkcp2006@gmail.com **19. Dr. P.B. Mahapatra,** Professor, Ghubaya College of Engg. & Tech., Sukhera Bodla, Jalalabad West-152024 (Punjab) (9478210661) gcetpb@gmail.com **20. Dr. Swaranjit Singh,** Professor, Dept. of Electronics & Communication Engg., Desh Bhagat Group of Institutions, Ferozepur Road, Dagru-142048 (Punjab) (9876409200) sawarnjit@live.ca, dbfgoi@gmail.com	
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./ Constituent/ Affiliated Colleges	**1. Er. Charanjit Singh,** Associate Professor, Deptt. of Mech. Engg., GZSCCET, Bathinda (8195888988) charanjitmech@gmail.com **2. Er. Gurpreet Singh Bath,** Associate Professor, Department of Civil Engineering, GZS Campus CET, Dabwali Road, Bathinda-151001 (9417171710) gpsbath66@gmail.com.	Members
05	Two Assistant Professors by seniority by	**1. Er. Parikshit Paul,** Assistant Professor, Department of Textile Engg., GZSCCET, Bathinda	Members

	rotation for a period of 2 years from Univ. Depts./ Constituent / Affiliated Colleges	(9417645348) parikshit_paul@yahoo.com 2. **Dr. Kamaljit Singh Boparai**, Assistant Professor, Department of Mechanical Engg., GZSCCET, Bathinda (9988041549) kamaljitboparai2006@yahoo.co.in	
06	In case any branch is not represented above in the Faculty by a representative from Affiliated Colleges, then add here up to two HODs from Affiliated Colleges in the concerned branch by rotation	1. **Dr. Harminder Singh Bindra,** Head, Department of Information Technology, MIMIT, Malout (9872928828) bindra.harminder@gmail.com	Members
07	One expert in each branch from outside University.	1. **Dr. S.M. Ishtiaqe,** Professor, Department of Textile Technology, IIT, Delhi (9871692079) ishtiaque@textile.iitd.ernet.in 2. **Dr. Sehijpal Singh,** Professor & Head, Deptt. of Mech. Engg., GNEC, Ludhiana (9855279865) mech@gndec.ac.in 3. **Dr. D.C. Saxena,** Professor, Department of Food Engineering & Technology, SLIET, Longowal, Sangrur (9815608859) dcsaxena@yahoo.com 4. **Dr. Yadwinder Singh Brar,** Professor, Department of Electrical Engineering, PIT, Kapurthala (9478098013) braryadwinder@yahoo.co.in 5. **Dr. Rajesh Bhatia,** Professor, CSE Dept., PEC Technological Campus, Sector-12, Chandigarh-160012 (9463369282, 0172-2753854) rbhatia@pec.ac.in	Members
	Subject Experts	1. **Dr. Tanuja Srivastawa,** Head, Dept. of Food Technology, Bhai Gurdas Institute of Engineering & Technology, Main Patiala Road, Sangrur–148001 (Punjab) (9814847492) tanusriva@yahoo.co.in 2. **Dr. Sandeep Mann,** Principal Scientist (APE) & HOD Transfer of Technology Division, ICAR-Central Institute of Post-Harvest Engineering & Technology. Ministry of Agriculture and Farmer's Welfare, Govt. of India. P.O. P.A.U. Ludhiana (9463043396) sandeep_mann76@yahoo.com	Members (Co-opted)

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

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FACULTY OF ARCHITECTURE & PLANNING
(01.10.17 to 30.09.19)

Faculty of Architecture & Planning is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Ar. (Dr.) Karamjit Singh Chahal,** Professor, Department of Architecture, Guru Nanak Dev University, Off NH-1, Amritsar (9417107403) kschahal@rediffmail.com	Chairperson
02	All Heads of University Deptts of various branches of the Faculty in Univ.	**1. Ar. Ripu Daman Singh,** Associate Professor, GZS Campus CET, Bathinda (8872500273, 9815222335) ripu_jatinder@yahoo.co.in	Member
03	All Professors in Faculty from University Deptts./ Constituent /Affiliated Colleges	**1. Ar. Avinash Singh,** Professor, SBS State Technical Campus, Ferozepur (9888612612) avinash_dadhwal@rediffmail.com **2. Ar. Ranjeet Kaur,** Associate Professor, GZS Campus CET, Bathinda (9988486889) ranjeetkjohal@yahoo.co.in	Members
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./Constituent /Affiliated Colleges	**1. Ar. Bhupinder Pal Singh,** Associate Professor, GZS Campus CET, Dabwali Road, Bathinda (9417755569) bpaldhot@hotmail.com. **2. Ar. Jatinder Kaur,** Associate Professor, GZS Campus CET, Dabwali Road, Bathinda (9878022335) ar.jatinder@gmail.com	Members
05	Two Assistant Professors by seniority by rotation for a period of 2 years from Univ. Depts./constituent College/affiliated College	**1. Ar. Kapil Arora,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (9914146068) arkapilarora@gmail.com **2. Ar. Sandeep Singh,** Assistant Professor, SBS State Technical Campus, Ferozepur (9888778800) ar.sandeepsingh@yahoo.com	Members
06	In case any branch is not represented above in the Faculty by a representative	NA	

	from Affiliated Colleges, then add here up to two HODs from Affiliated Colleges in the concerned branch by rotation		
07	One expert in each branch from outside Univ.	**1. Ar. Jit Kumar Gupta,** Retd. Chief Town Planner, UT, Chandigarh (9041026414) jit.kumar1944@gmail.com **2. Dr. Prabhjot Kaur,** Professor, IK Gujral PTU Mohali Campus, C-102, Industrial Area, Phase-7, Mohali (9780811342) pkaurdap@gmail.com **3. Ar. Sohan Lal Saharan,** Associate Professor, CCA, Chandigarh (9417303195) saharansohan@hotmail.com **4. Ar. (Dr.) Sarbjot Singh Behl,** Prof. & Head, Department of Architecture, Guru Nanak Dev University, Off NH-1, Amritsar-143005 (9814593666) sarbjotbehl@yahoo.com **5. Ar. (Dr.) Bhanu Marwaha,** Prof. & Head, Department of Architecture, NIT, Hamirpur (9459317508) bhanu@nith.ac.in	Members

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

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www.mrsptu.ac.in daa.mrsstu@gmail.com, daa@mrsptu.ac.in

FACULTY OF SCIENCES
(01.10.17 to 30.09.19)

Faculty of Sciences is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Dr. Geeta Hundal,** Professor, Deptt. of Chemistry, GNDU, Amritsar (Ph. 09501114469) geetahundal@yahoo.com	Chairperson
02	All Heads of University Deptts. of various branches of the Faculty in the University	**1. Dr. Sandeep Kansal**, Professor & Head, Department of Physics, GZS Campus CET, Dabwali Road Bathinda–151001 (8725072490) skansal2k1@yahoo.com, head.physics.gzs@gmail.com **2. Prof. Karanvir Singh,** Head, Department of Applied Mathematics, GZS Campus CET, Dabwali Road, Bathinda – 151001 (8872211150) karanvirs786@gmail.com **3. Dr. Seema Sharma,** Associate Professor & Head, Department of Chemistry, GZS Campus CET, Bathinda (9417114169, 8725072411) harprit6920@gmail.com **4. Mr. Sanjay Bhatnagar,** Head, Department of Computer Applications, GZS Campus CET, Bathinda (8725072319) bhatnagar.sanjay@hotmail.com **5. Dr. Kawaljit Singh Sandhu,** Associate Professor, Department of Food Science and Technology, MRSPTU, Bathinda (9896268539) kawsandhu@rediffmail.com	Members
03	All Professors in Faculty from Univ. Deptts. Const./ Affiliated Colleges	**1. Dr. Gursharan Singh,** Professor, GZS Campus CET, Bathinda (8725072488, 9417628270) gursharans82@gmail.com **2. Dr. J.S. Hundal,** Professor, GZS Campus CET, Bathinda (8872500251) jshundal@yahoo.com **3. Dr. R.P. Gupta,** Head, Dept. of Bio-Technology, BIS Institute of Sciences and Technology, (Gagra Campus) Moga-Amritsar Highway, Gagra-142043, Moga, Punjab (9878822104) rpgupta1947@gmail.com **4. Dr. Manoj Bali,** Professor, Baba Hira Singh Bhattal Institute of	Members

		Engineering & technology, Lehragaga (7087000702, 8054644823) drmanojbali@gmail.com **5. Dr. A.K. Tyagi,** Professor, Department of Physics, SBS State Technical Campus, Ferozepur-152004 (9463000886) akt@aol.in **6. Dr. Archana Gupta,** Professor, Dept. of Physics, Swami Vivekanand Group of Institutes Chandigarh-Patiala Highway, Sector-8, Ramnagar, Banur, Chandigarh-140601 (7837300487) director_ac@sviet.ac.in **7. Dr. Awdesh Pandey,** Professor, Guru Ram Das Institute of Engg. & Tech. Lehra Bega-151111, Barnala Road, Bathinda, Punjab (8146223456) mrawdeshpandey@gmail.com, grdietacademics@gmail.com **8. Dr. M.S. Dhanju,** Professor, Dept. of Bio-Technology, BIS Group of Institutions (Gagra Campus) Moga-Amritsar Highway, Gagra-142043, Moga, Punjab (9872208277) mukhtardhanju@gmail.com **9. Dr. Virinder Singh,** Professor, Department of Chemistry, Baba Banda Singh Bahadur College of Engineering, Fatehgarh Sahib (9914349612) virinder.singh@bbsbec.ac.in **10. Dr. Amritbir Singh,** Professor, Department of Mathematics, Baba Banda Singh Bahadur College of Engineering, Fatehgarh Sahib (9914241230) amritbir.singh@bbsbec.ac.in **11. Dr. Harbax S. Bhatti,** Professor, Department of Mathematics, Baba Banda Singh Bahadur College of Engineering, Fatehgarh Sahib (8872035211) hod_as@bbsbec.ac.in, bhattihs100@yahoo.com	
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./ Constituent/ Affiliated Colleges	**1. Dr. Jaskaran Singh,** Associate Professor, Department of Mathematics, MIMIT, NH-15, Near New Grain Market, Green Field Enclave, District Shri Mukatsar Sahib, Malout-152107 (9356737037) bhullarjaskarn@rediffmail.com **2. Dr. Lalit Sharma,** Associate Professor, Department of Chem., Dept. of Applied Sciences, Shaheed Bhagat Singh State Technical Campus, Moga Road (NH-95), Ferozepur-152004 (9872069500) lalitlalit64@rediffmail.com	Members

05	Two Assistant Professors by seniority by rotation for a period of 2 years from Univ. Depts./constituent College/ Affiliated Colleges	**1. Dr. Anju Sharma,** Assistant Professor, Department of Computer Applications, GZS Campus CET, Bathinda (Ph. 7888874425) phdanju@gmail.com **2. Mrs. Rajinder Kaur Sangha,** H.O.D. Fashion Technology, DBFGI, Moga (9988255255) rajinderkaursangha@gmail.com	Members
06	In case any branch is not represented above in the Faculty by a representative from affiliated Colleges, then add here up to two HODs from Affiliated Colleges in the concerned branch by rotation	NA	Members
07	One Subject expert in each branch from outside University.	**1. Dr. Sushil Mittal,** Professor, Department of Chemistry, Thapar University, P.O Box 32, Patiala, Pin -147004 (175-2393021, 9815653261) smittal2001@yahoo.com **2. Dr. S.S. Bhatia,** Professor, Department of Mathematics, Thapar University, P.O Box 32, Patiala, Pin -147004 (0175-2393022) ssbhatia@thapar.edu **3. Dr. B.S. Bajwa,** Professor, Department of Physics, GND University, Grand Trunk Rd, Off NH 1, Amritsar-143005 (9914116916) bsbajwa1@gmail.com 4. **Dr. K.N. Chatterjee,** Professor & Head, Fashion & Apparel Engineering Research and Consulting, The Technological Institute of Textile & Sciences, Birla Colony, Bhiwani, Haryana-127021 (9255176649) kn.chatterjee@gmail.com **5. Dr. Sarbjit Singh Bal,** Dean Agriculture, Baba Farid College, Deon, Bathinda (9501115223) drssbal@yahoo.co.in **6. Dr. Gurcharan Kaur,** Professor, Department of Biotechnology, GND University, Off NH 1, Amritsar-143005 (9815450737) kgurcharan.neuro@yahoo.com	Members

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

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FACULTY OF PHARMACY
(01.10.17 to 30.09.19)

Faculty of Pharmacy is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Dr. Ashish Baldi** Professor & Head, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda (8968423848) baldiashish@gmail.com	Chairperson
02	All Heads of University Departments of various branches of the Faculty in University	**1. Dr. Ashish Baldi** Professor & Head, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda (8968423848) baldiashish@gmail.com	Member
03	All Professors in Faculty From University Departments/ Constituent /Affiliated Colleges	**1. Prof. R.K. Narang** ISF College of Pharmacy, G.T. Ferozepur Road, NH 95, P.O. Ghal Kalan, Moga (9878696688) drrknisf@gmail.com **2. Prof. G.S. Roy** Baba Ishar Singh College of Pharmacy, Kot-ise-khan, Dharmkot Road, Tehsil Zira, District Moga (9878822103) soham_ronkini@yahoo.com	Members
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./ constituent College/ affiliated College	**1. Dr. Puneet Kumar** Associate Professor, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda (9876100692) punnubansal79@gmail.com **2. Dr. Uttam Kumar Mandal** Associate Professor, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda (9872419542) mandalju2007@gmail.com	Members
05	Two Assistant Professors by seniority by rotation for a period of 2 years from Univ. Depts./ Constituent/ Affiliated Colleges	**1. Mr. Amit Sharma** ISF College of Pharmacy, G.T. Ferozepur Road, NH 95, PO Ghal Kalan, Moga (9646755140) choice.amit@gmail.com **2. Ms. Sonia Pahuja** Swami Vivekanand College of Pharmacy, Chandigarh, Ramnagar, Banur, District Patiala (9815613484) pharmsoniapahuja@gmail.com	Members
06	In case any branch is not represented above in the Faculty by a representative from Affiliated Colleges, then add here up to	**1. Prof. Rakesh Garg** (Pharmacognosy) S.D. College of Pharmacy, Pakka College Road, Barnala (9417493032) rakeshgogi@rediffmail.com **2. Prof. Baljinder Singh Bajwa** (Pharmaceutical Chemistry) Lala Lajpat Rai College of Pharmacy, Moga – Ferozepur GT Road, Near P.S.	Members

	two HODs from affiliated Colleges in the concerned branch by rotation	Sadar, Moga (9815640751) bajwabaljinder@yahoo.co.in	
07	One Subject Expert in each branch from outside University.	**1. Dr. Raj Kumar** In-charge, Centre for Pharmaceutical Sciences & Natural Products, Central University of Punjab, Bathinda (9914567224) raj.khunger@gmail.com **2. Dr. R.K. Goel** Professor, Department of Pharmaceutical Sciences & Drug Research, Punjabi University, Patiala (9417881189) goelrkpup@gmail.com **3. Dr. Harish Dureja** Dept. of Pharmaceutical Sciences Maharishi Dayanand University, Rohtak (7850088000) harishdureja@gmail.com	Members

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY,
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DEAN ACADEMIC AFFAIRS
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www.mrsptu.ac.in daa@mrstu.ac.in, daa.mrsstu@gmail.com

FACULTY OF COMMERCE & BUSINESS MANAGEMENT
(01.10.17 to 30.09.19)

Faculty of Commerce & Business Management is hereby constituted for a period of two years (01.10.17 to 30.09.19).

Sr. no	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Dr. Sanjeev Sharma,** Professor, University Institute of Applied Management Sciences (Ph. 09814487217) sksharma@pu.ac.in	Chairperson
02	All Heads of University Deptts of various branches of the Faculty in the University	**1. Dr. Suman Kathuria,** In-charge, Deptt. of Hum. & Mgmt. Studies, GZS Campus College of Engineering & Technology, Bathinda (8725072428) mgthod@mrsptu.ac.in	Member
03	All Professors in Faculty from University Deptts./ Constituent /Affiliated Colleges (Not Available)	1. **Dr. Gurdip Singh Batra**, Professor, School of Management Studies, Punjabi University, Patiala (9855028013) batra.gurdip@gmail.com **2. Dr. B.S. Bodla,** Professor, University School of Management, Kurukshetra University, Haryana (9466174087) bsbkuk@gmail.com **3. Dr. Ramesh Chander,** Professor, University School of Management, Kurukshetra University, Haryana (9466535510) dalal.kuk@gmail.com	Members (Co-opted)
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./ Constituent /Affiliated Colleges	**1. Dr. R.P. Singh,** Associate Professor, Deptt. of Hum. & Mgmt., SBSSTC, Ferozepur (8054011077) rpsinghromy@gmail.com **2. Dr. Bhupinder Singh Bhullar,** Head Department of Mgt., BBSEC, Fatehgarh Sahib (9814051870) bhullbs@yahoo.com	Members
05	Two Assistant Professors by seniority by rotation for a period of 2 years from	**1. Dr. Veerpaul Kaur Maan,** Assistant Professor, Deptt. of Hum. & Mgmt. Studies, GZS Campus College of Engineering & Technology, Bathinda (Ph. 09814503254) veerpaulkaur1@rediffmail.com **2. Dr. Jiwan Jyoti Maini,**	Members

	Univ. Depts./ Constituent / Affiliated Colleges	Assistant Professor, MIMIT, Malout (Ph. 9417941014) jjmaini@gmail.com	
06	In case any branch is not represented above in the Faculty by a representative from affiliated Colleges, then add here up to two HODs from affiliated Colleges in the concerned branch by rotation	**1. Dr. M.K. Kulshrestha,** Principal, Guru Gobind Singh College, Giddarbaha (8968412900) m_k_kulshrestha@yahoo.co.in **2. Dr. Karminder Ghuman,** Associate Professor, (Marketing, corporate trainer, consultant, researcher and institution builder) TIET (Deemed to be University) Patiala (9569612233) karminder@thapar.edu	Members
07	One Subject Expert in each branch from outside University.	**1. Dr. Pardeep Kumar Jain,** Professor, Deptt. of Management and Hum., SLIET, Longowal (9781300364) pardeep_jain2000@yahoo.com **2. Dr. M. Kanchan,** Associate Professor, (Financial Accounting, Management Accounting, Corporate Finance and Corporate Governance), TIET, (Deemed to be University) Patiala (7087404204) mkanchan@thapar.edu **3. Dr. Luxmi,** Associate Professor (Human Resource Management), University Business School, Panjab University, Chandigarh (9463888038) luxmi@pu.ac.in, luxmimalodia@yahoo.com **4. Dr. Jasveen Kaur,** Associate Professor & Head, University Business School, Guru Nanak Dev University, Amritsar (9356100011) jasveenkaurgndu@gmail.com	Members

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

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FACULTY OF HOSPITALITY & TOURISM MANAGEMENT
(01.10.17 to 30.09.19)

Faculty of Hospitality and Tourism Management is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
01	Dean, Faculty	**1. Prof. (Dr.) Parikshat Singh Manhas,** School of Hospitality and Tourism Management, University of Jammu, Jammu (9419188260) psmanhas@hotmail.com	Chairperson
02	All Heads of University Deptts. of various branches of the Faculty in the University	University Department not presently available	Members
	Academic Council appointee	**1. Dr. R.H. Taxak,** Professor, Department of Tourism and Hotel Management, Kurukshetra University, (9416782444) rhtaxak@kuk.ac.in	Member (Co-opted)
03	All Professors in Faculty from University Deptts./ Constituent Colleges/Affiliated Colleges (Not Available)	**1. Dr. Prashant Kumar Gautam,** Associate Professor & Director, University Institute of Hotel & Tourism Management, Panjab University, Chandigarh (9815976444) prashantgautam@pu.ac.in **2. Prof. Rajnit Kohli,** Principal, Institute of Hotel Management Catering Technology & applied Nutrition, Bathinda (0164-2430454, 978002223) ihm@ihmbti.com	Members (Co-opted)
04	Two Associate Professors by seniority by rotation for a period of 2 years from Univ. Depts./ Constituent College/Affiliated Colleges (Not Available)	**1. Dr. Ramjit** Assistant Professor (Tourism Management) Department of Tourism Studies, Central University of Kashmir, Nowgam Campus-1, Wanbal, Srinagar-190015 (J & K) India (9858520378, 9419291269) ramjitmonu@yahoo.co.in **2. Dr. Arun Singh Thakur,** Assistant Professor, University Institute of Hotel & Tourism Management, Punjab University, Chandigarh (9465226116) aunthakur@pu.ac.in	Members (Co-opted)

05	Two Assistant Professors by seniority by rotation for a period of 2 years from Univ. depts./ constituent College/ affiliated College (Not Available)	**1. Dr. Arun Sharma** Asst. Prof. Tourism Management, Maharaja Agrasen School of Management, Maharaja Agrasen University Baddi, HP, India 174103. (9418358007) sharma.arun84@gmail.com **2. Jaswinder Singh** Assistant Professor, UIHTM Panjab University, Chandigarh-160014 (9041489099) jaswinder_chef@yahoo.co.in	Members (Co-opted)
06	In case any branch is not represented above in the Faculty by a representative from Affiliated Colleges, then add here up to two HODs from Affiliated Colleges in the concerned branch by rotation (Not Available)	**1. Raj Kumar** Head of The Department (Hotel Management) Amritsar College of Engg. & Tech., Amritsar (0183-5069530, 5069532, 8872072609) rajkumar8620@gmail.com **2. Ashish Nikhanj** Senior Lecturer, IHM Bathinda (Under National Council of Hotel Management and Catering Tech.) (7837333446, 9736003737) nikhanjhotelier@gmail.com	Members (Co-opted)
07	One Subject expert in each branch from outside University	**1. Mr. Nikhil Singh Charak** Programme Manager-B Voc Retail Management and Tourism Hospitality School of Vocational Studies, Ambedkar University, Delhi Shivaji Marg, Karampura Campus-110015 (9419301059) nikhil@aud.ac.in	Member(s)

The major functions of each Faculty shall be to supervise, discuss and decide on all matters pertaining to courses of studies, teaching schemes and other academic matters falling in their respective fields.

Dean Academic Affairs

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Board of Studies
Architecture & Planning
(01.10.17 to 30.09.19)

Programmes:
1. **B. Arch.**
2. **M. Arch.**

Board of Studies in Architecture & Planning is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	1. **Ar. Ripu Daman Singh,** Head, GZS Campus CET, Dabwali Road, Bathinda (8725072417, 9815222335) ripu_jatinder@yahoo.co.in	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	1. **Ar. Bhupinder Pal Singh Dhot,** Associate Professor, GZS Campus CET, Dabwali Road, Bathinda (9417755569) bpaldhot@hotmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	1. **Dr. Sandeep Dua,** Professor, Deptt. of Architecture, GNDU, Amritsar (9872253455) duasandeep18@rediffmail.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. Karamjit Singh Chahal,** Associate Professor, Deptt. of Architecture, GNDU, Amritsar (9417107403) kschahal@rediffmail.com 2. **Dr. Mahua Mukherjee,** Associate Professor, IIT Roorkee, (01332-285334/285036) mahuafap@iitr.ac.in	Members
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	1. **Ar. Jatinder Kaur,** Associate Professor, GZS Campus CET, Dabwali Road, Bathinda (9878022335) ar.jatinder@gmail.com 2. **Ar. Kapil Arora,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (9914146068) arkapilarora@gmail.com	Members

(vi)	One Representative (from Industry/ Corporate sector)	**1. Ar. Rimpesh Sharma,** Principal Architect, InGenious Studio Pvt. Ltd. Gurgaon (918130213222) rimpesh@ingeniousstudio.in rimpesh.sharma@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Ar. Amandeep Kaur,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (8872800226) ar.amankhiva@gmail.com	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the Board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

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www.mrsptu.ac.in **daa.mrsstu@gmail.com, daa@mrsptu.ac.in**

Board of Studies
Agriculture Engineering
(01.10.17 to 30.09.19)

Programme:
1. B. Tech. (Agriculture Engineering)
Board of Studies in Agriculture Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council appointee	**1. Dr. Sandeep Mann,** Principal Scientist (APE) & HOD Transfer of Technology Division, ICAR-Central Institute of Post-Harvest Engineering & Technology. Ministry of Agriculture and Farmer's Welfare, Govt. of India. P.O. P.A.U. Ludhiana (9463043396) sandeep_mann76@yahoo.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization) (Not Available)	**1. Dr. Gursahib Singh Manes,** Senior Research Engineer, Farm Machinery and Power Engineer (FMPE), College of Agriculture Engineering, Punjab Agriculture University, Ludhiana (9815959515) manesgs@pau.edu **2. Dr. Baldev Dogra,** Senior Research Engineer, Farm Machinery and Power Engineer (FMPE), College of Agriculture Engineering, Punjab Agriculture University, Ludhiana (8146585683) baldevdogra@pau.edu **3. Dr. A.K. Jain,** Professor, Department of Soil & Water Engineering, PAU, Ludhiana (9815024022) akjain@pau.edu	Member(s) (Co-opted)
(iii)	One Subject Expert (from outside the Univ.)	**1. Dr. Sunil Garg,** Senior Research Engineer, Soil and Water Engineering, College of Agriculture Engineering, Punjab Agriculture University, Ludhiana	Member

		(9463319365) sunil1765@rediffmail.com	
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Rakesh Sharda,** Department of Soil and Water Engineering, College of Agricultural Engineering and Technology, Punjab Agricultural University, Ludhiana-141004 (Ph. 09855545189) rakeshsharda@pau.edu **2. Dr. Sajeev Rattan Sharma,** Senior Engineer, PAU, Ludhiana (Ph. 09872221839) sajeevrattan@pau.edu	Members
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	**1. Er. Gurpreet Singh Bath,** Associate Prof., Deptt. of Civil Engg., GZS Campus CET, Bathinda (Geotechnical Engg.) (9417171710) gpsbath66@gmail.com **2. Prof. Ravi Shankar,** Assistant Professor in Agriculture Engineering, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib (9721892179) ravi.shiats007@gmail.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Dr. R.K. Jhorar,** College of Agricultural Engineering & Technology, CCS Haryana Agricultural University, Hisar- 125004, Haryana (01662255206, 09416586022) deancoaet@rediffmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Tejinder Pal Singh Sarao,** Prof & Head, Department of Mechanical Engineering, Baba Farid College of Engineering & Technology, Deon, BTI (9501115438) hodmebfcet@gmail.com	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the Board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

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Board of Studies
Agriculture Sciences
(01.10.17 to 30.09.19)

Programme:
1. B. Sc. (Agriculture) (Hons.) (4 Yrs.)
Board of Studies in Agriculture Sciences is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council appointee	1. **Dr. S.S. Bal,** Dean, Baba Farid Group of Institutions and Former Director of Seeds, PAU, Ludhiana, Bathinda (9501115223) drssbal@yahoo.co.in	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization) (Not Available)	1. **Dr. C.M. Parihar,** Scientist, Agronomy, Water Technology Centre, Indian Agricultural Research Institute, PUSA Campus, N.Delhi-110012 (9013172214) pariharcm@gmail.com	Member(s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the Univ.)	1. **Dr. Naveen Singh,** Principal Scientist (Plant Breeding) Division of Genetics, Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012 (09013473811) ns1.genet@gmail.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. B.D. Sharma**, Prof. Emeritus Soil Science (Retd.), # 31, Sunil Park, Barewal Road, Ludhiana (Ph. 09417451080) bdsharma31@gmail.com 2. **Dr. Joginder Singh,** Head, Department of Economics (Retd.), # 44, Shant Park, Ludhiana (9814435516) drjogindersingh@hotmail.com	Members
(v)	Two Faculty Members (from Affiliated/	1. **Dr. Tarun Goyal,** Head, Department of Agriculture Zoology, Baba Farid College, Bathinda (Ph. 09501115279) goyaltarun06@gmail.com	Members

	Constituent Colleges)	**2. Mr. Gurjinder Singh,** Assistant Professor, Agriculture Department, Bhai Gurdas Degree College, Sangrur (09803339607) gurjindersingh4u@gmail.com	
(vi)	One Representative (from Industry/ Corporate sector)	**1. Dr. Surbhi Sharma,** Prof. Botany, Baba Farid College, Bathinda (9501115350) ajyanshi@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Dr. D.S. Malik,** Professor & Head, Department of LPM & ILFC, GADVASU, Ludhiana-141004 (9876351524) dsmalik67@gmail.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of Studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the Board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

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Board of Studies
Biotechnology
(01.10.17 to 30.09.19)

Programmes:
1. B.Sc. (Biotechnology)
2. M.Sc. (Biotechnology)
3. B.Sc. (Medical Laboratory Science)
4. M.Sc. (Medical Laboratory Science)

Board of Studies in Biotechnology is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council appointee	**1. Kashmir Singh,** Department of Biotechnology, Panjab University, Chandigarh (9501684096) kashmirbio@pu.ac.in	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization) (of each specialization) (not available)	**1. Dr. Jagdeep Kaur,** Department of Biotechnology, Panjab University, Chandigarh (9872846201) jagdeep@pu.ac.in	Member(s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. A.K. Gupta,** Retired Professor cum Head, Department of Biochemistry, PAU Ludhiana, (Ph. 9872452820) anilkgupta1954@gmail.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Giridhar Soni,** Retired Professor, Department of Biochemistry, PAU, Ludhiana, 503/2 Housefed Complex Pakhowal Road Ludhiana-141002 (9888483754) giridharsoni@gmail.com **2. Dr. Shammi Kapoor,** Professor & Head, Deptt of Microbiology, PAU, Ludhiana, (8427204189) hodmb@pau.edu	Members

(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	**1. Dr. R.P. Gupta,** Head, Dept. of Bio-Technology, BIS Institute of Sciences and Technology, Gagra (Moga), (Ph. 09878822104) rpgupta1947@gmail.com **2. Ms. Reena Mittal,** Assistant Professor, Dept. of Bio-Technology, BIS Group of Institutions, Gagra Campus, Moga – 142001, (9417926991) vasumittal60@gmail.com.	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Dr Harvinder Singh Saini,** Professor, Department of Microbiology, GNDU, Asr (9463186886) sainihs@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Meenakshi Bhagat,** Assistant Professor, Dept. of Bio-Technology, BIS Institute of Sciences and Technology, Gagra (Moga) (9988700252) meenakshi1910@yahoo.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of Studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the Board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

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Board of Studies
Chemical Engineering
(01.10.17 to 30.09.19)

Programme: B. Tech. (Chemical Engineering)

Board of Studies in Chemical Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council appointee	1. **Dr. Rajiv Arora,** Head of Chemical Engg. Department, Shaheed Bhagat Singh State Technical Campus, Ferozepur (9463385619) rajiv_fzr@yahoo.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization)	1. **Dr. Rajeev Kumar Garg,** Associate Prof. (Chemical Engg.), Shaheed Bhagat Singh State Technical Campus, Ferozepur (8288012013) rkg_garg@rediffmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	1. **Dr. Ajay Bansal, Assoc.,** Prof & Head, Department of Chemical Engineering, National Institute of Technology, Jalandhar (9417223839) bansala@nitj.ac.in	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. Gaurav Verma,** Assoc. Prof., Dr S.S.B. University Institute of Chemical Engg. & Technology, Panjab University, Chandigarh (9872492858) gauravverma@pu.ac.in 2. **Prof. Vinod Kumar Garg,** Head, Department of Environmental Science & Technology, Central University of Punjab, Bathinda. (8708460331) vinodkgarg@yahoo.com	Members
(v)	Two Faculty Members (from Affiliated/Constituent Colleges)	1. **Dr Seema Sharma,** Head, Department of Applied Chemistry, GZS Campus College of Engg. & Technology, MRSPTU, Bathinda. (8872500279, 8872500260) harprit6920@gmail.com	Members

		2. Mr Pankaj Kalra, Assoc. Prof., Department of Chemical Engineering, Shaheed Bhagat Singh State Technical Campus, Ferozepur (8054100770) pankajkalra75@gmail.com	
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr Tirathrup Mandape,** Senior Manager (Production), National Fertilizer Limited, Bathinda (9417407687) tmmandape@nfl.co.in	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Ms Aashna Suneja,** Research Scholar, Indian Institute of Technology, N. Delhi (7589236992) aashnasuneja2@gmail.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the Board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY,
DABWALI ROAD, BATHINDA-151001
[Established by Govt. of Punjab vide Act No. 5 of 2015, UGC Act 2(f)]
DEAN ACADEMIC AFFAIRS
Ph. 0164-2284298, 8725072488
www.mrsptu.ac.in **daa.mrsstu@gmail.com, daa@mrsptu.ac.in**

Board of Studies
Chemistry
(01.10.17 to 30.09.19)

Programme:
1. M. Sc. (Chemistry)

Board of Studies in Chemistry is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Seema Sharma,** Associate Professor, Deptt. of Applied Chemistry, GZS Campus CET, Bathinda (Inorganic Chemistry) (9417114169, 8872500279) harprit6920@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Sudhanshu Pratap Singh,** Assistant Professor, Deptt. of Applied Chemistry, GZS Campus CET, Bathinda (Analytical Chemistry) (8266939341, 9997182264) anshubol@gmail.com **2. Dr. Kewal,** Assistant Professor, Deptt. of Applied Chemistry, GZS Campus CET, Bathinda (Organic Chemistry) (8054066055, 9417369463) kewal_8454@ymail.com **3. Dr. Meenu,** Assistant Professor, Deptt. of Applied Chemistry, GZS Campus CET, Bathinda (Inorganic Chemistry) (9872728259) menu.chem@gmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Navneet Kaur,** Associate Professor, Deptt. of Chemistry, Panjab University, Chandigarh (98152450, 98) navneetkaur@pu.ac.in	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Palwinder Singh,** Professor, Deptt. of Chemistry, G.N.D. Univ., Asr. (9876062406) palwinder_singh_2000 @yahoo.com **2. Dr. Geeta Hundal,** Professor, Deptt. of Chemistry, G.N.D. Univ., Asr. (9501114469) geetahundal@yahoo.com	Members
	Subject Expert	**1. Dr. Alok Srivastava,** Professor, Deptt. of Chemistry, Panjab Univ., Chandigarh (0172-2534424, Fax 0172-2545074) alok@pu.ac.in	Member (Co-opted)
(v)	Two Faculty Members (from Affiliated/	**1. Dr. Lalit Sharma,** Professor, Chemistry, Deptt. of Applied Sciences, SBSSTC Ferozepur	Member

	Constituent Colleges)	(9872069500) lalitlalit64@rediffmail.com **2. Dr. Sangeeta Sharma,** Professor, Chemistry, Deptt. of Applied Sciences, SBSSTC, Ferozepur (9888569566) ssharma70in@yahoo.co.in	Member
(vi)	One Representative (from Industry/ Corporate sector)	**1. Sh. Daljit Singh,** AGM Maintenance-Civil, Guru Gobind Singh Refinery, Bathinda- a unit of HMEL, village Phillokhari, Talwandi Sabo (9988887610) daljit.singh@hmel.in, dsingh33@rediffmail.com	Member
(vii)	One Post Graduate meritorious alumnus (Not available)	**1. Dr. Rajesh Kumar,** Associate Professor, Centre of Chemical Sciences, Central University of Punjab, Bathinda (9914969694) rajeshchem01@gmail.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
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f) Any other assignment given by the Vice-Chancellor from time to time.

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Dean Academic Affairs

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Board of Studies
Civil Engineering
(01.10.17 to 30.09.19)

Courses:
Programmes:
1. B.Tech. (Civil Engineering)
2. B.Tech. (Construction Engineering)
3. M.Tech. (Civil Engineering)
4. M. Tech. (Structural Engineering)
5. B.Tech. (Mining Engineering)
6. B.Tech. (Geotechnical Engineering)
7. B.Tech. (Structure & Foundation Engineering)
8. B.Tech. (Infrastructure Engineering)

Board of Studies in Civil Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Manjeet Bansal,** Head Deptt. of Civil Engg., GZS Campus CET, BTI (8725072480) push kar5@yahoo.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Sanjiv Kumar Aggarwal,** Prof., Deptt. of Civil Engg. GZS Campus CET, Bathinda (Transportation Engg.) (9478022281) sanjiv_aggarwal@rediffmail.com **2. Dr. Rakesh Kumar,** Prof., Deptt. of Civil Engg., GZS Campus CET, Bathinda (Structural Engg.) (7589196148) rkumar _s@rediffmail.com **3. Dr. Bal Krishan,** Professor, Deptt. of Civil Engg., GZS Campus CET, Bathinda (Structural Engg.) (8872320600) balkrishandr@yahoo.com **4. Er. Gurprit Singh Bath,** Associate Prof., Deptt. of Civil Engg., GZS Campus CET, Bathinda (Geotechnical Engg.) (9417171710) gpsbath66@gmail.com	Member(s)
(iii)	One Subject Expert (in the Subject from outside the Univ.)	**1. Dr. Sanjeev Naval,** Head, Deptt. of Civil Engg., DAVIET, Jalandhar (9914014848) sanjeevnavaI2005@yahoo.com	Member

(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. Rakesh Khosa,** Prof., Deptt. of Civil Engg., lIT Delhi, (9810457772) rkhosa@civiLiitd.ac.in, rakesh.khosa@gmail.com 2. **Dr. B.R. Gurjar,** Prof., Deptt. of Civil Engg. lIT Roorkee, (9927141416) brgurjar@gmaiLcom	Members
	Subject Expert	1. **Dr. Rajiv Chauhan,** Head, Deptt. of Civil Engg., IKG PTU, Jalandhar (9416496964) rajiv.meet@gmail.com	Member (Co-opted)
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	1. **Dr. Vidya Sagar Batra.** Prof., Deptt. of Civil Engg, RIMIT, Gobindgarh (9779250636) vidyabatra6@gmail.com 2. **Er. Ritesh Jain,** Associate Prof., Deptt. of Civil Engg., PAU, Ludhiana (9463319384) ritesh5@pau.edu	Members
(vi)	One Representative (from Industry /Corporate sector)	1. **Er. Naresh Garg** (Structural. Engineers & Consultants), New Life Engineers, Kotakpura, (9876711647) nareshwrites@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	2. **Er. Sandeep Singla,** Head, Deptt. of Civi Engg., RIMlT Institute of Engineering & Tech, Gobindgarh (8872002097)	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
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f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Dean Academic Affairs

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Board of Studies
Commerce and Business Management
(01.10.17 to 30.09.19)

Programmes:

1. **Bachelor in Business Administration,**
2. **B.Com. (Hons.),**
3. **M.Com.,**
4. **Master in Business Administration,**
5. **Post Graduate Diploma (Management)**

Board of Studies in Commerce and Business Management is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
1	Head of the University Department concerned	**1. Dr. Suman Kathuria,** GZSCCET, Dabwali Road, Bathinda (8725072428) suman_kathuria@yahoo.co.in	Chairperson (Ex-officio)
2	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Veerpal Kaur,** Associate Professor, GZSCCET, Dabwali, Road, Bathinda (9814503254) veerpalkaur1@rediffmail.com **2. Dr. Pritpal Singh Bhullar,** Assistant Professor, GZSCCET, Bathinda. (8968890006) bhullar_pritpal36@yahoo.co.in	Member
3.	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Sonia Chawla,** Prof. & Head, Department of Management, DAVIET, Jalandhar, (9888250412) mimitrohit@gmail.com	Member
4.	Two Subject Experts (nominated by the Vice Chancellor)	**1. Major Gen. TPS Bakhshi,** Director, Business Affairs, Indian School of Business, Mohali Campus, Knowledge City, Sector-8l, Mohali-140306 (9357892530) tejpal_bakhshi@isb.edu. **2. Dr. Pomy Bansal,** Assistant Professor, S.S.D. Girls College, Bathinda (9872065150) pomybansal@gmail.com	Members
5.	Two Faculty Members (from Affiliated/	**1. Dr. Jiwan Jyoti Maini,** Assistant Professor & Incharge, Deptt. of Management Studies, MIMIT, Malout (9417941014) jjmaini@gmail.com	Member

	Constituent Colleges)	**2. Dr. Bhupinder Singh Bhullar,** Assistant Professor & HOD MBA, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib (9814051870) bhullbs@yahoo.com	
6.	OneRrepresentative (from Industry/Corporate sector	**1. Mr. Vinay Grover,** Director, Symbiosis Management Consultants Pvt. Ltd., Chandigarh (9316722155) vgrover@symbiosisindia.net	Member
7.	One Post Graduate meritorious alumnus (Not Available)	**1. Mr. Ajay Kumar,** Management Associate, (Unit HR & Admin Head) Dainik Bhaskar Corp. Ltd., Bathinda (987296318) ajay.kumar6@dbcorp.in, ajay_25thakur@yahoo.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
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f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Dean Academic Affairs

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Board of Studies
Computer Applications
(01.10.17 to 30.09.19)

Programmes:

1. Bachelor of Computer Applications
2. Masters of Computer Applications
3. M.Tech. (Computer Applications)
4. Post Graduate Diploma in Computer Applications
5. M.Sc. (Mathematics and Computation)

Board of Studies in Computer Applications is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Prof. Sanjay Bhatnagar,** Head, GZS Campus CET, Dabwali Road, Bathinda (8725072319) hodcc.gzsccet@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Munish Kumar,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (9872319157) munishcse@gmail.com **2. Dr. Amitoj Singh,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (9855000456) amitoj.ptu@gmail.com **3. Dr. Anju Sharma,** Assistant Professor, GZS Campus CET, Dabwali Road, Bathinda (9888997297) anjuphd@gmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Prof. (Dr.) Manish Kumar Jindal,** Professor, Computer Applications Panjab University Regional Centre, Muktsar (9779351188) manishphd@rediffmail.com	Member
	Subject Expert	**1. Dr. S.N. Panda,** Professor & Director (Research), Chitkara University, Rajpura (9466496257) snpanda@chitkara.edu.in	Member (Co-opted)
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Vishal Goyal,** Associate Professor, Department of Computer Science, Punjabi University, Patiala (9501096111) vishal.pup@gmail.com	Members

		2. Dr. Anil Verma, Professor, Department of Computer Science & Engineering, Thapar University, Patiala (9888601667) anilk@thapar.edu.in	
	Subject Expert	**1. Dr. Amandeep Kaur,** Associate Professor & Head, Computer Science & Technology Department, Central University of Punjab, Bathinda (9464946974) aman_2007@hotmail.com	Member (Co-opted)
(v)	Two Faculty members (from Affiliated/ Constituent Colleges)	**1. Dr. Gulshan Ahuja,** Assistant Professor in Computer Applications, SBS Campus College of Engg. & Tech. Ferozpur (8146550540) gulshanahuja@gmail.com **2. Mrs. Nisha Gupta,** Assistant Professor in Computer Applications, Punjab Institute of Technology, Nandgarh (Bathinda) (7696340632) nisha_bti@yahoo.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Ms. Anuka Kumar,** Manager, Academic Partnership IBM Career Education, IBM India Private Ltd., DLF Silokhera NH-8, Section-30, Gurgaon (9910038405) anukakumar@in.ibm.com	Member
	Subject Expert	**1. Neeraj Bhat,** Team Leader, AON Infotech, Gurgaon, neeraj.bhatt@aon.com	Member (Co-opted)
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Er. Navdeep Goel,** Block A and B, Ground Floor, DLF Building, Plot No. 2, Rajiv Gandhi Technology Park, Kishangarh, Chandigarh (9158594096) navdeep_nanu@yahoo.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
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f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Dean Academic Affairs

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Board of Studies
Computer Science & Engineering
(01.10.17 to 30.09.19)

Programmes:

1. **B. Tech. (Computer Science & Engineering)**
2. **B. Tech. (Computer & Communication Engineering)**
3. **B. Tech. (3-D Animation & Graphics)**
4. **B. Tech. (Computer Networking)**
5. **M. Tech. (Computer Science & Engineering)**
6. **M. Tech. (Computer Engineering)**
7. **M. Tech. CSE (E-Security)**
8. **M. Tech. CSE (Computer Network and Internet Security)**
9. **M. Tech. CSE (Software Engineering)**

Board of Studies in Computer Science & Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	1. **Dr. Naresh Kumar Garg,** Professor & Head, GZSCCET, Dabwali Road, Bathinda (8725072422, 9463077886) cse.gzscet@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty member from University Department concerned (of each specialization)	1. **Dr. Paramjit Singh,** Professor CSE Dept. GZSCCET, Bathinda. (8725072459) param2009@yahoo.com 2. **Dr. Shaveta Rani,** Professor CSE, GZSCCET, Bathinda, {8284011796) garg_shavy@yahoo.com 3. **Dr Anupama Gupta,** Associate Professor CSE, GZSCCET, BTI (9872008716) anupamagemini@gmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	1. **Dr. Rajesh Bhatia,** Professor, CSE Dept., PEC Technological Campus, Sector-12, Chandigarh-160012. (9463369282, 0172-2753854) rbhatia@pec.ac.in.	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. Savita Gupta,** Professor, CSE Dept., University Institute of Engineering & Technology, Panjab University (9463330763, 0172- 2536117) savita2k8@yahoo.com.	Members

		2. Dr. H.S. Saini, Managing Director, Guru Nanak Institutions, Hyderabad (8008477668) md@gniindia.org	
(v)	Two Faculty Members (from Affiliated/Constituent Colleges)	**1. Dr. Gurpreet Singh,** Associate Professor CSE, PIT Rajpura (8195965203) gps_ynr@yahoo.com **2. Er. Japinder Singh,** Assistant Professor CSE, SBSSTC, Ferozepur (847102004) japitaneja@gmail.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Er. Harvinder Singh,** Project Manager, TCS Chandigarh (8968833188) mail2harvinder@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Gaurav Gupta,** Assistant Professor, Computer Engg. Dept., Punjabi University, Patiala (9501236400) gauravshakti@yahoo.com	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
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Dean Academic Affairs

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Board of Studies
Electrical & Electronics Engineering
(01.10.17 to 30.09.19)

Programme:
1. B. Tech. (Electrical & Electronics Engineering)
Board of Studies in Electrical & Electronics Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council Appointee	**1. Dr. Jyoti Saxena,** Professor ECE Deptt. GZSCCET, Bathinda (Communication Systems, Soft Computing, Signal Processing, Communication) (8725072489) jyotianupam@yahoo.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. A.K. Goel,** Professor and Head, Department of Electronics and Communication Engineering, GZS Campus CET Bathinda (8725072491) ashokkgoel1@gmail.com **2. Dr S.K. Bath,** Professor and Head, Department of Electrical Engineering, GZS Campus CET Bathinda (9463836070, 8725072420) skbath77@gmail.com **3. Dr. Lakhwinder Singh,** Professor, Department of Electrical Engineering, BBSB CET Fatehgarh Sahib (9814508213, 8872007780) b_lakh@yahoo.com, dean.academics@bbsbec.ac.in	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. J.S. Dhillon,** Professor, Department of Electrical and Instrumentation Engineering, SLIET, Longowal (9779828833) jsdhillonp@yahoo.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Yadwinder Singh Brar,** Professor, Department of Electrical Engineering, PIT, Kapurthala. (9478098013) braryadwinder@yahoo.co.in	Members

		2. Dr. Surinder Singh, Professor, Department of Electronics and Communication Engineering, SLIET, Longowal (9501022632, 9417589632) surinder_sodhi@rediffmail.com, surinder_sodhi@sliet.ac.in	
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	**1. Dr. Satish Kansal,** Associate Professor, Department of Electrical Engineering, Baba Hira Singh Bhattal Institute of Engg. & Technology, Lehragaga, Sangrur) (9417250579) kansalbhsb@gmail.com **2. Dr. Sanjeev Dewra,** Assistant Professor (Senior Scale), Deptt. of Electronics and Communication Engineering, SBSSTC, Ferozpur. (9478602002, 9417944033) sanjeev_dewra@yahoo.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr. Pardeep Aggarwal,** Jay Bee Industries, 5 km Stone, Malout Road, Bathinda (9815032387) pradeep@jaybeeindustries.com.	Member
(vii)	One Post Graduate meritorious alumnus	**1. Er. Amit Goel,** Additional Superintending Engineer, Ash Handling Plant, Guru Nanak Dev Thermal Power Plant, Bathinda (9646115179) amitgoel1976@gmail.com	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
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c) Suggest panel of experts to the Academic Council for appointment as examiners.
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Dean Academic Affairs

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Board of Studies
Electrical Engineering
(01.10.17 to 30.09.19)

Programmes:
1. B.Tech. (Electrical Engineering)
2. B.Tech. (Electrical Engineering & Industrial Control)
3. M.Tech. (Electrical Engineering)
4. M.Tech. EE (Power System)
5. M.Tech. EE (Instrumentation & Control Engineering)

Board of Studies in Electrical Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Sarbjeet Kaur Bath** Prof. and Head, Deptt. of Electrical Engg., Giani Zail Singh Campus College of Engineering & Technology, Bathinda, Punjab-151001 (9463836070, 8725072420) sjkbath77@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty member from University Department concerned (of each specialization)	**1. Dr. Ved Parkash** Assistant Prof., Deptt. of Electrical Engg., Giani Zail Singh Campus College of Engineering & Technology, Bathinda, Punjab-151001 (9416130902) ved_park@yahoo.co.in **2. Dr. Amit Kumar Manocha** Associate Prof., Deptt. of Electrical Engg., PIT, Moga, Punjab (9855920758) akmanochagzsccet@gmail.com	Member(s)
	Subject Experts	**1. Dr. Kanwardeep Singh** Associate Prof., Deptt. of Electrical Engg, Guru Nanak Dev Engg. College, Gill Road, Ludhiana (9501411533) kds97dee@gmail.com **2. Dr. Derminder Singh** Associate Prof., School of Electrical Engg. and Information Technology, PAU Ludhiana (9463452068) derminder@pau.edu	Member(s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the university)	**1. Dr. A. S. Arora** Prof. Deptt. of Electrical & Instrumentation Engg., SLIET, Longowal, Sangrur, Punjab (9463217074) ajatsliet@yahoo.com	Member
(iv)	Two Subject Experts (nominated by	**1. Dr. J.S. Dhillon** Prof. Deptt. of Electrical & Instrumentation Engg., SLIET, Longowal, Sangrur, Punjab	Members

	The Vice Chancellor)	(9779828833) jsdhillonp@yahoo.com **2. Dr. Yadwinder Singh Brar** Prof. Deptt. of Electrical Engg., PIT, Kapurthala (9478098013) braryadwinder@yahoo.co.in	
(v)	Two Faculty Members (from Affiliated/ Constituent colleges)	**1. Dr. Lakhwinder Singh** Prof. Deptt. of Electrical Engg., Baba Banda Singh Bahadur Engineering College Campus, Fatehgarh Sahib, Punjab-140407 (9814508213) b_lakh@yahoo.com **2. Mrs. Navneet Kaur** Assistant Prof. Deptt. of Electrical Engg., Shaheed Bhagat Singh State Technical Campus, Ferozepur (8288012021) navneetkular@rediffmail.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr. Karan Kansal (Director)** Mahashakti Energy Ltd., A-8, New Focal Point, Dabwali Road, NH-64, Bathinda 151001, Punjab, India (01642280058, 9878507000) karan@mahashaktienergy.com	Member
(vii)	One Post Graduate meritorious alumnus	**2. Dr. Satish Kansal** Associate Prof., Deptt of Electrical Engg., Baba Hira Singh Bhathal Institute of Engg. & Tech., Lehragaga, Sangrur, Punjab-148031 (9417250579) kansal_bhsb@gmail.com	Member

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a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
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d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

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Board of Studies
Electronics Engineering
(01.10.17 to 30.09.19)

Programmes:
1. B.Tech. (Electronics & Communication Engineering)
2. B.Tech. (Electronics & Tele-Communication Engineering)
3. B.Tech. (Electronics & Instrumentation Engineering)
4. M.Tech. (Electronics & Communication Engineering)
5. M.Tech. ECE (Microelectronics)
6. M.Tech. ECE (Embedded System)
7. M.Tech. ECE (Signal Processing)

Board of Studies in Electronics Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Ashok Kumar Goel,** Prof. & Head, GZS Campus CET, Dabwali Road, Bathinda (8725072491, 9417625153) eceptugzs@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**2. Dr. Savina Bansal,** Professor, ECE Deptt. GZSCCET, Bathinda (High Performance, Energy Efficient & Fault-tolerant Computing) (8146600954) savina.bansal@gmail.com **3. Dr. Jyoti Saxena,** Professor ECE Deptt. GZSCCET, Bathinda (Communication Systems, Soft Computing, Signal Processing, Communication) (8725072489) jyotianupam@yahoo.com **4. Dr. R.K. Bansal,** Professor ECE Deptt. GZSCCET, Bathinda (Real Time Computer Systems, Wireless Sensor Networks) (9463000954) drrakeshbansal@gmail.com **5. Dr. Balraj Singh Sidhu,** Professor ECE Deptt. GZSCCET, Bathinda (Optimization Techniques) (9781649000) drbss.sidhu@gmail.com **6. Er. Neeraj Gill,** Associate Professor, ECE Deptt. GZSCCET Bathinda (Nano Composites for Electromagnetic Wave Absorption)	Member(s)

		(9464662132) neerajgiil_ece@rediffmail.com **7. Dr. Shweta Rani,** Assistant Professor, Deptt. of ECE, GZSCCET Bathinda (Antennas, Wireless Communication, Soft-Computing) (8968999118) shwetaranee@gmail.com **8. Dr. Manoj Sharma,** Assistant Professor, Deptt. of ECE, GZSCCET Bathinda (Wireless Communication) (829561000) neelmanoj@gmail.com	
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Prof. Parveen Bajaj,** Associate Professor MMU, Sadopur, Haryana (9416244697, 7015562150) erparveen@rediffmail.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Amit Wason,** Principal, Ambala College of Engg & Research, Near Saha Ambala Cantt, Ambala (9896240333) wasonamit13@gmail.com **2. Mr. Ish Bharghaw,** Managing Director, Spectross Digital Systems, Floor-II, Plot no. 483, Udhay Vihar, Gurgaon, Haryana (9811808102) ish@spectross.com	Members
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	**1. Er. Vikas Goyal,** HOD Electronics Deptt. ASRA College of Engg., Patiala (9464143864) asrahodece@gmail.com **2. Er. Hardeep Singh,** Head of ECE Deptt, Baba Farid Group of Institutions, Bathinda (9501115485) hodecebfcet@babafaridgroup.com	Members
(vi)	One representative (from Industry/ Corporate sector)	**1. M. Arvind Dixit,** Managing Director, Advanced Technologies, SCO-08, Ajit Enclave, Kalka Road, Dhakoli, Zirakpur. (9813036923) dixitarvind16@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Kulwinder Singh** Assistant Professor, Department of Electronics & Comm. Engg., BMS CET Mukatsar	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.

b) Suggest methodologies for innovative teaching and evaluation techniques.

c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Dean Academic Affairs

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Board of Studies
Environmental Science & Technology
(01.10.17 to 30.09.19)

Programmes:
1. B. Tech. (Environmental Science & Engineering)
2. M. Tech. (Environmental Engineering & Management)
3. M. Sc. Environmental Science

Board of Studies in Biotechnology is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairman (Ex-officio)
	Academic Council Appointee	**1. Dr. Manjeet Bansal,** Head, Deptt. of Civil Engineering, GZS Campus CET, Dabwali Road, Bathinda. (8725072480, 98151261) push¬_kar5@yahoo.com	Chairperson(Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Prof. (Dr.) Gursharan Singh,** Professor, Department of Chemistry, GZS Campus College of Engg. & Tech, Bathinda (Ph. 09417628270) gursharans82@gmail.com	Member(s)
	Subject Experts	**1. Dr. Sunil Mittal,** Associate Professor, Department of Environmental Science & Engineering, Central University of Punjab, Bathinda (9815620186) unil.cevs@gmail.com **2. Dr. V.K. Garg,** Professor, Department of Environmental Science & Engineering, Guru Jambeshwar University of Science & Technology, Hissar (9812058109) vinodkgarg@yahoo.com	Member(s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Er. Ritesh Jain,** Associate Professor, Deptt. of Civil Engg. PAU, Ludhiana (9463319384) ritesh5a@pau.edu	Member
(iv)	Two Subject Experts (nominated	**1. Dr. Manpreet Singh Bhatti,** Associate Professor, Department of Botanical & Environmental Sciences, GNDU, Amritsar	Members

	by the Vice Chancellor)	(9417107598) mbhatti73@gmail.co **2. Dr. B.R. Gurjar,** Professor, Deptt. of Civil Engg. IIT Roorkee (9927141416) brgurjar@gmail.com	
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges) (Not Available)	**1. Dr. Sushil Kumar Kansal,** Professor, Deptt. of Environmental Science & Engg., Punjab University, Chandigarh (9876581564) sushilkk1@pu.ac.in **2. Dr. Sanjay Sharma,** Professor, Department of Civil Engg, NITTTR, Sector-26, Chd. (9872005961) sanjaysharmachd@yahoo.com	Members (Co-opted)
(vi)	One Representative (from Industry/ Corporate sector)	**1. Er. Sanjay Kumar Singh,** Head, Environment Management Division & Management Systems, Ambuja Cement Ltd., Near GNDTP Malout Road, Bathinda (8146665957) anjaykumar.singh@ambujacement.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Er. Sandeep Singla,** Head, Deptt. of Civil Engg., RIMIT - Institute of Engineering & Tech, Gobindgarh (8872002097) prof.sandeepsingla@gmail.com	Member (Co-opted)

The main functions of BOS are as follows:

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b) Suggest methodologies for innovative teaching and evaluation techniques.
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f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Board of Studies
Food Science & Technology
(01.10.17 to 30.09.19)

Programmes:

1. **Certificate Programme (Food Processing)**
2. **Diploma Programme (Food Processing)**
3. **B.Tech. (Food Technology)**
4. **M.Sc. (Food Technology)**
5. **Ph.D. (Food Technology)**

Board of Studies in Food Technology is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	1. **Dr. Kawaljit Singh Sandhu,** Associate Professor, Department of Food Science and Technology, Maharaja Ranjit Singh Punjab Technical University, Bathinda (9896268539) kawsandhu@rediffmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	1. **Dr. Gursharan Singh,** Professor, Department of Chemistry, GZS Campus CET, Bathinda (9417628270) gursharans82@gmail.com 2. **Dr. Tanuja Srivastwa,** Head, Dept. of Food Technology, Bhai Gurdas Institute of Engineering & Technology, Sangrur (9814847492) tanusriva@yahoo.co.in	Member(s)
(iii)	One Subject Expert (in the subject from outside the University)	1. **Dr. Poonam A. Sachdev,** Professor, Dept. of Food Science and Technology PAU, Ludhiana, sachdev_poonam@pau.edu, sachdev_poonam@yahoo.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	1. **Dr. S.S. Marwaha,** Professor, Centre for Applied Agriculture Department of Food Science and Technology (9815014974) ssmarwaha@yahoo.com 2. **Dr. D.C. Saxena,** Professor, Dept. of Food Engineering & Technology, SLIET Sangrur (9815608859) dcsaxena@yahoo.com	Members
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	1. **Dr. Ashish Baldi,** Professor & Head, Dept. of Pharmaceutical Science & Technology, Maharaja Ranjit Singh Punjab Technical University, Bathinda (8968423848) baldiashish@gmail.com	Members

		2. Mrs. Renu Sharma, Assistant Professor, Department of Chemistry, Bhai Gurdas Institute of Engineering & Technology, Sangrur (9855083400) renu.sharma6286@gmail.com	
(vi)	One Representative (from Industry/ Corporate sector)	**1. Dr Jyoti Saroop,** General Manager, The Unati Co-operative Society 5 km Talwara Milestone, GT Road, Talwara, Hoshiarpur-144216 (9417036707) unatiamla@yahoo.co.in, jsaroop@hotmail.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Sukhcharan Singh,** Professor, Department of Food Engineering and Technology, SLIET, Longowal, Punjab (9501583366) sukhcharns@yahoo.com, sukhcharn@sliet.ac.in	Member

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
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Board of Studies
Hospitality & Tourism Management
(01.10.17 to 30.09.19)

Programmes:

1. **Bachelor of Management Studies (Airline Tourism & Hospitality Management) (3 Yrs.)**
2. **Bachelor of Management Studies (Hotel Management and Catering Technology) (3 Yrs.)**
3. **Bachelor of Hotel Management and Catering Technology (4 Yrs.)**
4. **Bachelor of Tourism & Travel Management (4 Yrs.)**

Board of Studies in Hospitality & Tourism Management is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council Appointee	**1. Dr. R.H. Taxak,** Professor, Department of Tourism and Hotel Management, Kurukshetra Univ, (9416782444) rhtaxak@kuk.ac.in	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization) (Not Available)	**1. Mr. Raj Kumar,** HOD, Dept of Hotel Management, Amritsar College of Engg. and Technology. Amritsar (88720726090) hod.hmct@acetedu.in **2. Dr. Vinay Chamoli,** Associate Professor, Dept of Hotel Mgt . Maharaja Agrasen University, Baddi (8283827783) chamoli79@gmail.com	Member(s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Anish Slath,** Assistant Prof., University Institute of Hotel and Tourism Management, P.U. Chandigarh, (9872039980) anish_slath@pu.ac.in	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Prof. Parminder Singh Dhillon,** Assistant Professor, Department of Tourism, Hospitality & Hotel Management, Punjabi University, Patiala (9876166063) pamsfood@gmail.com **2. Dr. Hardaman Singh Bhinder,** Department of Tourism Hospitality & Hotel Management, Punjabi University, Patiala (9501024656) hardaman.bhinder@gmail.com	Members

(v)	Two Faculty Members (from affiliated/ constituent Colleges) (Not Available)	**1. Dr. Damanpreet Kaur,** HOD Management Deptt., Desh Bhagat Foundation Group, (8146438786) daman_preet802003@yahoo.com **2. Ms. Harpreet Kaur,** AP ATHM Deptt., Desh Bhagat Foundation Group, (7973484367) kaurharry1313@gmail.com	Members (Co-opted)
(vi)	One Representative (from Industry/ Corporate sector)	**1. Ashish Nikanj,** Senior lecturer, IHM Catering Technology & Nutrition, Bathinda (736003737) nikanjhotelier@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Amit Tomar,** Teaching Associate, IHM Catering Technology & Nutrition, Bathinda (9001468555) amittomar4444@gmail.com	Member (Co-opted)

The main functions of BOS are as follows:

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Board of Studies
Humanities & Social Studies
(01.10.17 to 30.09.19)

Programmes:
1. B.Sc. (Mass Communication)
2. Humanities and Social Studies subjects offered in other Programmes offered in the University

Board of Studies in Humanities & Social Studies is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council Appointee	**1. Dr. Manish Bansal,** Associate Professor (Management) cum Dean Academics, Malout Institute of Management & Information Technology (MIMIT), Near New Grain Market, Malout- 152107 Punjab (9356937037) bansal_mimit@yahoo.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization) (Not Available)	**1. Sushil Kumar,** Assistant Professor (English), Yadvindra College of Engineering, Punjabi University Campus, Talwandi Sabo (9417405636) kmrsushil@yahoo.co.in **2. Prof. Jyotsana Singla,** Associate Prof & HOD, Dept. of English, Govt. Rajindra College, Bathinda-151001 (9463120959) jsingla69@gmail.com	Member (s) (Co-opted)
(iii)	One Subject Expert (in the subject from outside the University)	**1. Prof. (Dr.) Harpreet Singh,** Principal, Gujranwala Guru Nanak Institute of Management & Technology(GGNIMT) Ghumar Mandi, Civil Lines, Ludhiana (9872681111) harpreetsinghmahal@gmail.com	Member (s)
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Prof. Narinder Sharma,** Associate Professor (English), DAV College, MALOUT- 152107 Punjab (9814961589) snarinder3011@gmail.com **2. Dr. Kulbhushan Kumar,** Professor & Head, Dept of English &	Members

		Communication Skills, Eternal University, Baru Sahib (8894593313, 8725819005) kulbhushanenglishphd@yahoo.co.in	
(v)	Two Faculty Members (from Affiliated/Constituent Colleges)	**1. Dr. Adarsh Preet Mehta,** Director MBA/MCA, Lala Lajpat Rai Institute of Engineering & Technology, MOGA (9041400786) dr.apmehta@gmail.com **2. Dr. Sukhbir Kaur,** Assistant Professor, Malout Institute of Management & Information Technology (MIMIT), Near New Grain Market, MALOUT- 152107, Punjab (427203505) sukhbir.mimit@gmail.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr. Jaiparkash Singh Hasrajani,** Co-Founder & CEO, Valeur HR E-Solutions Pvt. Ltd., 58, Industrial Area, Phase 1, Chandigarh-160002 (9815166998) jai@valeurhr.com	Member
(vii)	One Post Graduate meritorious alumnus	**1. Mr. Sachin Garg,** Assistant General Manager, HDFC Bank, Near Main Bus Stand, Bathinda (8054900625) sachin.garg@hdfcbank.com	Member

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Board of Studies
Information Technology
(01.10.17 to 30.09.19)

Programmes:

1. B. Tech. (Information Technology)
2. B.Sc. (Information Technology)
3. M.Tech. (Information Technology)
4. M.Tech. (Information Technology & Cyber Warfare)
5. M.Sc. (Information Technology)

Board of Studies in Information Technology is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council Appointee	**1. Dr. Harminder Singh Bindra,** Head, Department of Information Technology, MIMIT, Malout (9872928828) bindra.harminder@gmail.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Er. Abhilasha Jain,** Associate Prof., Department of Computer Science & Engg., GZS Campus CET, Bathinda **2. Er. Jyoti Rani,** Associate Prof., Department of Computer Science & Engg., GZS Campus CET, Bathinda. (9417460026) csejyotigill@gmail.com (8872500274) cse.gzscet@gmail.com. **3. Dr. Kanwalvir Singh Dhindsa,** Professor, Department of Information Technology, BBSB Engg. College, Fatehgarh Sahib (9855087778) kdhindsa@gmail.com, kanwalvir.singh@bbsbec.ac.in	Member(s) Member (Co-opted)
	Subject Expert	**1. Dr. Parminder Singh,** Professor, Dept of CSE, GNDEC, Ludhiana (9855576176) parminder2u@gmail.com	Member (Co-opted)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Akshay Girdhar,** Professor, Department of IT, GNDEC Ludhiana (9872461620) akshay_girdhar@gndec.ac.in	Member

(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Hardeep Singh,** Professor, Department of Computer Science, GND University, Amritsar (Ph. 9872002958) hardeep.dcse@gndu.ac.in **2. Prof. Kapil Sharma,** Head, Department of Information Technology, Delhi Technological University, Delhi (Ph. 0) kapsharma1977@gmail.com	Members
(v)	Two Faculty Members (from affiliated/constituent Colleges	**1. Er. Vijay Samyal,** Assistant Professor, Dept. of CSE, MIMIT Malout (9872992930) samyalmimit@gmail.com **2. Er. Vikas Singla,** Assistant Professor, Dept of IT, MIMIT, Malout (9815962612) single_vikas123@yahoo.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr. Vivek Prajapati,** CEO, Iron Network, E-51, Phase-8, Industrial Area Mohali (Ph. 9646002250) vivekprajapati24@gmail.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Ms. Varsha Sahni,** Assistant Professor, CT Institute of Engineering, Shahpur, Jalandhar (7986215457) barkhabright@gmail.com	Member (Co-opted)

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www.mrsptu.ac.in daa.mrsstu@gmail.com, daa@mrsptu.ac.in

Board of Studies
Marine Engineering
(01.10.17 to 30.09.19)

Programme:

1. B.Tech. (Marine Engineering)

Board of Studies in Marine Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	University Department not presently available	Chairperson (Ex-officio)
	Academic Council Appointee	**1. Dr. Balwinder Singh,** Professor, Department of Mech. Engg., GZS Campus CET Bathinda (8872500275) drbwssidhu07@gmail.com	Chairperson (Co-opted)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Rajesh Gupta,** Professor, Deptt. of Mech. Engg., GZSCCET, Bathinda (8872500261) rg91@rediffmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Hazoor Singh,** Professor, Deptt. of Mech. Engg., YCoE Talwandi Sabo (8146260200) hazoors@yahoo.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Buta Singh Sidhu,** Professor & Dean Planning & Development, MRSPTU, Bathinda (Ph. 09501109002) butasidhu@yahoo.com **2. Dr. Pardeep Jindal,** Assistant Professor, Deptt. of Mech. Engg. YCoE Talwandi Sabo, (9463443524) pardeepjindal79@gmail.com	Members
(v)	Two Faculty members (from Affiliated/ Constituent Colleges)	**1. Prof. J.S. Tiwana,** Associate Professor, Deptt. of Mech. Engg., GZSCCET, Bathinda (872072402) jstiwana1@rediffmail.com	Members

		2. Dr. Manpreet Kaur, Associate Professor, Deptt. of Mech. Engg., BBSBCE, Fatehgarh Sahib (9814818606) manpreet.arora@bbsbec.ac.in	
(vi)	One Representative (from Industry/ Corporate sector)	**1. Yadvinder Singh Dhaliwal,** Assistant Manager, Ambuja Cement Ltd, Bathinda (7087417004), yadvinder.dhaliwal@ambujacement.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Prof. Khushdeep Goyal,** Assistant Professor, Deptt. of Mech. Engg, Punjabi University Patiala (8283823283) khushgoyal@yahoo.com	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

Quorum of the Board of Studies is a minimum of half of the members of the board of Studies including the Chairperson, Board of Studies.

Dean Academic Affairs

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY,
DABWALI ROAD, BATHINDA-151001
[Established by Govt. of Punjab vide Act No. 5 of 2015, UGC Act 2(f)]
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Board of Studies
Mathematics
(01.10.17 to 30.09.19)

Programmes:
1. M.Sc. (Mathematics)

Board of Studies in Mathematics is hereby proposed for a period of two years (01.10.17 to 30.09.19).

Sr. No.	Nomenclature	Name & Address	Designation
1	Head of the University Department concerned	**1. Prof. Karanvir Singh** Head, Department of Applied Mathematics, GZS Campus CET, Dabwali Road, Bathinda – 151001 (8872211150) karanvirs786@gmail.com	Chairperson (Ex-officio)
2	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Kulbhushan Agnihotri,** Associate Professor, Department of Mathematics, Shaheed Bhagat Singh State Technical Campus, Moga Road (NH-95), Ferozepur, Punjab 152004**,** (9815264641) agnihotri69@gmail.com **2. Mr. Mukesh Grover,** Assistant Professor, Department of Applied Mathematics, GZS Campus CET, Dabwali Road, Bathinda – 151001**,** (9814922258) mukeshgrover.bti@gmail.com.	Members
	Subject Expert	**1. Dr. Vinay Kanwar,** Professor, Department of Mathematics, UIET, Panjab University, Chandigarh (9878369981) vkanwar_@hotmail.com	(Co-opted)
3.	One Subject Expert (in the subject from outside the Univ.)	**1. Prof. Sukhjeet Singh Dhaliwal,** Professor, Department of Mathematics, SLIET, Campus Road, Sangrur, Longowal, Punjab 148106, (9815980406) sukhjit_d@yahoo.com.	Member
4.	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. S.K. Tomar,** Professor, Department of Mathematics, Panjab University, Chandigarh (9463223629) sktomar@pu.ac.in **2. Dr. Parminder Singh**, Professor, Department of Mathematics, Guru Nanak Dev University, Amritsar (9501101298) singhparm@gmail.com	Members

5.	Two Faculty members (from Affiliated/ Constituent Colleges)	**1. Dr. Jaskaran Singh Bhullar,** Professor, Department of Mathematics, MIMIT, District Shri Mukatsar Sahib, Malout, Punjab-152107 (Ph. 09356737037) bhullarjaskarn@rediffmail.com **2. Ms. Mamta Kansal,** Assistant Professor, Department of Applied Mathematics, GZS Campus CET, Dabwali Road, Bathinda 151001 (8872211700) mamtakansal2k8@yahoo.com.	Members
6.	One Representative (from Industry/ Corporate sector	**1. Dr. O.P. Vinocha,** Ex-Professor, Department of Mathematics, Tantia University, Shri Ganganagar, Rajasthan (9468681182) vinochar@yahoo.com	Member
7.	One Post Graduate meritorious alumnus	**1. Dr. Amarinder Singh**, Assistant Professor, Department of Mathematics, Baba Banda Singh Bahadur Engineering College Campus, Fatehgarh Sahib, Punjab 140407 (9814521113) amarinder.singh@bbsbec.ac.in	Member

The main functions of BOS are as follows:

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b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
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f) Any other assignment given by the Vice-Chancellor from time to time.

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Board of Studies
Mechanical Engineering
(01.10.17. to 30.09.19)

Programmes:

1. **B.Tech. (Mechanical Engineering)**
2. **B.Tech. (Automobile Engineering)**
3. **B.Tech. (Automotive Engineering)**
4. **B.Tech. (Industrial Engineering)**
5. **M.Tech. (Mechanical Engineering)**
6. **M.Tech. ME (CAD/CAM),**
7. **M.Tech. ME (Thermal Engineering)**
8. **M.Tech. ME (Production Engineering)**
9. **M.Tech. ME (Industrial & Production Engineering)**
10. **M.Tech. ME (Automation & Robotics)**
11. **M.Tech. ME (CAD, Manufacturing & Automation)**

Board of Studies in Mechanical Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Balwinder Singh,** Professor, Department of Mech. Engg. GZS Campus CET Bathinda (8872500275) drbwssidhu07@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. B.S. Bhullar,** Associate Professor, Deptt. of Mech. Engg., BBSBCET, Fatehgarh Sahib, (9814051870) bs.bhullar@bbsbec.ac.in	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Pardeep Jindal,** Assistant Professor, Deptt. of Mech. Engg. YCoE Talwandi Sabo, (9463443524) pardeepjindal79@gmail.com	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Buta Singh Sidhu,** Professor and Dean Planning & Development, MRSPTU, Bathinda (9501109002) butasidhu@yahoo.com **2. Dr. Sehijpal Singh,** Professor & Principal., GNEC, Ludhiana (9855279865) mech@gndec.ac.in	Members

(v)	Two Faculty members (from Affiliated/ Constituent Colleges)	**1. Prof. Charanjit Singh,** Associate Professor, Deptt. of Mech. Engg., GZSCCET, Bathinda (8195888988) charanjitmech@gmail.com	Members
	Subject Expert	**1. Dr. Neel Kanth Grover,** Professor, Deptt. of Mech. Engg., IKGPTU, Jalandhar (9855857900) neelkanthgrover@gmail.com	Member (Co-opted)
(vi)	One Representative (from Industry/ Corporate sector)	**1. Yadvinder Singh Dhaliwal,** Assistant Manager, Ambuja Cement Ltd., Bathinda (7087417004) yadvinder.dhaliwal@ambujacement.com	Member
(vii)	One Post Graduate meritorious alumnus (Not Available)	**1. Dr. Harpreet Singh,** Professor, Deptt. of Mech. Engg, IIT, Ropar (9855709052) harpreetsingh@iitrpr.ac.in	Member (Co-opted)

The main functions of BOS are as follows:

a) Prepare syllabi for various Programmes keeping in view the objectives of the institution, interest of stakeholders and national requirements for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of experts to the Academic Council for appointment as examiners.
d) Coordinate research, teaching, extension and other academic activities in the department/ institution.
e) The Board of studies will also suggest a panel of faculty members for setting the question papers and for appointment as External examiners for practical Programmes.
f) Any other assignment given by the Vice-Chancellor from time to time.

Quorum:

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Board of Studies
Pharmacy
(01.10.17. to 30.09.19)

Programmes:

1. **Pharm. D.**
2. **Pharm. D. (Post Baccalaureate)**
3. **B. Pharm.**
4. **B. Pharm. (Practice)**
5. **M. Pharmacy (Pharmacognosy)**
6. **M. Pharm. (Pharmaceutical Analysis)**
7. **M. Pharm. (Quality Assurance)**
8. **M. Pharm. (Pharmaceutics)**
9. **M. Pharm. (Pharmaceutical Chemistry)**
10. **M. Pharm. (Pharmacology)**
11. **PG Skill Certification Programmes**

Board of Studies in Pharmacy is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S.N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	1. **Dr. Ashish Baldi** Prof. & Head, Department of Pharmaceutical Sciences, MRSPTU, Bathinda (8725072348) baldiashish@gmail.com	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Puneet Kumar** Department of Pharmaceutical Sciences, MRSPTU, Bathinda (8725072349) punnubansal79@gmail.com **2. Dr. B.S. Bajwa** Professor, Lala Lajput Rai College of Pharmacy, Moga-Ferozepur GT Road, Near P.S. Sadar, Moga (9815640751) bajwabaljinedr@yahoo.co.in **3. Dr. Uttam Kumar Mandal** Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda (9872419542) mandalju2007@gmail.com **4. Rakesh Garg** SD College of Pharmacy, Barnala (9417493032) rakeshgogi@rediffmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Anupam Sharma** Professor, University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, Sector – 14, Chandigarh (9872021661) ans1959@rediffmail.com	Member

(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. Pawan Krishan** Department of Pharmaceutical Sciences & Drug Research, Punjabi University, Patiala (9417874747) pawankrishan@rediffmail.com 2. **Dr. Subheet Jain** Head, Department of Pharmaceutical Sciences, GNDU, Amritsar (9815899705) subheetjain@rediffmail.com	Members
(v)	Two Faculty Members (from Affiliated/ Constituent Colleges)	**1. Dr. Gautam Rath** ISF College of Pharmacy, Moga – Ferozepur GT Road, Moga (9888206383) gautamrath@rediffmail.com **2. Dr. A.M.J. Newton** Director Principal, Swift School of Pharmacy, Rajpura (9878872510) dramjnewton@gmail.com	Members
(vi)	One Representative (from Industry/ Corporate sector)	**1. Dr. Indresh Jain** Senior Production Manager, Sun Pharmaceutical Industries Ltd., Mohali (Pb.) (indresh_jain@yahoo.com)	Member
(vii)	One Post Graduate meritorious alumnus	**1. Dr. Rahul Deshmukh** Department of Pharmaceutical Sciences, MRSPTU, Bathinda (9877039159) login2rd@gmail.com	Member

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Board of Studies
Physics
(01.10.17. to 30.09.19)

Programme:
1. M.Sc. (Physics)

Board of Studies in Physics is hereby proposed for a period of two years (01.10.17 to 30.09.19).

Sr. No.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Prof. (Dr.) Sandeep Kansal,** Professor & Head, Dept. of Applied Physics, GZSCCET, Bathinda (8725072490) skansal@mrsptu.ac.in	Chairperson (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Prof. (Dr.) J.S. Hundal,** (Material Science) Registrar, MRSPTU, Bathinda (8872500251) jshundal@yahoo.com. **2. Dr. Veena Sharma,** Assistant Professor (Experimental Atomic Physics), Dept. of Applied Physics, GZSCCET, Bathinda (9781601059) vn.veena@gmail.com **3. Dr. Gagan Gupta,** Assistant Professor (Theoretical Physics), Dept. of Applied Physics, GZSCCET, Bathinda. (7589091005) gagan.astro@gmail.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the Univ.)	**1. Dr. Rohit Mehra,** Associate Professor, Dept. of Physics, Dr. B.R. Ambedkar NIT, Jalandhar. (9888534590) mehrar@nitj.ac.in	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Prof. (Dr.) B.S. Bajwa,** Professor, Dept. of Physics, Guru Nanak Dev University, Amritsar. (9914116916) bsbajwa1@gmail.com. **2. Prof. (Dr.) Manoj Kumar Sharma,** Professor, School of Physics and Material Sciences, TIET (Deemed to be University), Patiala. (9115608847) msharma@thapar.edu	Members
(v)	Two Faculty Members (from Affiliated/	**1. Dr. Archana, Professor,** Department of Applied Sciences, SVIET, Chandigarh-Patiala, Highway	Members

	Constituent Colleges)	(7837300487) director_ac@sviet.ac.in **2. Dr. Ravi Kant, Professor,** Dept. of Applied Sciences, Bhai Gurdas Degree College, Sangrur. (9023532440) ravikant_mail@rediffmail.com	
(vi)	One Representative (from industry/ corporate sector)	**1. Prof. (Dr.) Arvind, Professor,** Dept. of Physics, IISER, Mohali (9888564456) arvind@iisermohali.ac.in	Member
(vii)	One Post Graduate meritorious alumnus	**1. Mr. Amit Kumar Singla,** JRF, Department of Applied Physics, GZSCCET, Bathinda (9814133348) amitalicesingla@gmail.com	Member

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Ref. No.: DAA/MRSPTU/1115 **Date: 13.10.2017**

Board of Studies
Textile Engineering
(01.10.17. to 30.09.19)

Programmes:
1. B. Tech. (Textile Engineering)
2. M.Tech. (Textile Engineering)

Board of Studies in Textile Engineering is hereby proposed for a period of two years (01.10.17 to 30.09.19).

S. N.	Nomenclature	Name & Address	Designation
(i)	Head of the University Department concerned	**1. Dr. Devanand Uttam,** Head of Department, Department of Textile Engg., GZSCCET, Bathinda, (Ph. 08725072426) textilegzscetbti@gmail.com	Chairman (Ex-officio)
(ii)	One Faculty Member from University Department concerned (of each specialization)	**1. Dr. Anupam Kumar,** Professor, Department of Textile Engg. GZSCCET, Bathinda (9417025296) anup28298@yahoo.com **2. Dr. Rajeev Varshney** Professor, Department of Textile Engg GZSCCET, Bathinda, (7009300964) rajeev_varshney2002@yahoo.co.in **3. Prof. Parikshit Paul,** Assistant Professor, Department of Textile Engg., GZSCCET, Bathinda (9417645348) parikshit_paul@yahoo.com	Member(s)
(iii)	One Subject Expert (in the subject from outside the university)	**1. Dr. Arunangshu Mukhopadhyay,** Professor, Department of Textile Technology, National Institute of Technology, Jalandhar (9463283698) arunangshu@nitj.ac.in	Member
(iv)	Two Subject Experts (nominated by the Vice Chancellor)	**1. Dr. S. Ghosh,** Professor, Department of Textile Technology, National Institute of Technology, Jalandhar (9463553727) ghoshs@nitj.ac.in **2. Dr. Prasant Vishnoi** Professor, Department of Textile Technology UP Textile Technology Institute, Kanpur (UP) (9415292231) prashantvishnoi@rediffmail.com	Member (s)

(v)	Two Faculty Members (from Affiliated/ Constituent Colleges) (Not Available)	**1. Dr. S.K. Sinha,** Professor, Department of Textile Technology, National Institute of Technology, Jalandhar (9417366906) sinhask@nitj.ac.in **2. Er. Reeti Pal Singh,** Associate professor, IKG PTU, Jalandhar, (9478098044) en_rps@yahoo.com	Member (Co-opted)
(vi)	One Representative (from Industry/ Corporate sector)	**1. Mr. Sandeep Bahl,** General Manager, Vardhaman Polytex Limited, Bathinda, (9781129324) sandeep.bahl@vpl.in, sandeepbahl@yahoo.com	Member
(vii)	One Post Graduate Meritorious Alumnus (Not Available)	**1. Mr. Harwinder Singh** Research Scholar; Department of Textile Technology, NIT, Jalandhar, (9463537733) singh1987har @gmail.com	Member (Co-opted)

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Dean Academic Affairs

4th SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-435	Introduction to Genetics	2	1	0	40	60	100	3
BAGE1-436	Principles of Seed Technology	2	0	0	40	60	100	2
BAGE1-437	Principles of Agronomy-II (Rabi Crops)	2	1	0	40	60	100	3
BAGE1-438	Organic Farming	1	0	0	40	60	100	1
BAGE1-439	Insect Ecology and Pest Management	2	0	0	40	60	100	2
BAGE1-440	Farm Management & Agriculture Finance	2	0	0	40	60	100	2
BAGE1-441	Extension Methodology and Communication Skills	1	1	0	40	60	100	2
BAGE1-442	Livestock Production and Management	2	0	0	40	60	100	2
BAGE1-443	Introduction to Genetics Lab.	0	0	2	60	40	100	1
BAGE1-444	Principles of Seed Technology Lab.	0	0	2	60	40	100	1
BAGE1-445	Principles of Agronomy-II (Lab/Field).	0	0	2	60	40	100	1
BAGE1-446	Organic Farming (Lab./Field)	0	0	2	60	40	100	1
BAGE1-447	Insect Ecology and Pest Management (Lab./Field)	0	0	2	60	40	100	1
BAGE1-448	Farm Management & Agriculture Finance Lab.	0	0	2	60	40	100	1
BAGE1-449	Livestock Production and Management Lab.	0	0	2	60	40	100	1
Total		**14**	**3**	**14**	**740**	**760**	**1500**	**24**

INTRODUCTION TO GENETICS

Subject Code: BAGE1-435 **L T P C** **Duration: 37 Hrs.**
2 1 0 3

Unit-1

Structure of cell and cell organelles and their functions: mitosis and meiosis, significance and differences between them; Study of chromosome structure, morphology, number and types; Karyotype and idiogram; Mechanism of crossing over and cytological proof of crossing over; Numerical and structural chromosomal aberrations.

Unit-II

Mendel's laws of inheritance and exceptions to the laws, Cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance; Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Qualitative and Quantitative traits and differences between them; Multiple factor hypothesis.

Unit-III

DNA and its structure, function, types, modes of replication and repair, RNA and its structure, function and types; Transcription and Translation; Genetic code and outline of protein synthesis; Linkage, types of linkage and its estimation; Mutation and its characteristic features; Methods of inducing mutations and detection of sex linked and autosomal mutations (CLB technique etc.).

Unit-IV

Evolution of different crop species like cotton, wheat, gram, triticale and Brassicas.

Recommended Books

1. B.D. Singh, 'Fundamentals of Genetics'.
2. P.K. Gupta, 'Genetics'.
3. E.J. Gardner and M.J. Simmons, 'Principles of Genetics'.

PRINCIPLES OF SEED TECHNOLOGY

Subject Code: BAGE1-436 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Introduction to seed production; seed policy; deterioration of crop varieties; maintenance of genetic purity during seed production; seed quality

Unit-II

Different classes of seed; Nucleus, Breeder, Foundation and certified seed production of varieties and hybrids of field and vegetable crops

Unit-III

Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; constitution and role of central seed committee, central seed certification board, state seed certification agency, central and state seed testing laboratories; duties and powers of seed inspectors, offences and penalties; seed control order; Seed Act; other issues related to WTO, IPRs, Patenting, Plant Breeder's Rights; varietal identification through grow-out test and electrophoresis; seed drying; establishment of seed processing plant; establishing a seed testing laboratory

Unit-IV

Seed testing procedures for quality assessment, seed treatment, importance of seed treatment, types of seed treatment, seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, general

principles of seed storage, measures for pest and disease control, temperature control, seed marketing, factors affecting seed marketing.

Recommended Books

1. R.L Agrawal, 'Seed Technology'.
2. P.K. Agarwal, 'Principles of Seed Technology'.
3. Khare and Bhale, 'Seed Technology'.

PRINCIPLES OF AGRONOMY-II (RABI CROPS)

Subject Code: BAGE1-437 **L T P C** **Duration: 37 Hrs.**
2 1 0 3

Unit-I

Origin, geographic distribution, area, yield and production of *rabi* crops in different states of India; Causes of variation in their productivity under different agro-ecologies of the country; National and International Agricultural Research Institutes and their mandate and role in Indian agriculture.

Unit-II

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of rabi season cereal crops

Unit-III

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of rabi pulses -chickpea, lentil, field pea, French bean and oilseeds rapeseed and mustard, sunflower, safflower, linseed

Unit-IV

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of other important rabi crops such as sugarcane, sugar beet, potato, tobacco and forage crops- berseem, Lucerne and oats

Recommended Books

1. Chidda Singh, 'Modern Techniques of Raising Field Crops'.
2. 'Package of Practices for Rabi Crops', PAU.
3. S.R. Reddy, 'Agronomy of Field Crops'.
4. 'Hand Book of Agriculture', Indian Council of Agricultural Research.
5. Rajendra Prasad, 'Text Book of Field Crop'.

ORGANIC FARMING

Subject Code: BAGE1-438 **L T P C** **Duration: 12 Hrs.**
1 0 0 1

Unit-I

Organic farming: introduction, concept, relevance in the present context; Merits and demerits. Organic production requirements; Biological intensive nutrient management, Bio-farming.

Unit-II

Recycling and *in situ* management of organic residues; site selection, Soil improvement and amendments; integrated diseases and pest management

Unit-III

Use of bio-control agents; bio-pesticides; pheromones, trap crops and bird perches, biological weed management.

Unit-IV

Quality considerations- certification, labelling and accreditation processors, marketing and export requirements for organic products.

Recommended Books

1. Anil Chavan and Sandeep Raskar, 'Text Book of Organic Agriculture'.
2. D. Kumara Manimuthu Veeral, 'Text Book of Organic Farming'.

INSECT ECOLOGY AND PEST MANAGEMENT

Subject Code: BAGE1-439 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Insect Ecology- Introduction, environment and its components, effect of abiotic and biotic factors. Biotic potential, environmental resistance and causes of pest outbreaks in agro-ecosystem. Pest and its categories, Crop Losses. Beneficial insects: important pollinators, weed killers and scavengers; their importance. Important non-insect pests: mites, rodents and birds.

Unit-II

Chemical Control: importance, hazards and limitations. Natural Control. Host plant resistance. Physical, Mechanical and Cultural Control. Biological Control: parasitoids, predators and microbes. Legislative Control. Insecticide Act 1968.

Unit-III

Classification, toxicity and formulations of insecticides. Study of important insecticides: botanicals, organochlorines, organophosphates, carbamates, synthetic pyrethroids. Rodenticides, Acaricides and Fumigants. Biorational and other innovative approaches in pest management: insect growth regulators (Hormones), semiochemicals, Synergism, Pheromones, Repellents, antifeedants, chemosterilants, genetic control etc.

Unit -IV

Pest surveillance, monitoring and forecasting. Economic threshold and Economic injury levels. Integrated pest management (IPM): need; its tools and limitations. IPM in important vegetables: brinjal, okra, cauliflower and cucurbits.

Recommended Books

1. A.S. Atwal and G.S. Dhaliwal, 'Agricultural Pests of South Asia and their Management', Kalyani Publishers, Ludhiana.
2. G.S. Dhaliwal and Ramesh Arora, 'Principles of Insect Pest Management', National Agricultural Technology Information Centre, Ludhiana.
3. R.C. Saxena and R.C. Srivastava, 'Entomology at a Glance', Agrotech Publishing Academy, Udaipur.
4. S.S. Bains and A.S. Atwal, 'Applied Animal Ecology', Kalyani Publishers, Ludhiana.
5. G.S. Dhaliwal, Ram Singh and B.S. Chillar, 'Essentials of Agriculture Entomolgy', Kalyani Publishers, Ludhiana.
6. G.S. Dhaliwal and K.P. Srivastava, 'A Text Book of Applied Entomology', Vol. -I and II, Kalyani Publishers, Ludhiana.

FARM MANAGEMENT AND AGRICULTURAL FINANCE

Subject Code: BAGE1-440 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Farm Management: meaning, definition and Importance; Economic principles applicable to the organizations of farm business. Agricultural Production Economics: definition, nature and scope; Laws of returns; Factor- product Relationships; determination of optimum input and output.

Unit-II

Types and Systems of Farming: Farm planning and budgeting; Risk and uncertainty; Farm record keeping- need and importance.

Unit-III

Agricultural Finance: nature and scope, compounding and discounting. Agricultural credit: meaning, definition, need and classification; Credit appraisal; History of financing agriculture in India. Agricultural Financial Institutions, indebtedness problems.

Unit-IV

Assessment of Crop Losses: Determination of compensation; Crop insurance; Agricultural Cooperatives- philosophy and principles; History of Indian Cooperative Movement; Reorganization of cooperative credit structure.

Recommended Books

1. Joginder Singh, 'Farm Business Accounting', R.S.G. Publishers.
2. Singh and Lekhi, 'Agricultural Economics', Kalyani Publishers.
3. Johl and Kapoor, 'Fundamental of Farm Management', Kalyani Publishers.

EXTENSION METHODOLOGIES AND COMMUNICATION SKILLS

Subject Code: BAGE1-441 **L T P C** **Duration: 25 Hrs.**

1 1 0 2

Unit-I

Meaning, nature, importance, models and barriers in communication; Extension programme planning; Principles and steps in programme development process; Monitoring and evaluation of extension programmes

Unit-II

Extension teaching methods and factors influencing their selection and use; Combination (Media Mix) of teaching methods; Innovative information sources; Audio- visual aids; Meaning, scope and importance of agricultural journalism.

Unit-III

Diffusion and adoption of innovations; Models of adoption process. Factors influencing adoption process.

Unit-IV

Capacity building of extension personnel and farmers, Communication skills for effective transfer of technology; Organizing Field days, exhibitions; seminars and conferences

Recommended Books

1. G.L Ray, 'Extension Communication and Management'.
2. O.P. Dharma and O.P. Bhatnagar, 'Education and Communication for Development'.
3. Ranjit Singh, 'Extension Education'.

LIVESTOCK PRODUCTION AND MANAGEMENT

Subject Code: BAGE1-442 **L T P C** **Duration: 25 Hrs.**

2 0 0 2

Unit-I

Place of livestock in the national economy, Livestock development programmes. Exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Reproductive behaviour; oestrous cycle. Artificial Insemination. Pregnancy and parturition in various livestock species. Care of pregnant animal and new born young one. Measures and factors affecting fertility in livestock.

Unit-II

Physiology of milk secretion and different milking methods. Factors affecting milk yield and composition. Selection procedure and various systems of breeding in livestock.

Unit-III

Feeding and management of calves, heifers, pregnant and milch animals sheep, goat and swine. Housing principles for livestock. Vaccination and prevention of important diseases of livestock and poultry.

Unit-IV

Important breeds of poultry, egg formation, abnormal eggs and factors affecting egg size. Moulting, incubation, hatching and brooding. Housing, breeding, feeding and management of poultry. Biotechnological interventions in animal production and reproduction.

Recommended Books

1. G.C. Banerjee, 'A Textbook of Animal Husbandry', Oxford IBH Publications.
2. C.K. Thomas and N.S.R. Shastr, 'Dairy Bovine Production', Kalyani Publications.
3. C.K. Thomas and N.S.R. Shastry, 'Livestock Production Management', Kalyani Publications.
4. 'Handbook of Animal Husbandry', ICAR Publication.
5. R.A. Singh 'Poultry Production Management', Kalyani Publications.

INTRODUCTION TO GENETICS LAB.

Subject Code: BAGE1-443 **L T P C**
0 0 2 1

Microscopy (Light microscopes and electron microscopes; Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of mitosis and meiosis; Monohybrid, Dihybrid and Trihybrid ratios and their modifications; Chi- square analysis; Interaction of factors; Epistatic factors, Supplementary factors and Duplicate factors; Complementary factors, Additive factors and Inhibitory factors; Linkage - Two point test cross; Linkage - Three point test cross; Induction of polyploidy using colchicine; Induction of chromosomal aberrations using chemicals.

PRINCIPLES OF SEED TECHNOLOGY LAB.

Subject Code: BAGE1-444 **L T P C**
0 0 2 1

Seed sampling principles and procedures; physical purity analysis of field crops; germination analysis of field crops; moisture tests of field crops; viability test of field crops; seed health test of field crops; seed dormancy and breaking methods; grow out tests for varietal identification; visit to seed production plots; visit to seed processing plants; visit to seed testing laboratories; planting ratios, isolation distance and rouging, etc.

PRINCIPLES OF AGRONOMY-II LAB./FIELD

Subject Code: BAGE1-445 **L T P C**
0 0 2 1

Study of manures, fertilizers and green manure crops; Study of intercultural implements; Methods of fertilizer application; Seed bed preparation and sowing of wheat, sugarcane and sunflower; Calculations of seed rate; Identification of weeds in wheat and grain legumes; Morphological characteristics of wheat, sugarcane, chickpea and mustard; Yield components of wheat and sugarcane.

ORGANIC FARMING LAB./FIELD

Subject Code: BAGE1-446 **L T P C**
0 0 2 1

Raising of vegetable crops through organic sources. Diseases and pest management; Vermi-composting; Vegetable and ornamental nursery raising; Macro quality analysis; Grading, packaging and post-harvest management.

INSECT ECOLOGY AND PEST MANAGEMENT LAB./FIELD

Subject Code: BAGE1-447 **L T P C**
0 0 2 1

Study of terrestrial and pond ecosystem, behaviour, orientation, distribution patterns of insects. Sampling techniques for the estimation of insect population and damage. Pest surveillance through light and pheromone traps. Practicable IPM practices. Insecticides and their formulations; calculation of doses of insecticides. Compatibility of pesticides. Identification of common insect-pests, phytophagous mites, rodent, bird pests and their damage, other beneficial insect-pollinators, weed killers and scavengers.

FARM MANAGEMENT AND AGRICULTURAL FINANCE LAB.

Subject Code: BAGE1-448 **L T P C**
0 0 2 1

Filling of farm record book, analysis of farm records and possible improvements, Methods of depreciation. Preparation of farm plans and budgets, profit and loss account. Break-even analysis. Economic analysis of different crop and livestock enterprises. Compounding and discounting the cost and return. Preparation of balance sheet, income statement and cash flow analysis. Estimation of credit needs. Determination of unit costs. Preparations and analysis of loan proposals.

LIVESTOCK PRODUCTION AND MANAGEMENT LAB./FARM

Subject Code: BAGE1-449 **L T P C**
0 0 2 1

Visit to livestock farms and breed identification. Study of external body parts. Handling and restraining of animals. Judging of animals. Milking methods. Feeding and ration formulation. Record keeping. Study of reproductive organs and Artificial Insemination. Physiological norms in cattle and buffaloes. Hatching, housing and management of poultry.

Total Contact Hrs. = 28 **Total Marks = 1000** **Total Credits= 23**

Semester 5th		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-534	Parasitology & Virology	4	0	0	40	60	100	4
BMLS1-535	Clinical Biochemistry-II	4	0	0	40	60	100	4
BMLS1-536	Blood Banking	4	0	0	40	60	100	4
BMLS1-537	Medical Lab. Management	3	0	0	40	60	100	3
BHUM0-103	Human Values & Professional Ethics	3	0	0	40	60	100	3
BMLS1-538	Parasitology & Virology Lab.	0	0	2	60	40	100	1
BMLS1-539	Clinical Biochemistry-II Lab.	0	0	2	60	40	100	1
BHUM0-540	Blood Banking Lab.	0	0	2	60	40	100	1
BMLS1-541	Medical Lab. Management Practical	0	0	2	60	40	100	1
BMLS1-542	Seminar	0	0	2	0	100	100	1
Total		18	0	10	440	560	1000	23

Semester 6th		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-643	Professional Training (3 Months)	0	0	6	40	60*	100	7
BMLS1-644	Project/Practical File	0	0	0	0	100	100	5
BMLS1-645	Practical Performance/Viva	0	0	6	0	100	100	5
Total		0	0	12	40	260	300	17

- **Marks to be provided by the Health Care Industry where training is provided.**

PARASITOLOGY & VIROLOGY

Subject Code: BMLS1-534 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Learning Objectives

1. The students will learn the morphology, life cycles & laboratory diagnosis of medically important parasites and viruses.

UNIT- 1

Introduction to Medical Parasitology (9 Hrs.)

Definition- Parastism, host, vectors; Study of the types of animal association's parasitism commensalisms and symbiosis; Types of parasites; Classification of protozoan & Helminthes; Collection, transport, processing and preservation of samples for routine parasitological investigations.

UNIT- 2

Morphology, Life cycle and Lab Diagnosis of Protozoa, Nematodes and Platyhelminths (14 Hrs.)

Intestinal Amoebae- *Entamoeba histolytica*, *Entamoeba coli*; Flagellates of intestine/genitalia- *Giardia lamblia*; *Trichomonas vaginalis*; Malarial Parasite- *Plasmodium vivax*; Intestinal Nematodes- *Ascaris*, *Ancylostoma duodenale*; *Taenia solium.*

UNIT- 3

Introduction to virology (10 Hrs.)

Properties of viruses: structure, replication, growth; Classification of viruses; Cultivation approaches; Collection, transportation and storage of sample for viral diagnosis.

UNIT- 4

Viruses' Life cycle, Diseases and Lab diagnosis (12 Hrs.)

Polio, Rhino; Influenza; Para influenza; Mumps, Measles; Rubella; Respiratory syncital, Rota; Chicken pox, Herpes; HIV; Viruses prevalent in India (Dengue, Japanese Encephalitis).

Course Outcomes

Through this course student should be able

1. To understand the nature of different parasites.
2. Explain the complete life cycles of intestinal and genital parasites.
3. Complete nature of the viruses.
4. Different types of viral diseases.

Recommended Books

1. K.D. Chatterjee, 'Text Book of Parasitology', Chatterjee Medical Publishers, Calcutta.
2. S.C. Parija, 'Text Book of Medical Parasitology'.
3. John B. Carter, Venetia A. Saunders, 'Virology Principles and Applications', John Wiley & Sons, Ltd., **2007.**

CLINICAL BIOCHEMISTRY- II

Subject Code: BMLS1-535 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives

1. The students will learn about various biochemical aspects of different diseases and diagnosis/ prognosis of these diseases.
2. This course will provide information about various clinically important enzymes & automation techniques.

UNIT- 1

Disorders of Metabolism (12 Hrs.)

Disorders of Carbohydrate Metabolism: Diabetes mellitus, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, galactose tolerance tests; Analysis of T3, T4 and TSH, and their significance in diagnosis of metabolic disorders; Disorders of Lipid metabolism: Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemias, and ketone bodies; Digestive diseases- Gastric analysis and its importance.

UNIT- 2

Inborn Errors of Metabolism (10 Hrs.)

Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyhan syndrome, sickle cell anemia, Histidinemia.

UNIT- 3

Disorders of liver and kidney (14 Hrs.)

Normal and abnormal functions of liver and kidney. Jaundice, fatty liver, acute and chronic renal failure; Clearance tests for renal function. Diagnostic Enzymes clinical significance of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alaninetransaminase and Creatine phosphokinase. Qualitative and quantitative analysis of renal calculi and its significance.

UNIT- 4

Clinical Automation (9 Hrs.)

History of Automaton, purpose; types of machines used in the routine laboratory practices their principles, construction and working.

Course Outcomes

Through this course student should be able

1. To know the metabolic disorders due the deficiencies of various bio- molecules.
2. Concepts of Inborn metabolic problems.
3. Various liver and kidney complications.
4. To understand the clinical automation.

Recommended Books

1. M.N. Chatterjea and Rana Shinde, 'Textbook of Medical Biochemistry', Jaypee Brothers.
2. John W. Baynes and Marek Dominiczak, 'Medical Biochemistry (Paperback)', Mosby.
3. Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd, 'Clinical Biochemistry: An Illustrated Colour Text (Paperback)', 3rd Edn.,. Churchill Livingstone.

4. G. Beckett, S. walker, P. Rae, P. Ashby, 'Clinical Biochemistry', 7th Edn., Blackwell Publishing.

BLOOD BANKING

Subject Code: BMLS1-536 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives

1. The student will learn about blood grouping, transfusion, collection, storage & maintenance.

UNIT- 1

Blood Grouping (12 Hrs.)

Human Blood Group system: ABO Subgroups, Red Cell Antigen, Natural Antibodies, Rh Antigens; Principal of Blood grouping, antigen-antibody reaction; Blood grouping techniques: Cell grouping, Serum grouping; Difficulties in ABO grouping; Inheritance of the Blood groups.

UNIT- 2

Blood Transfusion & Blood Donation (14 Hrs.)

Principal & Practice of blood Transfusion; Guide lines for the use of Blood, Appropriate use of Blood, Quality Assurance; Objectives of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies; Blood donor requirements; Criteria for selection & rejection.

UNIT- 3

Blood Collection & Testing Donor Blood (9 Hrs.)

Blood collection packs; Anticoagulants; Adverse donor reaction; Screening donor's blood for infectious agents - HIV, HCV, HBV, *Trepanoma palladium*, Plasmodium, HTLV.

UNIT- 4

Storage, Transport of Blood and Maintenance of Blood Bank Records (10 Hrs.)

Changes in blood after storage; Gas refrigerator; Lay out of a blood bank refrigerator; Transportation approaches: Blood bank temperature and stock sheet, transfusion request form.

Course Outcomes

Through this course student should be able

1. Different blood grouping aspects.
2. To understand the blood transfusion and donation processes.
3. To learn the blood collection and testing approaches.
4. Explain the blood storage, transport and maintenance.

Recommended Books

1. Haufbrand, 'Essentials of Hematology'.
2. J.V. Dacie, 'Practicals in Hematology'.
3. Lynch, 'Medical Laboratory Technology'.
4. 'Wintrobe's Clinical Hematology'.

MEDICAL LAB. MANAGEMENT

Subject Code: BMLS1-537 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Course Objectives

1. The students will become aware of ethics in a clinical laboratory, Good laboratory practice and Quality Management in a clinical laboratory.

UNIT- 1

Ethical Principles and Good Laboratory Practice (GLP) (10 Hrs.)

Duties to patient, colleagues, society and other professionals; Aims of GLP and accreditation, advantages of accreditation; awareness of general safety precautions; HIV- pre and post-exposure guidelines; patient management for sample collection, transportation and preservation.

UNIT- 2

Sample Analysis & Reporting (8 Hrs.)

Sample accountability, methods of accountability; Factors affecting sample analysis; format of test report, reference range, results from referral laboratories; clinical alerts.

UNIT- 3

Financial Management & Auditing (8 Hrs.)

Awareness of financial management in a clinical laboratory; Horizontal, Vertical and Test audit; Frequency of audit; Documentation.

UNIT- 4

Biomedical Waste Management (10 Hrs.)

Types of waste in clinical laboratories; preliminary disposal and advanced disposal techniques; Standard national and international guidelines for biomedical waste management.

Course Outcomes

Through this course student should be able

1. Explain the various ethical principles and GLP follows in the clinical laboratories on daily basis.
2. To know about the sampling aspects.
3. Explain the financial and auditing processes.
4. To dispose of the biomedical waste.

Recommended Books

1. Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi, Rajeev Thakur, 'Medical Laboratory Management Cost- Effective Methods', Viva Books.
2. P.B. Godkar, D.P. Godkar, Bhalani, 'Text Book of Medical Laboratory Technology', Vol.-1 and 2, 3rd Edn., Publishing House, **2005**.

HUMAN VALUES AND PROFESSIONAL ETHICS

Subject Code: BHMU0-103 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Course Objectives and Expected Outcomes

To help the students discriminate between what is valuable and what is superficial in the life. To help the students develop the critical ability to distinguish between essence and form in life - this ability is to be developed not for a narrow area or field of study, but for everyday situations in

life, covering the widest possible canvas. To help the students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability; it is important to act on such discrimination in a given situation. Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing) - it concentrates on providing to its students the skills to do things. In other words, it concentrates on providing "How to do" things. The aspects of understanding "What to do" or "Why something should be done" is assumed. No significant cogent material on understanding is included as a part of the curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course is an effort to fulfill our responsibility to provide our students this significant input about understanding. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. It has been experimented at IIITH, IITK and UPTU on a large scale with significant results.

UNIT-I (6 Hrs.)

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration-what is it? - its content and process; "Natural Acceptance" and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT-II (8 Hrs.)

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient "I" and the material "Body"
Understanding the needs of Self ("I") and "Body" - *Sukh* and *Suvidha*
Understanding the Body as an instrument of "I" (I being the doer, seer and enjoyer)
Understanding the characteristics and activities of "I" and harmony in "I"
Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyam* and *Swasthya*

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction; Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship; Understanding the meaning of *Vishwas*; Difference between intention and competence Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

UNIT-III (6 Hrs.)

Understanding the Harmony in the Society (Society Being an Extension of Family)

Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature; Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature; Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence

UNIT-IV (4 Hrs.)

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics:

- Ability to utilize the professional competence for augmenting universal human order,
- Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- Ability to identify and develop appropriate technologies and management patterns for above
- production systems;
- Case studies of typical holistic technologies, management models and production systems; Strategy for transition from the present state to Universal Human Order:
- At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- At the level of society: as mutually enriching institutions and organizations

Recommended Books

1. R.R. Gaur, R. Sangal, G.P. Bagaria, 'A Foundation Course in Value Education', **2009.**

Suggested Readings/Books

1. Ivan Illich, 'Energy & Equity', The Trinity Press, Worcester, and Harper Collins, USA, **1974.**
2. E.F. Schumacher, 'Small is Beautiful: A Study of Economics as if People mattered', Blond & Briggs, Britain, **1973.**
3. A. Nagraj, 'Jeevan Vidya ek Parichay', Divya Path Sansthan, Amarkantak, **1998.**
4. Sussan George, 'How the Other Half Die's, Penguin Press. Reprinted **1986, 1991.**
5. P.L. Dhar, R.R. Gaur, 'Science and Humanism', Commonwealth Publishers, **1990**.
6. A.N. Tripathy, 'Human Values', New Age International Publishers, **2003.**
7. Subhas Palekar, 'How to practice Natural Farming', Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, **2000.**
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 'Limits to Growth - Club of Rome's report', Universe Books, **1972.**
9. E. G. Seebauer & Robert L. Berry, 'Fundamentals of Ethics for Scientists & Engineers', Oxford University Press, **2000.**
10. M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, 'Engineering Ethics (including Human Values)', Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 'Foundations of Ethics and Management', Excel Books, **2005.**
12. B. L. Bajpai, **2004,** 'Indian Ethos and Modern Management', New Royal Book Co., Lucknow, Reprinted **2008.**

PARASITOLOGY & VIROLOGY LAB.

Subject Code: BMLS1-538 **L T P C**
0 0 2 1

EXPERIMENTS

1. Routine stool examination for detection of intestinal parasites with concentration methods: Saline preparation, Iodine preparation, Floatation method, Centrifugation method, Formal ether method, Zinc sulphate method.
2. Identification of adult worms from models/slides: Tapeworm, Ascaris, Hookworms.
3. Malarial parasite: Preparation of thin and thick smears, Staining of smears, Demonstration of various stages of life cycle of malarial parasites from stained slides.
4. Demonstration of fertilized hen egg.
5. Demonstration of virus inoculation routes in fertilized hen egg.

Recommended Books

1. J. Ochei, Arundhti Kolhatkar, 'Medical Laboratory Science: Theory and Practice', McGraw Hill Education.
2. K.D. Chatterjee, 'Text Book of Parasitology', Chatterjee Medical Publishers, Calcutta.

CLINICAL BIOCHEMISTRY- II LAB.

Subject Code: BMLS1- 539 **L T P C**
0 0 2 1

EXPERIMENTS

1. To perform the Glucose tolerance test of the given sample (GTT).
2. To perform the Insulin tolerance test (ITT).
3. Determination of Uric acid in Urine of the patient.
4. Determination of Creatinine clearance.
5. Determination of Urea clearance.
6. Determination of Serum acid phosphatase.
7. Determination of Serum Alkaline phosphatase.
8. Determination of Serum Lactate dehydrogenase.
9. Determination of Serum CPK
10. Determination of T3, T4 and TSH.

Recommended Books

1. K.L. Mukherjee, 'Medical laboratory Technology', Vol.-III.
2. Richard Luxton, 'Clinical Biochemistry',
3. Barbara H. Estridge et.al, 'Basic Medical Laboratory Techniques'.

BLOOD BANKING LAB.

Subject Code: BMLS1-540 **L T P C**
0 0 2 1

EXPERIMENTS

1. Screening of blood donor: physical examination including medical history of the Donor.
2. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions.

3. Collection and preservation of blood for transfusion purpose.
4. Screening of blood for Malaria, Microfilaria, HBsAg, syphilis and HIV.
5. To determine the ABO & Rh grouping.
6. To perform Direct and Indirect Coomb's test.
7. To perform cross matching.

Recommended Books

1. K.L. Mukherjee, 'Medical laboratory Technology', Vol.-I.
2. P.B. Godkar, D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 & 2, 3rd Edn., Bhalani Publishing House, **2005**.

MEDICAL LAB. MANAGEMENT PRACTICAL

Subject Code: BMLS1- 541 **L T P C**
0 0 2 1

1. Clinical sample collection e.g. Blood, Urine, Stool examination, Saliva sample, Sputum sample, Semen.
2. Sample accountability: Labeling of sample, making entries in Laboratory records.
3. Reporting results: Basic format of a test report, Release of examination results.
4. Calibration and Validation of Clinical Laboratory instruments.
5. Biomedical waste management in a clinical laboratory: Disposal of used samples, reagents and other biomedical waste.

Recommended Books

1. Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi, Rajeev Thakur, 'Medical Laboratory Management Cost- Effective Methods', Viva Books.
2. P.B. Godkar, D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 & 2, 3rd Edn., Bhalani Publishing House, **2005**.

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-517	Design of Steel Structures-I	3	1	0	40	60	100	4
BCIE1-518	Transportation Engineering-I	3	1	0	40	60	100	4
BCIE1-519	Environmental Engineering-II	3	1	0	40	60	100	4
BCIE1-520	Geomatics Engineering	3	1	0	40	60	100	4
BCIE1-521	Disaster Management	2	0	0	40	60	100	2
BHUM0-F93	Soft Skills-III	0	0	2	60	40	100	1
BCIE1-522	Environmental Engineering Lab.	0	0	2	60	40	100	1
BCIE1-523	Transportation Engineering Lab.	0	0	2	60	40	100	1
BCIE1-524	Training-II (Survey Camp)#	0	0	4	60	40	100	2
Total		**14**	**4**	**10**	**440**	**460**	**900**	**23**

 # 6-Week Training during summer vacations after 4th semester

SEMESTER 6th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-625	Design of Concrete Structures-II	3	1	0	40	60	100	4
BCIE1-626	Geotechnical Engineering	3	1	0	40	60	100	4
BCIE1-627	Numerical Methods in Civil Engineering	3	1	0	40	60	100	4
BCIE1-628	Structural Analysis-II	3	1	0	40	60	100	4
BCIE1-629	Estimating and Costing	3	0	0	40	60	100	3
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
BCIE1-630	Geotechnical Engineering Lab.	0	0	2	60	40	100	1
BCIE1-631	Concrete Structures Drawing	0	0	2	60	40	100	1
Total		**15**	**4**	**6**	**380**	**420**	**800**	**22**

SEMESTER 7th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-732	Design of Steel Structures-II	3	1	0	40	60	100	4
BCIE1-733	Foundation Engineering	3	1	0	40	60	100	4
BCIE1-734	Irrigation Engineering-II	3	1	0	40	60	100	4
Departmental Elective-I (select any one)		3	1	0	40	60	100	4
BCIE1-756	Pre-Stressed Concrete							
BCIE1-757	Bridge Engineering							
BCIE1-758	Solid Waste Management							
BCIE1-759	Ground Improvement Techniques							
BCIE1-735	Steel Structures Drawing	0	0	2	60	40	100	1
BCIE1-736	Hydraulic Structures Drawing	0	0	2	60	40	100	1
BCIE1-737	Training-III (Practical)#	0	0	4	60	40	100	2
Total		**12**	**4**	**8**	**340**	**360**	**700**	**20**

 # 8-Week In-House / Industrial Training during summer vacations after 6th semester

SEMESTER 8th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-838	Transportation Engineering-II	3	1	0	40	60	100	4
BCIE1-839	Earthquake Resistant Design of Structures	3	1	0	40	60	100	4
Departmental Elective-II (select any one)		3	1	0	40	60	100	4
BCIE1-860	Hydrology & Dams							
BCIE1-861	Pavement Engineering							
BCIE1-862	Advanced Structural Analysis							
BCIE1-863	Advanced Reinforcing Techniques in Soils							
Open Elective-I (select any one)		3	0	0	40	60	100	3
BCIE1-840	Software Lab.	0	0	2	60	40	100	1
BCIE1-841	Advanced Testing Lab.	0	0	2	60	40	100	1
BCIE1-842	Major Project	0	0	6	60	40	100	2
Total		**12**	**3**	**10**	**340**	**360**	**700**	**19**

DESIGN OF STEEL STRUCTURES – I

Subject Code: BCIE1-517 **L T P C** **Contact Hrs. 45**
3 1 0 4

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Note: IS 800:2007, General construction in Steel-Code of practice is permitted in examination.

Unit - I

Introduction: Properties of structural steel, I.S. rolled sections, I.S. specifications. **Connections**: Riveted, bolted and welded connections for axial and eccentric loads.

Unit - II

Tension Members: Design of members subjected to axial tension using bolts and welds
Compression Members: Design of axially loaded members, built-up columns, laced and battened columns including the design of lacing and battens using bolts and welds.

Unit - III

Flexural Members: Design of laterally restrained and un-restrained rolled and built-up sections, encased beams using bolts and welds.
Foundation: Design of slab base, gusseted base and grillage foundation using bolts and welds.

Unit - IV

Roof Truss: Design of roof truss using bolts and welds.

Books & Codes Recommended

1. S.K. Duggal, 'Limit State Design of Steel Structures', McGraw Hill.
2. N. Subramanian, 'Design of Steel Structures', Oxford Higher Education.
3. 'Design of Steel Structures', Vol. -1, Ram Chandra Standard Book House – Rajsons.
4. S S Bhavikatti, 'Design of Steel Structures' (by limit state method as per IS: 800-2007)', I.K. International Publishing House.
5. 'IS 800: 2007 (General construction in Steel-Code of practice)'.

TRANSPORTATION ENGINEERING–I

Subject Code: BCIE1-518 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit I

Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.
Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.
Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

Unit II

Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.
Highway Materials: Properties of Sub-grade and Pavement Component Materials, Tests on Sub-Grade Soil, Aggregates and Bituminous Materials.
Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.

Unit III

Introduction to Pavements Design: Types and Introduction of pavements design.

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

Highway Economics & Financing: Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

Unit IV

Traffic Characteristics: Road User Characteristics, Driver Characteristics, Vehicular Characteristics.

Traffic Studies: Volume Studies, Speed Studies, O-D Survey, Parking Study.

Traffic Safety and Control Measures: Traffic Signs, Markings, Islands, Signals, Cause and Type of Accidents, Use of Intelligent Transport System.

Traffic Environment Interaction: Noise Pollution, Vehicular Emission, Pollution Mitigation Measures.

Recommended Books

1. S.K. Khanna and C.E.G. Justo, 'Highway Engineering', Nem Chand and Brothers, Roorkee.
2. L.R. Kadiyali, 'Principles and Practice of Highway Engineering', Khanna Publishers, New Delhi.
3. S.K. Sharma, 'Principles, Practice & Design of Highway Engineering', S. Chand & Company Ltd., New Delhi.

Reference Books

1. C.A.O. Flaherty, 'Highway Engineering', Vol. 2, Edward Arnold, London.
2. Mannering, 'Principles of Highway Engineering & Traffic Analysis', Wiley Publishers, New Delhi.

ENVIRONMENTAL ENGINEERING–II

Subject Code: BCIE1-519 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT -I

Introduction: Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.

Sewerage Systems: Generation and estimation of community Sewage, flow variations, storm water flow, types of sewers. Design of sewers and storm water sewers, construction & maintenance of sewers, sewer appurtenances, sewage pumping and pumping stations.

UNIT -II

House Drainage: Principles of house drainage, traps, sanitary fittings, systems of plumbing, drainage lay out for residences.

Characteristics of Sewage: Composition of domestic and industrial sewage, sampling, physical, chemical and microbiological analysis of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits.

UNIT -III

Treatment of Sewage: Introduction to unit operations and processes - Primary treatment; screening (theory), grit chamber (theory and design), floatation units, sedimentation tanks(theory

and design), Secondary treatment units; ASP (theory and design), Sequencing batch reactors (theory and design), Trickling filters (theory and design) Anaerobic systems; Anaerobic filters (theory), UASB (theory), Anaerobic lagoons, Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal.

UNIT -IV

Introduction to Solid Waste Management Systems: Objective, Types and sources, Functional elements, Methods of solid waste management with their limitations.

Low Cost Sanitation Systems: Imhoff tanks (theory and design), septic tank (theory and design), soakage pit/soil absorption systems; stabilization ponds (theory and design); macrophyte ponds; oxidation ponds (theory and design); and constructed wetland systems.

Wastewater Treatment Plants and Advanced Wastewater Treatment: Treatment Plants; site selection, plant design, Hydraulic Profiles, operation and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection and polishing.

Recommended Books

1. B.C. Punmia, Ashok Jain, 'Waste Water Engg. (Environmental Engg.-II)', Laxmi Publications, New Delhi.
2. Arcadio P. Sincero and Gregoria P. Sincero, 'Environmental Engg. - A Design Approach', Prentice Hall of India, New Delhi.
3. Metcalf & Eddy, 'Waste Water Engineering - Treatment and Reuse', TMH, New Delhi.
4. Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, 'Environmental Engg.', International Edition, McGraw Hill.
5. S.K. Garg, 'Environmental Engineering (Vol. II)', Khanna Publishers, Delhi.

GEOMATICS ENGINEERING

Subject Code: BCIE1-520 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

Photogrammetry: Introduction, Basic Principles, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Vertical Photograph, Tilted Photograph, Scale, Crab and Drift, Flight Planning for Aerial Photography, Ground Control for Photogrammetry, Photomaps and Mosaics, Stereoscopic Vision, Stereoscopic parallax, Stereoscopic Plotting Instruments, Applications.

Unit-II

Remote Sensing: Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics – Geostationary and sun-synchronous, Earth Resources Satellites, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing.

Unit-III

Geographical Information System (GIS): Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS, Linkage between spatial and non-spatial data,

Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis, Errors in GIS, Integration of RS and GIS data, GIS Applications, Introduction to GIS Software Packages.

Unit-IV

Global Positioning System (GPS): Introduction, Fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, Satellite Movement, GPS Satellites, Co-ordinate systems - Geoids, Ellipsoid and Datum, Spheroid, Customized Local Reference Ellipsoids, National Reference Systems, Worldwide Reference Ellipsoid, WGS 84, Differential-GPS, Classification of GPS receivers, GPS Applications.

Recommended Books

1. K.R. Arora, 'Surveying', Vol-III, Standard Book House, **2007**.
2. J.B. Campbell, 'Introduction to Remote Sensing', Taylor Publications, **2002.**
3. T.K. Chang, 'Geographic Information Systems', Tata McGraw Hill, **2002.**
4. Joseph George, 'Fundamentals of Remote Sensing', Universities Press, **2003**.
5. B.C. Punmia, A.K. Jain, 'Higher Surveying', Luxmi Publications, **2005**.
6. S.K. Duggal, 'Higher Surveying', Vol-III, Tata McGraw Hill.

Reference Books

1. I. Heywood, S. Cornelius, Steve Crver, 'An Introduction to Geographical Information Systems', Pearson Education, **2003**.
2. F.F. Sabbins, 'Remote Sensing Principles and Interpretation', W.H. Freeman and Company, **1985**.
3. E.D. Kaplan, 'Understanding GPS: Principles and Applications', Artec House.

DISASTER MANAGEMENT

Subject Code: BCIE1-521 **L T P C** **Contact Hrs. 25**
2 0 0 2

UNIT-I

Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle.

Disaster Mitigation and Preparedness: *Natural Hazards*: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. *Man-madehazards*: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

UNIT-II

Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems.

Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.

UNIT-III

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like

NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.

UNIT-IV

Application of Geoinformatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.

Case Studies: Lessons and experiences from various important disasters with specific reference to Civil Engineering.

Recommended/References Books

1. Iyengar, C.B.R.I., 'Natural Hazards in the Urban Habitat', Tata McGraw Hill Publications.
2. Jon Ingleton (Ed), 'Natural Disaster Management', Tudor Rose, Leicester.
3. R.B. Singh (Ed), 'Disaster Management', Rawat Publications.
4. ESCAP: 'Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction'.

SOFT SKILLS-III

Subject Code: BHUM0-F93 **L T P C** **Contact Hrs. 25**

0 0 2 1

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procrastination.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016**.
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, M. John, et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007.**

ENVIRONMENTAL ENGINEERING LAB.

Subject Code: BCIE1-522 **L T P C** **Contact Hrs. 24**
0 0 2 1

EXPERIMENTS

1. To measure the pH value of a water and waste water samples.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water and water samples.
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample.
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water and waste water samples.
10. To find chlorides in given samples of water and waste water.
11. To find acidity and alkalinity of water samples.
12. To determine the COD of a waste water sample.

Recommended Books

1. Sawyer & McCarty, 'Chemistry for Environmental Engg. and Science', TMH, New Delhi.

TRANSPORTATION ENGINEERING LAB.

Subject Code: BCIE1-523 **L T P C** **Contact Hrs. 25**
0 0 2 1

Unit-I

Tests on Sub-Grade Soil

1. Proctor's Compaction Test
2. California Bearing Ratio Test

Unit-II

Tests on Road Aggregates

1. Crushing Value Test
2. Los Angles Abrasion Value Test
3. Impact Value Test
4. Shape Test (Flakiness and Elongation Index)

Unit-III

Tests on Bituminous Materials

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Flash & Fire Point Test

Lab. Manuals

1. S.K. Khanna and C.E.G. Justo, 'Highway Material & Pavement Testing', Nem Chand and Brothers, Roorkee.

TRAINING-II (SURVEY CAMP)#

Subject Code: BCIE1-524 **L T P C**
0 0 4 2

Survey Camp up to 4 weeks' duration will be held immediately after IVth semester at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, GPS etc.

DESIGN OF CONCRETE STRUCTURES-II

Subject Code: BCIE1-625 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: Indian Standards-IS 456, IS 3370 and Design Aid SP-16 are permitted in examination.

UNIT-I

1. Design of Foundations – Concept, Application, Types, Components of Footing, Design of Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal & Strap footing) and Raft Foundation.

2. Design of Stairs: Introduction, Elements of Stairs-Tread, Rise, Flight, Landing, Types of Stairs, Design and Reinforcement detail of Stairs.

UNIT-II

3. Design of Compression Members: Classifications (According to Shape, Length and loading conditions), Assumptions, Guidelines as per Indian Standards, Behavior of Compression Members, Short Compression Members under Axial Load with Uni-axial and Bi-axial Bending, Design of Slender (Long) Columns.

UNIT-III

4. Design of Beams (Continuous and Curved): Definition, Behavior, Design of Continuous beams and Curved beams, Reinforcement detailing.

5. Design of Retaining Walls: Classification, Elements-Stem, Base, Heel, Toe, Behavior and design of Cantilever and Counterfort type retaining wall.

UNIT-IV

6. Design of Domes: Types, Components, Design of Spherical and Conical Dome.

7. Water Tanks: Introduction, Types & uses of Underground water tanks, ground water tanks, Design of Circular and Rectangular water tanks resting on ground, Design of OHSR.

Recommended Books

1. N. Subramanian, 'Design of Reinforced Concrete Structures', Oxford University Press.
2. Pillai & Menon, 'Reinforced Concrete Design', Tata McGraw Hill Education.
3. P.C. Varghese, 'Limit State Design of Reinforced Concrete', Prentice Hall of India Pvt. Ltd.
4. Raju N. Krishna, 'Reinforced Concrete Elements'.
5. Mallick and Rangasamy, 'Reinforced Concrete', Oxford-IBH.

GEOTECHNICAL ENGINEERING

Subject Code: BCIE1-626 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

Basic Concepts: Definition of soil, Soil mechanics and its application in Civil Engineering, Major soil deposits in India, Weight volume relationship, Index and engineering properties of soil, Classification of soil (IS and Unified Soil Classification System).

Unit –II

Compaction: Compaction, Concept of O.M.C. and zero Air Void Line, Standard and Modified proctor test, Factors affecting compaction, Effect of compaction on engineering soil properties, Field compaction methods their comparison of performance and relative suitability, Field control of compaction by proctor needle.

Permeability of Soil: Concept of effective stress principle, Critical hydraulic gradient and quick sand condition, Capillary phenomenon in soil, Darcy's law and its validity, Co-efficient of permeability and its determination by Constant Head Permeability test and Variable Head Permeability test, Average permeability of stratified soils, Factors affecting coefficient of permeability.

Unit-III

Consolidation: Consolidation, Difference between compaction and consolidation, Concept of various consolidation characteristics, Primary and secondary consolidation, Terzaghi's theory for one-dimensional consolidation, Consolidation test, Determination of coefficient of consolidation from curve fitting methods, Normally consolidated and over consolidated clays, Importance of consolidation settlement in the design of structures, e-logP curve.

Unit -IV

Shear Strength: Shear Strength, Stress analysis of a two - dimensional stress system by Mohr circle, Revised Mohr-Coulomb's law of shear strength, Relations between principle stresses at failure, Types of shear strength tests, Skempton's pore pressure parameters. .

Stability of Slopes: Slope failure, base failure and toe failure, Swedish circle and Frictional circle methods for c-φ-soils, Taylor's stability number, Stability charts.

Recommended Books

1. K.R. Arora, 'Soil Mech. & Foundation Engg', Standard Publishers Distributors.
2. P. Purshotama Raj, 'Geotechnical Engineering', Tata McGraw Hill.
3. V.N.S. Murthy, 'Soil Mech. & Foundation Engg', CBS Publishers & Distributors.
4. B.M. Das, 'Principle of Geotechnical Engineering', Cengage Publisher.
5. Gopal Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International Publishers.
6. Joseph E. Bowle 'Physical & Geotechnical Properties of Soil'.

NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code: BCIE1-627 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Equation: Roots of algebraic transcendental equation, Solution of linear simultaneous equations by different methods using Elimination, Iteration, Inversion, Gauss-Jordan and method, Homogeneous and Eigen Value problem, Non-linear equations.

UNIT-II

Finite Difference Technique: Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems.

UNIT-III

Numerical Integration: Numerical Integration by trapezoidal and Simpson's rule.
Statistical Methods: Method of correlation and Regression analysis for fitting a polynomial equation by least square

UNIT-IV

Initial Value Problem: Galerkin's method of least square, Initial Value problem by collocation points, Runge-Kutta Method.
Interpolation: Newton's Backward, Forward and Lagrange's Interpolation methods.

Recommended Books

1. James B. Scarborough, 'Numerical Mathematical Analysis', Oxford and IBH Publishing,
2. S.S. Sastry, 'Introductory Methods of Numerical Analysis', PHI Learning, **2012**.
3. Xundong Jia and Shu Liu, Dubuque, Iowa, 'Introduction to Computer Programming and Numerical Methods', Kendall/Hunt Publishing Co.
4. J.B Dixit, 'Numerical Methods', USP, Laxmi Publication.
5. C.P. Gandhi, 'Numerical Methods'.

STRUCTURAL ANALYSIS-II

Subject Code: BCIE1-628 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

ANALYSIS OF STATICALLY INDETERMINATE STRUCTURES: Degree of static and kinematic indeterminacies, analysis of indeterminate beams, rigid frames and trusses by method of consistent deformation, law of reciprocal deflections, method of least work, induced reactions on statically indeterminate beams & rigid frames due to yielding of supports.
FIXED & CONTINUOUS BEAMS: Introduction, Analysis of fixed beams by moment-area theorem and strain energy method, fixed end moments due to different types of loadings, sinking and rotation of supports, bending moment and shear force diagrams for fixed beams, slope and deflection of fixed beams, analysis of continuous beams by the Three moment equation (Clapeyron's theorem) due to different types of loadings, effect of sinking of supports, BMDs.

Unit-II

SLOPE-DEFLECTION METHOD: Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

MOMENT-DISTRIBUTION METHOD: Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements, symmetrical beams and frames with symmetrical, skew-symmetrical and general loading.

Unit-III

ROTATION CONTRIBUTION METHOD: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loadings and yielding of supports, symmetrical beams and frames, general case-storey columns unequal in height and bases fixed or hinged.

APPROXIMATE METHODS OF STRUCTURAL ANALYSIS: Introduction, Vertical and lateral load analysis of multistory frames, portal, cantilever and substitute-frame methods and their comparison.

Unit-IV

TWO HINGED ARCHES: Introduction, Analysis of two hinged arches for Horizontal Thrust, Bending Moment, Normal Thrust, and Radial Shear, Settlement (Foundation Yielding) and Temperature Effects, Rib Shortening and Shrinkage, Influence Lines for Two Hinged Arches.

INFLUENCE LINES FOR STATICALLY INDETERMINATE STRUCTURES: Muller-Breslau principle for statically determinate and indeterminate beams, trusses and rigid frames, influence lines for reactions, shear force and bending moment for statically indeterminate beams, trusses and rigid frames.

Recommended Books

1. C.S. Reddy, 'Basic Structural Analysis'.
2. C.K. Wang, 'Intermediate Structural Analysis'.
3. J. Sterling Kinney, 'Indeterminate Structural Analysis'.
4. B.C. Punima, 'Theory of Structures'.

ESTIMATING AND COSTING

Subject Code: BCIE1-629 **L T P C** **Contact Hrs. 36**

3 0 0 3

Unit-I

ESTIMATING: Different types of estimates, methods of estimating and scheduling quantities for the following works: Building, culverts, bridges, irrigation works, steel structures, road works, canal works, sanitary and water supply works, roofs, R.C.C. work.

ANALYSIS OF RATES: Schedule of rates (As per CSR Punjab-2016), Analysis of rates: earth work, brick masonry, stone masonry, cement concrete, RCC work, iron work, plastering, flooring, white washing, painting, wood work, Road work.

Unit–II

SPECIFICATIONS: Detailed specifications of the following: earth work in foundation, lean concrete in foundation, lime concrete in roof terracing, cement concrete, RCC, brick work,

plastering, painting, C.C. floor, mosaic floor, white washing, distempering, varnishing, painting, doors and windows, DPC, cantering and shuttering, stone masonry, cement mortar, lime mortar, brick ballast, surkhi, cinder and sand.

Unit–III

ACCOUNTS PROCEDURES: Regular and work charged establishment, pay bill, ACR, classifications of works, contract, tender, tender notice, earnest money, security money, arranging contract, power of accepting tender, daily labour, muster roll, classification of contracts, penalty, measurement book, account procedures of stores, issue rate, stock accounting, Introduction to forms and bills, Advance payment, hand receipt, refund of security money, cash book, imprest, deposit works, temporary advances, treasury challan, inventory, administrative approval, competent authority, building bye laws.

Unit-IV

VALUATION: Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, valuation of building, determination of depreciation, method of valuation, life of various items of works, mortgage lease, fixation of rates, plinth area required for residential building., Arbitration.

Recommended Books

1. B.N. Dutta, 'Estimating & Costing in Civil Engg.: Theory & Practice', UBS Publishers Distributors Ltd.
2. G.S. Birdie, 'Estimation and Costing in Civil Engineering', Dhanpat Rai Publishing Co. Ltd, New Delhi, **2011**.

Reference Books

1. M. Chakraborti, 'Estimation, Costing, Specifications and Valuation in Civil Engineering', National Halftone Co. Calcutta.
2. George H. Cooper, 'Building Construction Estimating'.
3. P.L. Bhasin, 'Estimating and Costing for Building & Civil Engg. Works'.
4. 'Standard Schedule of Rates and Standard Data Book', Public Works Department.
5. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

SOFT SKILLS-IV

Subject Code: BHUM0-F94 **L T P C** **Contact Hrs. 25**

0 0 2 1

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Nonverbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004**.
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, **1985**.

GEOTECHNICAL ENGINEERING LAB.

Subject Code: BCIE1-630 **L T P C** **Contact Hrs. 25**

0 0 2 1

1. Determination of in-situ density by core cutter method and Sand replacement method.
2. Determination of Liquid Limit & Plastic Limit.
3. Determination of specific gravity of soil solids by Pycono-meter method.
4. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
5. Determination of coefficient of permeability by Constant Head and Variable Head methods.
6. Determination of optimum moisture content and maximum dry unit weight by standard Proctor's test and Modified Proctor's Test.
7. Unconfined Compression Test for fine grained soil.
8. Determination of cohesion intercept and angle of shearing resistance by direct shear test.
9. Determination of cohesion intercept and angle of shearing resistance by tri-axial test.
10. Determination of co-efficient of consolidation.
11. Demonstration of Standard Penetration Test (SPT).

Recommended Books

1. Shamsher Prakash and P.K. Jain, 'Soil Testing Engineering, Manual', Nem Chand & Brother.

CONCRETE STRUCTURES DRAWING

Subject Code: BCIE1-631 **L T P C** **Contact Hrs. 25**

0 0 2 1

Structural Drawings of concrete elements such as Beams, Columns, Slabs, Stair Cases as per Reinforced Concrete Elements as per BTCIE1-625.

DESIGN OF STEEL STRUCTURES-II

Subject Code: BCIE1-732 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: IS: 800, General construction in Steel-Code of practice is permitted in examination

Unit-I

Plastic Analysis: Introduction, Design of Beams.
Plate Girder: Elements of a plate girder, design of a plate girder, curtailment of flanges, various type of stiffeners using bolts and welds.

Unit-II

Foot Bridge: Design of steel foot bridge with welded joints.

Unit-III

Industrial Buildings: Design of elements of industrial buildings: Gantry girder, Column bracket.

Unit-IV

Railway Bridge: Design of single track Railway Bridge with lattice girders having parallel chords (for B.G.)- Stringer, Cross girder, Main girders with welded joints, Portal sway bracings, Rocker and rollers bearing.

Recommended Books & Codes

1. S.K. Duggal, 'Limit State Design of Steel Structures'.
2. N. Subramanian, 'Design of Steel Structures'.
3. Ram Chandra, 'Design of Steel Structures', Vol. 2.
4. L.S. Negi, 'Design of Steel Structures'.
5. S.S. Bhavikatti, 'Design of Steel Structures (by limit state method as per IS: 800-2007).
6. IS 800: 2007 (General Construction in Steel-Code of Practice) *
7. SP: 6(1) (Handbook for Structural Engineers-Structural Steel Sections) *

FOUNDATION ENGINEERING

Subject Code: BCIEI-733 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: **Relevant data should provide by Paper Setter with respect to design problems; if any.**

Unit–I

Soil Investigation: Soil Investigation for new and existing structures. Depth of exploration for different structures, spacing of bore Holes, Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance, Essential features and application of various types of samplers, Geophysical exploration by seismic and electrical resistivity methods, Standard Penetration Test and Plate load test, Bore hole log.

Stresses in Soil: Boussinesq's equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams, Isobars, New mark's chart and its construction, Approximate method of load distribution, Comparison of Boussinesq's and Westergaard analysis for a point load.

Unit-II

Earth Pressure: Terms and symbols used for a retaining wall, Movement of all and the lateral earth pressure, Earth pressure at rest, Rankine states of plastic equilibrium, Coefficient of active and passive earth pressures for horizontal backfills, Rankine's theory both for active and passive earth pressure for Cohesion-less and cohesive backfill with surcharge and fully submerged case, Coulomb's method for cohesion less backfill, Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).

Unit-III

Shallow Foundation: Type of shallow foundations, Factors affecting choice of foundation, Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity, Terzaghi's analysis. Types of failures, Factors affecting bearing capacity, Skempton's equation, B.I.S. recommendations for shape, depth, inclination factors and water table corrections, Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data, Allowable settlement of various structures according to I.S. Code, Introduction of rafts and floating foundation.

Unit-IV

Pile Foundations: Types, Necessity and uses of piles, Classification of piles, Types of pile driving hammers & their comparison, Determination of load carrying capacity of driven piles by dynamic formulae, Cyclic Pile Load Test, Determination of point resistance and frictional resistance of a single pile by Static formulas in sand and clay, Spacing of piles in a group, Group action of piles, Calculation of settlement of friction pile group in clay, Settlement of pile groups in sand, Negative skin friction.

Caissons and Wells: Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons, Essential part of a pneumatic caisson, Components of a well foundation, Calculation of allowable bearing pressure, Conditions for stability of a well, Forces acting on a well foundation, Computation of scour depth.

Recommended Books

1. K.R. Arora, 'Soil Mech. & Foundation Engg,', Standard Publishers Distributors.
2. V.N.S. Murthy, 'Soil Mech. & Foundation Engg.'.
3. Gopal Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International.
4. Muni Budhu, 'Soil Mech. & Foundations', Wiley, John Wiley & Sons.
5. Gulhati and Datta, 'Geotechnical Engineering', Tata McGraw Hill Education.

IRRIGATION ENGINEERING-II

Subject Code: BCIE1-734 **L T P C** **Contact Hrs. 45**

3 1 0 4

Unit-I

Head Works: Types of head works, Functions and investigations of a diversion head work: component parts of a diversion head work and their design considerations, silt control devices.

Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

Unit-II

Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipaters and their hydraulic design.

Unit-III

Canal Regulators: Offtake alignment, cross- regulators – their functions and design, Distributary head regulators, their design, canal escape.

Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls and level crossing**.**

Unit-IV

Cross-Drainage works: Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons.

Canal Out-lets: Essential requirements, classifications, criteria for outlet behaviors, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

Recommended Books

1. Santosh Kumar Garg, 'Irrigation Engineering & Hydraulic Structure', Khanna Publishers.
2. R.K. Sharma, 'Design of Irrigation Structures', Oxford IBH Publishers.
3. S.R. Sahasrabudhe, 'Irrigation Engineering and Hydraulics Structures', Katson Publishing.
4. K.B. Khushlani, 'Irrigation Practice and Design', Vol. I to VII, Oxford IBH Publishers.
5. P.N. Modi, 'Irrigation with Resources and with Power Engineering', Standard Book House.
6. Ivan E. Houk, 'Irrigation Engineering', Vol. I, II, John Wiley and Sons.

PRESTRESSED CONCRETE

Subject Code: BCIE1-756 **L T P C** **Contact Hrs. 45**

3 1 0 4

Note: IS 1343 Code of Practice is permitted in the examination.

UNIT-I

Materials for Pre-stressed Concrete and Pre-stressing Systems:

High strength concrete and high tensile steel, tensioning devices, pre-tensioning systems, post tensioning systems.

UNIT-II

Analysis of Pre-stress and Bending Stresses:

Analysis of pre-stress, resultant stresses at a sector, pressure line or thrust line and internal resisting couple, concept of load balancing, losses of pre-stress, deflection of beams.

UNIT-III

Strength of Pre-stressed Concrete Sections in Flexure, Shear and Torsion:

Types of flexural failure, strain compatibility method, IS:1343 code procedure, design for limit state of shear and torsion.

UNIT-IV

Design of Pre-stressed Concrete Beams and Slabs:
Transfer of prestress in pre tensioned and post tensioned members, design of anchorage zone reinforcement, design of simple beams, cable profiles, Design of slabs.

Recommended Books

1. N. Krishna Raju, 'Pre-stressed Concrete', Tata McGraw Hill.
2. T.Y. Lin, Ned H. Burns, 'Design of Pre-stressed Concrete Structures', John Wiley & Sons.
3. P. Dayaratnam, 'Prestressed Concrete', Oxford & IBH.
4. R. Rajagopalan, 'Pre-stressed Concrete'.
5. IS 1343 2012 Code of Practice for Pre-stressed Concrete.

BRIDGE ENGINEERING

Subject Code: BCIE1-757 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Introduction: Definition and components of a bridge, Classification of bridges, Choice of a bridge type. Investigation for bridges, Selection of bridge site, Determination of design discharge for River Bridge, Linear waterway, Economical span, Vertical clearance, scour depth, Afflux, Traffic projection.

Standard Specifications for Road Bridges: IRC Bridge Codes, Width of carriageway, Clearances, Dead load, I.R.C. standard live loads, Impact effect, Wind load, Longitudinal forces, Centrifugal forces, Horizontal forces due to water current, Buoyancy effect, Earth pressure, Deformation stresses, Erection stresses, Temperature effects, and Seismic force.

UNIT-II

Reinforced Concrete Bridges: Types of RCC bridges; Culverts - Box Culvert, Pipe Culvert, Solid slab bridge, T-beam girder bridges, Hollow girder bridges, Balanced cantilever bridges, Continuous girder bridges, Rigid frame bridges, Arch bridges, Pre-stressed concrete bridges.

Steel Bridges: Types of Steel bridges; Beam bridges, Plate girder bridges, Box girder bridges, Truss bridges, Arch bridges, Cantilever bridges, Cable stayed bridges, Suspension bridges.

UNIT-III

Sub-structure and Foundation: Piers and abutments, materials for piers and abutments, Types of foundations; Shallow, Pile, and Well foundations. Relative merits of piles and well foundations, Pneumatic Caissons, Box Caissons.

Bearings, Joints & Appurtenances: Importance of Bearings, Different types of bearings-Expansion Bearings, Fixed Bearings, Elastomeric Bearings, Expansion joints, Wearing Course, Approach Slab, Footpath, Handrails.

UNIT-IV

Construction and Maintenance of Bridges: Methods of construction of concrete and steel bridges. Formwork and false work for concrete bridges, Causes of Bridge failures, Inspection and maintenance, Bridge Management System.

Recommended Books

1. Johnson, Victor, 'Essentials of Bridge Engineering', Oxford University Press.
2. C.H. Khadilkar, 'A Text book of Bridge Construction', Allied Publishers.

3. S.C. Rangwala, 'Bridge Engineering', Charotar Publishing House Pvt. Ltd.
4. V.K. Raina, 'Concrete Bridges Handbook, Shroff Publishers and Distributors.
5. S. Ponnuswamy, 'Bridge Engineering', McGraw Hill Education.

SOLID WASTE MANAGEMENT

Subject Code: BCIE1-758 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Sources and Composition of Municipal: Solid Waste Introduction, Sources of solid waste, Types of solid waste, Composition of solid waste and its determination, Types of materials recovered from MSW.

Properties of Municipal Solid Wastes: Physical properties of Municipal Solid Waste, Chemical properties of Municipal Solid Waste, Biological properties of Municipal Solid Waste, Transformation of Municipal Solid Waste.

UNIT-II

Solid Waste Generation and Collection: Quantities of Solid Waste, Measurements and methods to measure solid waste quantities, Solid waste generation and collection, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW.

Handling, Separation and Storage of Solid Waste: Handling and separation of solid waste At site, Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices for material separation, Waste handling and separation at Commercial and industrial facilities, Storage of solid waste at the sources.

UNIT-III

Processing of Solid Waste: Processing of solid waste at residence e.g. Storage, conveying, compacting, Shredding, pulping, granulating etc., Processing of solid waste at Commercial and industrial site.

Disposal of Municipal Solid Waste: Combustion and energy recovery of municipal solid waste, effects of combustion, Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design, landfill operation, Differentiate sanitary land fill and incineration as final disposal system for solid waste

UNIT-IV

Solid Waste Management: Municipal solid waste (management and handling) rules, hazardous waste (management and handling) rules, biomedical waste handling rules, Fly ash rules, recycled plastics usage rules, batteries (management and handling) rules.

Recommended Books

1. P.A. Vesilind, W. Worrell and D.R. Reinhart, 'Solid Waste Engineering', Thomson Books.
2. A.D. Bhide and B.B. Sundaresan, 'Solid Waste Management, Collection, Processing and Disposal', Nagpur.
3. G. Tchobanoglous, H. Theisen and S.A. Vigil, 'Integrated Solid Waste Management', McGraw Hill International Editions.
4. 'Manual on Municipal Solid Waste Management', CPHEEO, Ministry of Urban Development, Government of India.
5. 'Management and Handling Rules for: Municipal Solid Waste, Biomedical Waste, Hazardous Waste and Radioactive Wastes', Government of India Publications.

GROUND IMPROVEMENT TECHNIQUES

Subject Code: BCIE1-759 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Introduction to Soil Improvement without the addition of Materials: Dynamic compaction equipment used - application to granular soils - cohesive soils - depth of improvement – environmental considerations - induced settlements - compaction using vibratory probes - vibro techniques vibro equipment - the vibro compaction and replacement process - control of verification of vibro techniques
- vibro systems and liquefaction - soil improvement by thermal treatment - preloading techniques - surface compaction introduction to bio technical stabilization

UNIT-II

Introduction to Soil Improvement with the addition of Materials - lime stabilization - lime column method - stabilization of soft clay or silt with lime - bearing capacity of lime treated soils – settlement of lime treated soils - improvement in slope stability - control methods - chemical grouting – commonly used chemicals - grouting systems - grouting operations - applications - compaction grouting - introduction - application and limitations - plant for preparing grouting materials - jet grouting – jet grouting process - geometry and properties of treated soils - applications - slab jacking - gravel - sand - stone columns.

UNIT-III

Soil Improvement using Reinforcing Elements - introduction to reinforced earth - load transfer mechanism and strength development - soil types and reinforced earth - anchored earth nailing reticulated micro piles - soil dowels - soil anchors - reinforced earth retaining walls.

UNIT-IV

Geotextiles - Behavior of soils on reinforcing with geotextiles - effect on strength, bearing capacity, compaction and permeability - design aspects - slopes - clay embankments - retaining walls – pavements.

Reference Books

1. Moseley, 'Text Book on Ground Improvement', Blackie Academic Professional, Chapman & Hall.
2. R. Boweven, 'Text Book on Grouting in Engineering Practice', Applied Science Publishers Ltd.
3. R.A. Jewell, 'Text Book on Soil Reinforcement with Geotextiles', CIRIA Special Publication, Thomas Telford.
4. W.E. Van Impe, 'Text Book on Soil Improvement Technique & their Evolution', Balkema Publishers.
5. Donald. H. Gray & Robbin B. Sotir, 'Text Book On Bio Technical & Soil Engineering Slope Stabilization', John Wiley.
6. G.V. Rao & G.V.S. Rao, 'Text Book on Engineering with Geotextiles', Tata McGraw Hill.
7. Korener, 'Construction & Geotechnical Methods in Foundation Engineering', McGraw Hill.
8. S.K. Shukla and J.H. Yin, 'Fundamental of Geosynthetic Engineering', Taylor & Francis.
9. Swamisaran, 'Reinforced Soil and its Engineering Application', New Age Publication.
10. S.K. Gulati and M. Datta, 'Geotechnical Engineering', TMH.

STEEL STRUCTURES DRAWING

Subject Code: BCIEI-735 **L T P C** **Contact Hrs. 24**
0 0 2 1

Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams, Foundations and Roof Trusses as BCIE1-732.

HYDRAULIC STRUCTURES DRAWING

Subject Code: BCIEI-736 **L T P C** **Contact Hrs. 24**
0 0 2 1

1. Unlined canal sections
2. Lined canal sections
3. Guide Bank
4. Weir/Barrage
5. Head/ Cross regulator
6. Canal Fall (Sarda/Inglis/Straight Glacis/Baffle Type)
7. Syphon Aqueduct
8. APM Outlet

TRAINING-III (PRACTICAL)#

Subject Code: BCIEI-737 **L T P C** **Contact Hrs. --**
0 0 0 2

Software Training or Industrial Training as per the interest of students. Field to be covered during;
Software Training: Relevant to Civil Engineering Fields.
Industrial Training: All type of Construction Projects of Civil Engineering
Note: Minimum period for training is 6-8 weeks.

TRANSPORTATION ENGINEERING-II

Subject code: BCIE1-838 **L T P C** **Contact hrs. 45**
3 1 0 4

UNIT-I

Introduction to Railway Engineering: History of Railways, Development of Indian Railway, Organization of Indian Railway, Important Statistics of Indian Railways. Railway Gauge, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.
Railway Track: Requirements of a Good Track, Components of Railway Track: Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

UNIT-II

Geometric Design of Railway Track: Track Specifications on Indian Railways, Cross-Section of Single/Double Track, Alignment, Gradients, Horizontal Curve, Cant, Equilibrium Cant, Cant Deficiency, Cant Excess, Transition Curves.

Points and Crossings: Necessity, Functions, Layout and Working of a Turnout, Various types of Track Junctions and their layouts, Level-crossing.

UNIT-III

Railway Stations & Yards: Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations & Yards

Signaling and Interlocking: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signaling, Principal of Interlocking.

Modernization of Railway Tracks: High Speed Tracks, Improvement in existing track for high speed, Ballast less Track, MAGLEV, TACV.

UNIT-IV

Airport Planning: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport, Approach Zones and Turning Zones,

Runway Orientation and Design: Head Wind, Cross Wind, Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration.

Taxiway and Aircraft Parking: Aircraft Parking System. Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.

Visual Aids: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

Recommended Books

1. S. Chandra and Aggarwal, 'Railway Engineering', M.M. Oxford University Press, New Delhi, **2007**.
2. S.C. Saxena and S.P. Arora, 'A Text Book of Railway Engineering', Dhanpat Rai and Sons, Delhi, **1997**.
3. J.S. Mundrey, 'Railway Track Engineering', McGraw Hill Publishing Co., **2009.**
4. S.K. Khanna, M.G. Arora and S.S. Jain, 'Airport Planning and Design', Nem Chand & Bros., Roorkee, **1999**.
5. R. Horenjeff, and F. McKelvey, 'Planning and Design of Airports', McGraw Hill Company, New York, **1994**.
6. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, 'Airport Engineering: Planning, Design and Development of 21st Century', Wiley Publishers, **2011.**

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Subject code -BCIE1-839 **L T P C** **Contact Hrs. 45**

3 1 0 4

Note: IS: 1893, IS: 4326 and IS: 13920 Code of practice is permitted in examination.

UNIT–I

Introduction to Structural Dynamics: – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum. Multi-Degree of Freedom (MDOF) Systems: - Formulation of

equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

UNIT–II

Earthquake Analysis: - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multistoried buildings – Use of response spectra. Codal Design Provisions: Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

UNIT–III

Earthquake Engineering: - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology –Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes– Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams. Codal Detailing Provisions: - Review of the latest Indian Seismic codes IS: 4326 and IS: 13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

UNIT–IV

Aseismic Planning: - Plan Configurations – Torsion Irregularities – Re-entrant corners – Nonparallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings. Shear walls: Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements**.**

Recommended Books

1. Clough & Penzien, 'Dynamics of Structures', International Edition, McGraw Hill.
2. Pankaj Agarwal & Manish Shrikhande, 'Earthquake Resistant Design of Structures', Prentice Hall of India, New Delhi.

Reference Books

1. A.K. Chopra, 'Dynamics of Structures', Pearson Education, Indian Branch, Delhi.
2. C.V.R. Murty, 'Earthquake Tips', I.I.T. Kanpur.
3. Mario Paaz, 'Structural Dynamics', IS Codes: IS:1893, IS:4326 and IS:13920.

HYDROLOGY & DAMS

Subject Code: BCIE1-860 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT -I

Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves and depth area-duration curves.

UNIT -II

Interception, Evapotranspiration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapotranspiration. Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination.

UNIT -III

Runoff: Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Synder's synthetic unit hydrograph.

Peak Flows: Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph.

UNIT -IV

Gravity Dams-Non Overflow Section: Forces acting, Stability factors, stresses on the faces of dam, Design of profile by the method of zoning, elementary profile of a dam.

Arch and Buttress Dams: Classification of arch dam- constant radius, constant angle and variable radius, Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams.

Earth Dams: Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods.

Recommended Books

1. J. Nemec, 'Engineering Hydrology', Prentice Hall.
2. 'Engineering Hydrology', Stanley Buttler, John. Wiley.
3. TODD, 'Ground Water Hydrology', John Wiley.
4. Creager Justin & Hinds, 'Engineering for Dams', Vol. -II, -III, John Wiley.
5. S.K. Garg, 'Hydrology', Khanna Publishers.
6. H.M. Raghunath, 'Hydrology Principles, Analysis and Design', New Age Int. Publishers.

PAVEMENT DESIGN

Subject Code: BCIE1-861 **L T P C** **Contact Hrs. 45**

3 1 0 4

Note: Use of IRC: 37-2012 and IRC: 58-2011 shall be allowed in the examination.

UNIT-I

Introduction: Types of pavement structure. Functions of pavement components, Factors affecting pavement design, Design wheel load, Strength characteristics of pavement materials. Comparison of flexible and rigid pavements.

UNIT-II

Design of Flexible Pavements: General design considerations, Methods for design of flexible pavements – Group Index Method, Triaxial Test Method, Hveem Stabilometer Method, McLeod's Method, Indian Roads Congress Method.

Design of Bituminous Mixes: Mix Design Approaches, Marshall Method of Bituminous Mix Design, Super pave.

UNIT-III

Design of Rigid Pavements: General design considerations, Wester Gard's Analysis,
Methods for design of rigid pavements - PCA method, AASHTO Method, Indian Roads Congress Method, Types and design of Joints in cement concrete pavements.

UNIT-IV

Modern Design Concepts: Reinforced Concrete Pavement, Airport Pavement Design, Bituminous Pavement with Cemented Base, Interlocking Concrete Block Pavement, Full Depth Bituminous Pavement, Ultrathin White Topping, Perpetual Pavement, Pavement Overlays.

Recommended Books

1. E.J. Yoder and M.W. Witczak, 'Principals of Pavement Design', Wiley Publication.
2. S.K. Khanna and C.E.G. Justo, 'Highway Engineering', Nem Chand & Bros., Roorkee.
3. S.K. Sharma, 'Principles, Practice and Design of Highway Engineering', S. Chand & Co.
4. P. Chakraborty and A. Das, "Principles of Transportation Engineering", Prentice Hall India.
5. Yang H. Huang, 'Pavement Analysis and Design', Prentice Hall.

ADVANCED STRUCTURAL ANALYSIS

Subject Code: BCIE1-862 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT-I

BASIC CONCEPTS OF STRUCTURAL ANALYSIS: Static and kinematic indeterminacies of beams, rigid-jointed plane and space frames, pin-jointed plane and space frames and hybrid structures, actions and displacements, action and displacement equations, generalized system of coordinates, slope-deflection equations in generalized coordinates, relation between flexibility and stiffness matrices, Basic definitions and types of matrices, matrix operations, matrix inversion, solution of linear simultaneous equations, matrix partitioning.

UNIT-II

FLEXIBILITY MATRIX (PHYSICAL APPROACH): Development of flexibility matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using physical approach.

STIFFNESS MATRIX (PHYSICAL APPROACH): Development of stiffness matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using physical approach, reduced stiffness matrix, total stiffness matrix, translational or lateral stiffness matrix.

UNIT-III

FLEXIBILITY MATRIX (ELEMENT APPROACH): Transformation of system forces to element forces through force transformation matrix, Development of flexibility matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using Element Approach.

STIFFNESS MATRIX (ELEMENT APPROACH): Transformation of system displacements to element displacements through displacement transformation matrix, Development of stiffness matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using Element Approach.

UNIT-IV

FLEXIBILITY METHOD OF ANALYSIS: Analysis of continuous beams, rigid-jointed plane frames and pin-jointed plane frames using the physical and element approaches, effect of support settlements, temperature stresses and lack of fit.

STIFFNESS METHOD OF ANALYSIS: Analysis of continuous beams, rigid-jointed plane frames and pin-jointed plane frames using the physical and element approaches, effect of support

settlements, temperature stresses and lack of fit, comparison of flexibility and stiffness methods of analysis.

Recommended Books

1. G.S. Pandit and S.P. Gupta, 'Structural Analysis, A Matrix Approach'.
2. William Weaver, Jr. James M. Gere, 'Matrix Analysis of Framed Structures'.
3. C.S. Reddy, 'Basic Structural Analysis'.
4. C.S. Krishnamurthy, 'Finite Element Analysis'.
5. O.C. Zeincwicz, 'Finite Element Methods'.

ADVANCED REINFORCING TECHNIQUES IN SOILS

Subject Code: BCIE1-863 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT-I

Geosynthetics: An overview of Geosynthetics, Description of Geotextiles – Geogrids – Geonets – Geomembranes –Geocomposites – Geocells – Designing with Geotextiles – Geotextile properties and test methods –Functions of Geotextile – Design methods for separation – stabilization – filtration – Drainage, Soil anchors.

UNIT-II

Reinforced Earth: The mechanisms of the reinforced earth techniques – Design principles – Materials used for construction – Advantages of reinforced earth – Reinforced earth construction with GI sheets and strips.

UNIT-III

Soil Anchors: Inclusions and Installation Techniques, Design of Soil Anchors, Application Criteria: Advantages and Limitations, Soil Nailing- concept, uses, applications and design methodology.

UNIT-IV

Coffer Dam: Braced cuts, Arching action of soil and its application, coffer dam's analysis and design.

Recommended Books

1. B.M. Das, 'Advanced Soil Mechanics', Taylor and Francis.
2. R.F. Scott, 'Principles of Soil Mechanics', Addison & Wesley.
3. R.O. Davis and A.P.S. Selvadurai, 'Elasticity and Geomechanics', Cambridge University Press, New York.
4. James K. Mitchell, 'Fundamentals of Soil Behaviour', John Wiley and Sons.
5. D.M. Wood, 'Soil Behaviour and Critical State Soil Mechanics', University of Glasgow.
6. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall – 1989
7. G.V. Rao & G.V.S. Suryanarayana Raju, Engineering with Geosynthetics, Tata McGraw Hill Publishing Co. New Delhi.
8. Korener, 'Construction & Geotechnical Methods in Foundation Engineering', McGraw Hill.
9. S.K. Shukla and J.H. Yin, 'Fundamental of Geosynthetic Engineering', Taylor & Francis.
10. Swamisaran, 'Reinforced Soil and its Engineering Application', New Age Publication.

SOFTWARE LAB.

Subject code -BCIE1-840 **L T P C** **Contact Hrs. 24**
0 0 2 1

Student can choose anyone software according to their choice.

1. STAAD-PRO
2. E-TAB
3. ARC VIEW GIS
4. MX ROAD
5. PLAXIS
6. PRIMA VERA

ADVANCED TESTING LAB.

Subject Code: BCIEI-841 **L T P C** **Contact Hrs. 24**
0 0 2 1

1. Rebound Hammer Test
2. Ultrasonic Pulse Velocity Test
3. Reinforced Bar Locator Test
4. Cut and Pull Out (CAPO) Test
5. Fifth Wheel Bump Integrator Test
6. Benkelman Beam Deflection Test
7. Vehicular Speed Radar Test
8. Static Cone Penetration Test (SCPT).

Lab Manuals

1. M.L. Gambhir, 'Concrete Manual', Dhanpat Rai & Sons, Delhi.
2. M.S. Shetty, 'Concrete Technology, Theory & Practice', S. Chand & Company.
3. S.K. Khanna and C.E.G. Justo, 'Highway Material & Pavement Testing', Nem Chand.

MAJOR PROJECT

Subject code -BCIE1-842 **L T P C** **Contact Hrs. 45**
0 0 6 2

Students are required to work on practical projects in the field of Civil Engineering. The students have to work for 6 hrs per week with his / her supervisor(s).

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE3- 301	Mechanics of Materials	3	1	0	40	60	100	4
BMEE3-302	Applied Thermodynamics	3	1	0	40	60	100	4
BMEE3-303	Internal Combustion Engines	3	0	0	40	60	100	3
BMEE3-304	Manufacturing Processes	3	1	0	40	60	100	4
BMEE3-305	Automotive Materials	3	0	0	40	60	100	3
BHUM0-F91	Soft Skill - I	0	0	2	60	40	100	1
BMEE3-306	Machine Drawing	1	0	4	60	40	100	3
BMEE3-307	Mechanics of Materials Lab.	0	0	2	60	40	100	1
BMEE3-308	Internal Combustion Engine Lab.	0	0	2	60	40	100	1
BMEE3-309	Manufacturing Processes Lab.	0	0	2	60	40	100	1
BMEE3-310	*Workshop Training	0	0	4	60	40	100	2
Total		**16**	**3**	**16**	**560**	**540**	**1100**	**27**

*Workshop training will be imparted in the institution at the end of 2nd semester for four-week duration (Minimum 36 hrs. per week). Industrial tour will also from the part of this training.

SEMESTER 4th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE3- 411	Automotive Chassis Systems	3	1	0	40	60	100	4
BMEE3- 412	Mechanics of Machines	3	1	0	40	60	100	4
BMEE3- 413	Fluid Mechanics and Machinery	3	1	0	40	60	100	4
BMEE3- 414	Automotive Electrical Systems	3	1	0	40	60	100	4
BMEE3- 415	Automotive Fuels & Emissions	3	1	0	40	60	100	4
BHUM0 – F92	Soft Skill – II	0	0	2	60	40	100	1
BMEE3- 416	Automotive Chassis Systems Lab.	0	0	2	60	40	100	1
BMEE3- 417	Fluid Mechanics and Machinery Lab	0	0	2	60	40	100	1
BMEE3- 418	Automotive Electrical Systems Lab.	0	0	2	60	40	100	1
Total		**15**	**5**	**8**	**540**	**560**	**1100**	**24**

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE3- 519	Vehicle Body Engineering	3	1	0	40	60	100	4
BMEE3- 520	Automotive Transmissions	3	1	0	40	60	100	4
BMEE3- 521	Heat Transfer	3	1	0	40	60	100	4
BMEE3- 522	Design of Automotive Components	3	1	0	40	60	100	4
BMEE3- 523	Measurements and Instrumentation	3	1	0	40	60	100	4
BHUM0 –F93	Soft Skill – III	0	0	2	60	40	100	1
BMEE1- 524	Measurements and Instrumentation Lab.	0	0	2	60	40	100	1
BMEE1- 525	Automotive Transmissions Lab.	0	0	2	60	40	100	1
BMEE1- 526	Vehicle Body Engineering Lab.	0	0	2	60	40	100	1
BMEE1- 527	*Industrial Training	0	0	0	60	40	100	2
Total		**15**	**5**	**8**	**500**	**500**	**1000**	**26**

*Industrial training to be imparted at the end of 4th semester for six weeks

SEMESTER 6th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE3- 628	Computer Aided Automotive Design	3	1	0	40	60	100	4
BMEE3- 629	Automotive Heating, Ventilation & Air Conditioning	3	1	0	40	60	100	4
BMEE3- 630	Vehicle Dynamics	3	1	0	40	60	100	4
BMEE3- 631	Automotive Aerodynamics	3	1	0	40	60	100	4
BMEE3- 632	Vehicle Safety Engineering	3	1	0	40	60	100	4
BHUM0 – F94	Soft Skill - IV	0	0	2	60	40	100	1
BMEE3- 633	Computer Aided Automotive Design Lab.	0	0	2	60	40	100	1
BMEE3- 634	Automotive Heating, Ventilation & Air Conditioning Lab.	0	0	2	60	40	100	1
BMEE3- 635	Minor Project*	0	0	2	60	40	100	1
Department Elective – I (Select any one)		3	1	0	40	60	100	4
BMEE3-656	Servo Mechanism and Automatic Controls							
BMEE3-657	Design of Energy Systems							
BMEE3-658	Special Purpose Vehicles							
BMEE3-659	Tractor and Earth Moving Machinery							
BMEE3-660	Finite Element Analysis							
Total		**18**	**6**	**8**	**480**	**520**	**1000**	**28**

MECHANICS OF MATERIALS

Subject Code: BMEE3-301 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Simple, Compound Stresses and Strains: Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, stress-strain diagram for ductile and brittle materials, Stress in a bar, Analysis of bars of varying sections, composite section, elastic constants and their significance, Temperature stress and strain calculation due to axial load and variation of temperature in single and compound bars. Two dimensional stress system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stress.

UNIT-II

Bending Moment (B.M) and Shear Force (S.F) Diagrams: S.F and B.M definitions; relation between load, shear force and bending moment; B.M and S.F diagrams for cantilevers, simply supported beams with or without overhangs, and calculation of maximum B.M and S.F and the point of contra flexure under the following loads: a) Concentrated loads b) Uniformity distributed loads over the whole span or part of span c) Combination of concentrated and uniformly distributed load.

Bending Stresses in Beams: Pure Bending or simple bending, Neutral axis and moment of resistance, Assumptions in the simple bending theory; derivation of formula and its application to beams of rectangular and circular section. Section modulus, section modulus for circular and rectangular section beam, combined direct and bending stresses, bending stress of composite / flitched beams.

UNIT-III

Shear Stresses in Beams: Shear stress at a section, Shear stress distribution in rectangular and circular sections.

Torsion: Derivation of torsion equation, assumptions and its application to the hollow and solid circular shafts, Torsional rigidity, Power transmitted by the shaft, Modulus of rupture, comparison of solid and hollow shafts, principal stress and maximum shear stresses under combined loading of bending and torsion of circular shaft.

UNIT-IV

Columns and Struts: Introduction, failure of columns, Euler's formula and assumptions, different end conditions, Limitations of Euler's formula. Rankine-Gordon's formula. Theories of failure: Strain energy in tension, compression, shear, bending and torsion Maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, total strain energy theory, shear strain energy theory. Graphical representation and derivation of equation for these theories and their application to problems related to two dimensional stress systems.

Thin Cylinders: Calculation of Hoop stress, longitudinal stress in a thin cylinder, effect of internal pressure on the change in diameter, length and internal volume.

Recommended Books

1. R.K. Bansal, 'A text Book of Strength of Materials', Laxmi Publications.
2. Kirpal Singh, 'Mechanics of Materials', Standard Publishers and Distributors.
3. D.S. Bedi, 'Strength of Materials', Khanna Book Publishing Company.
4. E.P. Popov, 'Mechanics of Materials', Prentice Hall India.
5. S.S. Rattan, 'Strength of Materials', Tata McGraw Hill.

APPLIED THERMODYNAMICS

Subject Code: BMEE3-302 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Air Compressors: Introduction; Classification; Application of compressors and use of compressed air in industry and other places; Complete representation of compression process on P-v and T-s coordinates with detailed description of areas representing total work done and polytropic work done; Areas representing energy lost in internal friction, energy carried away by cooling water and extra flow work on T-s coordinates for un-cooled and cooled compression; Definitions of isentropic, polytropic and isothermal efficiencies and their representation in terms of ratio of areas representing various energy transfers on T-s coordinates.

UNIT-II

Reciprocating Air Compressors: Single stage single acting reciprocating compressor (with and without clearance volume): construction, operation, work input and best value of index of compression, heat rejected to cooling medium, isothermal, overall thermal, isentropic, polytropic, mechanical, and clearance volumetric efficiency, overall volumetric efficiency, effect of various parameters on volumetric efficiency, free air delivery; Multistage compressors: purpose and advantages, construction and operation, work input, heat rejected in intercoolers, minimum work input, optimum pressure ratio, isothermal, overall thermal, isentropic, polytropic and mechanical efficiency.

Positive Displacement Rotary Compressors: Introduction; Classification; Comparison of rotary compressors with reciprocating compressors; Construction, operation, work input and efficiency of rotary compressors like roots blower, Lysholm compressor and Vane Type Blower.

UNIT-III

Centrifugal Compressors: Construction and operation; Applications of Steady Flow Energy Equation and thermodynamics of dynamic compressors; Stagnation and static values of pressure, Temperature and enthalpy for flow through dynamic machines; Complete thermodynamic analysis of centrifugal compressor stage; Polytropic, isentropic and isothermal efficiencies; Complete representation of compression process starting from ambient air flow through suction pipe, Impeller, Diffuser and finally to delivery pipe on T-S coordinates; Pre-guide vanes and pre-whirl; Slip factor; Power input factor; Various modes of energy transfer in impeller and diffuser; Energy transfer in backward, forward and radial vanes; Pressure coefficient as a function of slip factor; Efficiency and out-coming velocity profile from the impeller; Derivation of non-dimensional parameters for plotting compressor characteristics; Centrifugal compressor characteristic curves; Surging and choking in centrifugal compressors.

Axial Flow Compressors: Different components of axial flow compressor and their arrangement; Working; Discussion on flow passages and simple theory of aerofoil blading; Angle of attack; coefficients of lift and drag; Turbine versus compressor blades; Velocity vector; Vector diagrams; Thermodynamic analysis and power calculations; Modes of energy transfer in rotor and stator blade flow passages; Detailed discussion on work done factor, degree of reaction, blade efficiency and their derivations; Isentropic, polytropic and isothermal efficiencies; Surging, Choking and Stalling in axial flow compressors; Comparison of axial flow compressor with centrifugal compressor; Field of application of axial flow compressors.

UNIT-IV

Gas Turbines: Classification on the basis of system of operation (open and closed cycles) and on the basis of combustion (at constant volume or constant pressure); Comparison of open and closed cycles; Comparison of gas turbine with IC engine; Fields of application of gas turbines; Position of gas turbine in power industry; Thermodynamics of constant pressure gas turbine cycle (Brayton cycle); Calculation of net output, work ratio and thermal efficiency of ideal and actual cycles; Cycle air rate, temperature ratio; Effect of changes in specific heat and that of mass of fuel on power and efficiency; Multistage compression and expansion; Dual Turbine system; Series and parallel arrangements; Closed and semi-closed gas turbine cycle; Requirements of a gas turbine combustion chamber; Gas turbine fuels.

Jet Propulsion: Principle of jet propulsion; Description of different types of jet propulsion system like rockets and thermal jet engines like (i) Athodyds (ramjet and pulsejet), (ii) Turbojet engine, (iii) Turboprop engine. Thermodynamics of turbojet engine components; Types of rocket motors (e.g. solid propellant and liquid propellant systems); Various common propellant combinations (i.e. fuels) used in rocket motors; Cooling of rockets; Advantages and disadvantages of jet propulsion over propulsion systems.

Recommended Books

1. R. Yadav and Rajay, 'Applied Thermodynamics', Central Publishing House.
2. P.K. Nag, 'Basic and Applied Thermodynamics', Tata McGraw Hill.
3. D.S. Kumar and V.P. Vasandani, 'Heat Engineering', Metropolitan Book Co. Pvt. Ltd.
4. D.G. Shephered, 'Principles of Turbo machinery', Macmillan.
5. G.F.C. Rogers and M. Sarvan, 'Gas Turbine Theory', Longmans.
6. S.M. Yahya, 'Elementary Gas Dynamics', Satya Prakashan.

INTERNAL COMBUSTION ENGINES

Subject Code: BMEE3-303 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Fundamentals: Engine terminology, classification. Working principle of two stroke and four stroke engine, scavenging, scavenging processes. Thermodynamic cycles for automobile engine-Air standard cycle, Otto cycle, Diesel cycle, Dual cycle, Comparison between different cycles, Valve timing diagram for engine under different conditions, firing order, Factors affecting on selection of firing order, Square Engine, Wankel engine, Engine Mountings.

Constructional Details: Cylinder block, Engine cylinder, Cylinder liner, Cylinder Head and cover, Piston for C.I. and S.I. engine, Piston rings, Piston pin, connecting rod, Crank shaft, Main bearings, Cam shaft, Oil pan, Engine mountings and Engine balancing, Vibration Damper, Cam shafts & drives, Inlet and exhaust valves, Valve actuating mechanism including variable control system, Air cleaner, Manifold & gasket – intake and exhaust, silencer, tail pipe.

UNIT-II

Combustion in S.I. Engine: Ignition limits, Stages of combustion in petrol engine, Ignition lag, Effect of engine variables on ignition lag, Effect of engine variables on flame propagation, Abnormal combustion, Detonation, Effects of detonation, Theories of detonation, Effects of engine variables on knock, Control of knock. Surface ignition, Pre ignition, Post ignition, S.I. engine combustion chamber design, Types of combustion chambers for S.I. engine, Very high output combustion chamber engines.

Combustion in C.I. Engine: Air fuel ratio in C.I. engine, Stages of combustion in C.I. engine, Delay period, Variables affecting on delay period, Diesel knock, Methods of controlling diesel knock, C.I. engine combustion chamber, Direct injection type, Open type, Turbulent type, Pre chamber, M combustion chamber, Cold starting of C.I. engine- decompression devices, heater plug, inlet manifold heater, Chemical spray.

UNIT-III

Petrol Engine Fuel Supply System: Methods of fuel supply system- gravity system, pressure system, Vacuum system, pump system, Components of fuel supply system –Fuel tank, fuel pump (Mechanical and Electrical) Vapor return line, Air cleaner, Fuel filters, Carburetion, Functions of carburetor, simple carburetor, Limitations of simple carburetor, Types of Carburetor-Solex and SU carburetor, Special features of modern carburetor. Benefits of electronic fuel injection system.

Diesel Engine Fuel Supply System: Comparison of diesel engine with petrol engine, Requirements of diesel injection system, Fuel feed pump, Types of injection system, fuel injection pump, and fuel injectors. Fuel filter, air cleaner, Phasing and calibration of fuel injection pump, Injector Testing (pressure test, leak test) Electronic control of fuel injection system

Engine Friction, Lubrication and Lubricants: Total engine friction, Effects of engine variables on engine friction, Lubrication- Objectives of lubrication, Lubricants used, Requirements & selection of lubricants, Viscosity rating, Multi grade oil, Additives used in lubricant, Effects of engine variables on lubricating oil, Oil consumption, Different parts of engine to be lubricated, Types of lubrication system- petrol system, Wet sump method, Dry sump method, fully and partially pressurized lubrication system, Components of lubrication system- oil strainer, Oil filter and its types.

UNIT-IV

Engine Cooling System: Distribution of heat supplied to engine, Necessity of engine cooling, Piston and engine Cylinder temperatures, Factors affecting on piston temperature, Types of cooling system, Air cooling system, Water cooling system, Thermosiphon cooling, Cooling with thermostatic regulator. Components of water cooling System-Radiator, Pressure Cap, Expansion Reservoir, Coolants, Thermostat, Water Pump, Viscous coupling, Comparison between water cooling and air cooling. Effects of over and under cooling.

Supercharging: Objects of supercharging, Relative power with and without supercharging, supercharging of spark ignition engine, Supercharging of C.I. engine, Effects of supercharging on performance of engine, Supercharging limits for S.I. and C.I. engine, Methods of super charging, Supercharges, Turbo charging, Comparison with supercharging, Methods of turbo charging, Limitations of turbo charging.

Performance Testing of Engine: Losses in the engine, Performance parameters, Performance curves, Methods of improving performance of engine, testing of engine, Classification of testing, Basic measurement- Speed, Fuel consumption, Air consumption, mean effective pressure, Brake power, Indicated power, Frictional power (with different methods), Mechanical efficiency, Thermal efficiency, volumetric efficiency, Heat balance sheet, Engine analyzer.

Recommended Books

1. V. Ganesan, 'Internal Combustion Engines ', Tata McGraw Hill.
2. K.K. Ramalingam, 'Internal Combustion Engines Theory and Practice', Scitech Publications, India.
3. H.N. Gupta, 'Fundamentals of Internal Combustion Engines', PHI Learning.

4. Willard W. Pulkrabek, 'Engineering Fundamentals of the Internal Combustion Engine', Pearson Prentice Hall.
5. V.M. Maleev, 'Diesel Engine Operation and Maintenance', McGraw Hill.
6. William H. Crouse, 'Automotive Engines', McGraw Hill.

MANUFACTURING PROCESSES

Subject Code: BMEE3-304 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Casting: Introduction to metal casting, types of patterns, their materials and allowances. Moulding materials: Moulding sand compositions and moulding sand properties, types of moulds, moulding machines cores, core sands, types of cores, core banking, elements of gating system, and risers. Casting processes: sand casting, shell mould casting, investment casting, permanent mould casting, full mould casting, and vacuum casting. Die casting, Centrifugal casting and continuous casting. Casting defects, their causes and remedies.

UNIT-II

Welding: Introduction and classification of welding processes, welding terminology, welding positions, filler metals. Flame cutting. Electric arc welding. Principle, equipment, types- MIG, TIG, submerged arc welding. Welding electrodes, classification and selection of electrodes, welding arc and its characteristics. Thermal effects on weldment Resistance welding- principle and their types i.e. spot, seam, projection, upset and flash thermit welding, electro slag welding, friction welding, plasma arc welding, electron beam welding. Welding defects, their causes and remedies.

UNIT-III

Metal Forming: Classification, Process Principles, Description, Applications and Products of the Following: Rolling, Drawing, Forging, Extrusion, Sheet Metal, Spinning, Deep Drawing, Bending, Press working, Plastic moulding machines and extruders.
Metal Cutting and Machine Tools: Cutting tool materials and geometry, Coolants: Classification, purpose and their effects, Introduction to broaching machine, milling machine and its classification, indexing: Simple compound and differential, Boring Operation and their machines, Jig Boring, Slotting Machine, Grinding: Cylindrical, surface and centreless grinding.

UNIT-IV

Introduction to Non Traditional Machining: Working Principle and applications of the following: Electric Discharge Machining, Laser Beam Machining, Abrasive Water Jet Machining, Abrasive Flow Machining, Electro Chemical Machining, Chemical Machining.

Recommended Books

1. R.W. Heine and P.C. Rosenthal, 'Principles of Metal Casting', McGraw Hill.
2. R.S. Parmar, 'Welding Technology', Khanna Publishers.
3. J.S. Campbell, 'Principles of Manufacturing Materials and Processes', Tata McGraw Hill.
4. T. Alton, 'Metal Forming Fundamentals and Applications', Addison-Wesley.
5. P.C. Sharma, 'Production Technology', S. Chand Publisher.

AUTOMOTIVE MATERIALS

Subject Code: BMEE3-305 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Engineering materials, material classifications, mechanical, thermal, electrical, magnetic, chemical, optical and physical properties of materials, effects of alloying elements on properties of steel, carbon steel, low alloy steels, stainless steel, tool steels and die steels. Alloys of Ni, Al, Cu, Mg; properties and their applications. Recrystallization temperature, their effect on the properties of materials.
Ceramic Materials: Introduction, nature of ceramic materials, types, products, properties developments in ceramics.
Glass: Introduction, composition, structure, types of glass and their properties, use of glass, fracture in glass.
Rubber: Introduction, characteristics of rubbers, structure of elastomers, types of elastomers, vulcanization of rubber, uses of rubber and applications.
Plastics Materials: Introduction, definition and concept, properties of plastics, thermoplastics, thermosetting plastics, deformation of plastics, plastic alloys.

UNIT-II

Fundamentals of Composites: Need for composites – Enhancement of properties -classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Fibre reinforced composites, Applications of various types of composites.
Polymer Matrix Composites: Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – various types of fibres. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).
Ceramic Matrix Composites: Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics -Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibreswhiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

UNIT-III

Advances in Composites: Carbon / carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon f ibre.
Heat Treatment and Surface Treatment: Heat treatment of steel – Annealing, Normalizing, Hardening and tempering with their types and application to automotive components.
Surface Hardening Techniques: Induction, flame and chemical hardening, coating of wear and corrosion resistance, Electroplating, Phosphating, Anodizing, hot dipping, thermal spraying, hard facing and thin film coatings.

UNIT-IV

Selection of Materials: Factors affecting the selection of materials, Cryogenic wear, corrosion, fatigue, creep and oxidation resistance application. Criteria of selecting materials for automotive components viz. cylinder block, Cylinder head, piston, piston ring, Gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valve, gear wheel, clutch plate, axle, bearings, chassis, spring, body panel - radiator, brake lining etc. Materials for heavy duty vehicles: special alloys, plastics, seat fabrics and materials for bumpers.

Recommended Books

1. O.P. Khanna, 'Material Science and Metallurgy', Dhanpat Rai and Sons.
2. B.K. Agarwal, 'Introduction to Engineering Materials', Tata McGraw Hill.
3. Rakesh Dogra, 'Advances in Material Science', Katson Books.
4. F.L. Mathews and R.D. Rawlings, 'Composite Materials', 1st Edn., Chapman and Hall, London, England, **1994**.
5. K.K. Chawla, 'Composite Materials', Springer – Verlag, **1987**.
6. A.B. Strong, 'Fundamentals of Composite Manufacturing', SME, **1989**.
7. S.C. Sharma, 'Composite Materials', Narosa Publications, **2000**.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C** **Duration: 26 Hrs.**
0 0 2 1

Course Objectives

The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes

At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Course, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

MACHINE DRAWING

Subject Code: BMEE3-306 **L T P C**
1 0 4 3

Principles of Drawing: Requirements of production drawing, sectioning and conventional representation, dimensioning, symbols of standard tolerances, machining symbols, Introduction and familiarization of the code IS: 296.
Fasteners: Various types of screw threads, types of nuts and bolts, screwed fasteners, welding joints and riveted joints.
Assembly and Disassembly of the following manually and using computer aided drafting:

a) **Couplings:** Solid or rigid Coupling, protected type flange coupling, Pin type flexible coupling, muff coupling, Oldham, universal coupling, claw coupling, cone friction clutch, free hand sketch of single plate friction clutch.
b) **Knuckle and Cotter Joints.**
c) **Pipe and Pipe Fittings:** Flanged joints, spigot a socket joint, union joint, hydraulic an expansion joint.
d) **IC Engine Parts:** Piston, connecting rod.
e) **Boiler Mountings:** Steam stop valve, feed check valve, safety valve, blow off cock.
f) **Bearings:** Swivel bearing, thrust bearing, Plummer and angular plumber block.
g) **Miscellaneous:** Screw Jack, Drill Press Vice, Crane hook. Drafting of simple mechanical components on computer.

NOTE: Drawing Practice is to be done as per IS: 296 code. First angle projection to be used. Drawings should contain bill of materials and should illustrate finish. The syllabus given above indicates the broad outlines and the scope of the subject to be covered. It is not necessary to cover all the drawing exercises of the types of machine tools mentioned above.

Recommended Books

1. Ajit Singh, 'Machine Drawing', Tata McGraw Hill.
2. N.D. Bhatt, 'Machine Drawing', Charotar Publications.
3. N. Sidheshwar, 'Machine Drawing', Tata McGraw Hill.
4. P.S. Gill, 'Machine Drawing', B.D. Kataria and Sons.
5. V. Lakshmi Narayanan and Mathur, 'Text-Book of Machine Drawing', Jain Brothers.
6. R.K. Dhawan, 'Machine Drawing', S. Chand.

MECHANICS OF MATERIALS LAB.

Subject Code: BMEE3-307 **L T P C**
0 0 2 1

EXPERIMENTS

1. To perform tensile test in ductile and brittle materials and to draw stress-strain curve and to determine various mechanical properties.
2. To perform compression test on C.I. and to determine ultimate compressive strength.
3. To perform shear test on different materials and determine ultimate shear strength.
4. To perform any one hardness test (Rockwell, Brinell & Vicker's test) and determine hardness of materials.
5. To perform impact test to determine impact strength.

6. To perform torsion test and to determine various mechanical properties.
7. Study of performance of Fatigue & Creep tests.
8. To perform bending test on beam (wooden or any other material) and to determine the Young's modulus and Modulus of rupture.
9. To perform Torsion test on helical springs in tension and compression and to determine modulus of rigidity/stiffness.

INTERNAL COMBUSTION ENGINES LAB.

Subject Code: BMEE3-308 **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of layout of different components in an IC Engine.
2. Study and draw a valve timing diagram for a 4-stroke multi cylinder engine.
3. Study of valve actuating mechanisms of a multi cylinder engine.
4. Study of different carburetors in Indian make of vehicles.
5. Study of different fuel injection system in Indian make of vehicles.
6. Trouble shooting in an IC engine.
7. Morse test on petrol and diesel engines.
8. Heat balance test on an automotive engine.
9. Performance study of IC engine at full throttle and part throttle conditions with alternative fuels and their comparisons.
10. Exhaust emission analysis of an SI and CI engine.
11. Study of emission control systems on a vehicle.

MANUFACTURING PROCESSES LAB.

Subject Code: BMEE3-309 **L T P C**
0 0 2 1

EXPERIMENTS

Welding Practicals:

1. Study of Arc welding equipment and making a weld joint by this process.
2. Study of MIG welding equipment and making a weld joint by this process.
3. Study of Spot welding and preparing a weld joint by this process.

Machining Practicals:

1. Study of constructional features of following machines through drawings/ sketches and an exercise based on them:
   a) Universal milling machine.
   b) Grinding machines (Surface, cylindrical)
   c) c) Hydraulic Press.

Industrial Visit to demonstration of Machines.

AUTOMOTIVE CHASSIS SYSTEMS

Subject Code: BMEE3-411 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Types of chassis layout with reference to power plant locations and drive, Vehicle frames. Load acting on vehicle frame due to different systems.

Front Axle & Steering System: Types of front axles, Constructional details, materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe. Wheel Alignment. Steering geometry. Ackerman and Davis steering system. Different types of steering gear boxes. Steering linkages and their layouts. Power and power assisted steering. Steering of crawler tractors. Multi axle steering systems.

UNIT-II

Driveline and Differential: Effects of driving thrust and torque reactions. Hotch kiss drive, torque tube drive and radius rods. Transverse rods. Propeller shaft, Universal joints. Constant velocity universal joints. Drive Shaft. Front wheel drive. Different types of final drives. Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Constructional details of a differential gear unit. Non-slip and Limited slip differential. Differential locks - Differential housings. Comparison of front wheel, rear wheel and all-wheel drive arrangement.

Drive Axles: Construction of rear axles. Types of loads acting on rear axles. Fully floating, three quarter floating and semi floating rear axles. Rear axle housing. Construction of different types of axle housing, multi axled vehicles. Construction details of multi drive axle vehicles. Dead axles.

UNIT-III

Suspension System: Need of suspension system, Types of suspension, Suspension springs, Constructional details and characteristics of leaf, coil and torsion bar springs, Independent suspension, Types: Mc Pherson strut, Double wishbone, Five link type, etc, Rubber suspension, Pneumatic suspension, Shock absorbers.

Wheels and Tires: Types of wheels – wire spoke, disc – solid and split type, alloy type, offset, onset & zero set, denomination of rim. Tires, materials, construction, structure, denomination and function of tires, types of tires, comparison of radial and bias ply tires. Tubes – construction and types, Tubeless tires. Tire inflation, effects of tire pressure on tire performance. Tire wears patterns and their causes. Rolling Resistance and self-aligning torque, Wheel Balancing – need, procedure. All-season tires, tire quality grading, changing tire sizes. Run flat tires (RFT), new heat resistant tires for better mileage, fuel efficient handling and safety.

UNIT-IV

Braking System: Weight transfer during braking and stopping distances. Classification of brakes - drum brakes and disc brakes. Constructional details. Theory of braking, Brake split and proportioning. Mechanical, hydraulic and pneumatic brakes - Servo brake, power and power-assisted brakes -Different types of brake retarders like eddy current and hydraulic retarder. Skidding of wheels on braking and remedies, Anti-lock braking systems: types, system components, operations, fluids. Power Brakes and Parking Brakes, Additive, self-energizing brakes, regenerative and emergency braking system.

Recommended Books

1. Reimpell and Betzler, 'The Automotive Chassis: Engineering Principles', 2nd Edn., Butterworth Heinemann, London.
2. Giancarlo Genta, 'The Automotive Chassis', vol. I and II, Springer.
3. Heinz Heisler, 'Advanced Vehicle Technology', 2nd Edn., Butterworth Heinemann, London.
4. T. Gilles, 'Automotive Chassis Brakes Steering and Suspension', Thomson USA.
5. Newton Steeds and Garrot, 'Motor Vehicles', Butterworths, London.
6. A.W. Judge, 'Mechanism of the Car', Chapman and Halls Ltd., London.

MECHANICS OF MACHINES

Subject Code: BMEE3-412 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Basic Concept of Machines: Link mechanism kinematic pair and chain, principles of inversion, inversion of a four bar chain, slider-crank-chain, double slider-crank chain and their inversions, kinematic pairs. Determination of forces and couples for a crank, inertia of reciprocating parts, dynamically equivalent system, analytical and graphical method, inertia force analysis of basic engine mechanism torque required to overcome inertia and gravitational force of a four bar linkage.

UNIT-II

Belts, Ropes and Chains: Material, types of drives, idle pulley, intermediate or counter shaft pulley, angle and right angle drive, quarter turn drive, velocity ratio, crowning shaft pulley, loose and fast pulley, stepped or cone pulleys, ratio of tension on tight and slack sided of belts, HP transmitted by belts including consideration of creep and slip, centrifugal tensions and its effect on HP transmitted. Use of gravity, idle, flat, V-belts and rope materials. Length of belt, rope and chain drives, type and cone type.

UNIT-III

Cams: Types of cams and follower, definitions of terms connected with cams, displacement velocity and acceleration diagrams for cam followers. Analytical and Graphical design of cam profiles with various motions (SHM, uniform acceleration and retardation).

Flywheels: Turning moment and crank effort diagrams for reciprocating machines Fluctuations of speed, coefficient of fluctuation of speed and energy, Determination of flywheel mass and dimensions for engines and Punching Machines.

UNIT-IV

Governors: Function, types and characteristics of governors, Watt, Porter and Proell governor. Hartnell and Willson Hartnell, spring loaded governors, Simple numerical problems on these governors. Sensitivity, stability, isochronisms and hunting of governors, Governor Effort and power controlling force curve, effect of sleeve friction.

Balancing: Classifications, need for balancing, balancing of single and multiple rotating masses, static and dynamic balancing, primary and secondary balancing for reciprocating masses, partial balancing of locomotives, swaying couple, hammer blow, variation in tractive effort, balancing of V-engine, concept of direct and reverse crank, balancing of machines, rotors, reversible rotors.

Recommended Books

1. Jagdish Lal, 'Theory of Mechanisms and Machines', Metropolitan Book Co. Pvt. Ltd. New Delhi.

2. S.S. Rattan, 'Theory of Machines', Tata McGraw Hill, New Delhi.
3. Thomas Beven, 'Theory of Machines', Longman's Green & Co., London.
4. W.G. Green, 'Theory of Machines', Blackie and Sons, London.
5. I.E. Shigley and J.R. Uicker, 'Theory of Machines', McGraw Hill, New York.

FLUID MECHANICS AND MACHINERY

Subject Code: BMEE3-413 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Fluid and their Properties: Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; capillarity, vapors pressure, compressibility and bulk modulus; Newtonian and non- Newtonian fluids.

Fluid Statics: Concept of pressure, Pascal's law and its engineering applications, Hydrostatic paradox. Action of fluid pressure on a plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, metacentric height and its determination.

UNIT-II

Fluid Kinematics: Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal and tangential acceleration, streamline, path line and streak line, flow rate and discharge mean velocity, continuity equation in Cartesian and cylindrical, polar coordinates. Rotational flows, rotation velocity and circulation, stream and velocity potential functions, flow net.

Fluid Dynamics: Euler's equation, Bernoulli's equation and steady flow energy equation; representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline.

UNIT-III

Dimensional Analysis and Similitude: Fundamental and derived units and dimensions, dimensional homogeneity. Rayleigh's and Buckingham's Pi method for dimensional analysis. Dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies.

Introduction to Laminar and Turbulent Flows: Flow in circular cross- section pipes. Turbulent flows and flow losses in pipes, Darcy equation, minor head losses in pipes and pipe fittings, hydraulic and energy gradient lines.

UNIT-IV

Fluid Flow Measurements: Manometers, pitot tubes, ventui meter and orifice meters, orifice, mouthpieces, notches and weirs, rotameter.

Fluid Machinery: Basic components of a turbo machine and its classification on the basis of purpose, fluid dynamic action, operating principle, geometrical features, path followed by the fluid. Classification, Principle of operation of centrifugal and axial pumps, Construction, operation and utility of simple accumulator, intensifier, gear, vane and piston pumps.

Recommended Books

1. D.S. Kumar, 'Fluid Mechanics and Fluid Power Engineering', Kataria and Sons Publishers.
2. B.S. Massey, 'Mechanics of Fluids', Van Nostrand Reinhold Co.
3. J.F. Douglas, 'Fluid Mechanics', Pitman.

4. V.L. Streetes and E.B. Wylie, 'Fluid Mechanics', McGraw Hill Book Co.
5. Jagdish Lal, 'Hydraulic Machines', Metropolitan Book Co Pvt. Ltd.

AUTOMOTIVE ELECTRICAL SYSTEMS

Subject Code: BMEE3-414 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Earth returns and insulated return systems, 6, 12, and 24-volt systems. Positive & negative earth systems, fusing of circuits, relays, switches, low and high voltage automotive cables, wiring diagram for typical automotive wiring systems, maintenance and servicing.
Batteries: Principles of lead acid cells and their characteristics - construction and working of lead acid battery, types of batteries, testing of batteries, effect of temperature on: capacity and voltage, battery capacity, voltage, efficiency, charging of batteries, sulphation and desulphation, maintenance and servicing, Battery failures & checking, Maintenance free Batteries, High energy and power density batteries for electric vehicles.

UNIT-II

Charging System: Principle of generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators, compensated voltage regulator. Alternators - principle, constructional and working aspects, bridge rectifiers. Principle of Magneto, Flywheel Magneto, Maintenance and servicing. Trouble shooting in charging systems.
Starting System: Condition at Starting – starting torque and power requirements, behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care & maintenance of starter motor. Starter switches. Safety mechanism. Maintenance, servicing and trouble shooting.

UNIT-III

Ignition System: Types, construction & working of battery & coil and magneto ignition systems. Relative merits, Ballast Resistor, Ignition coil, Distributor, Contact breaker Point, centrifugal and vacuum advance mechanisms, Limitations of conventional ignition systems, Transistorized Ignition systems, Spark plugs - construction, different types, plug fouling, maintenance, servicing and fault diagnosis, Electronic Ignition system. Programmed ignition, distributor less ignition.
Lighting System: Principle of automobile illumination, headlamp construction and wiring, reflectors – types, signaling devices flashers, stop lights, fog lamps, auxiliary lighting-engine, passenger, reading lamp. Regn-plate lamps. Automatic illumination system. Head light levelling devices. Study of a modern headlight system with improved night vision.
Electrical Equipment and Accessories: Oil pressure gauge, fuel level gauge, engine temperature gauge, electrical fuel pump, speedometer, odometer, trip meter, engine rpm meter, Headlamp & Windshield washer and wiper, heaters and defrosters, horns, stereo/radio, power antennae. Central locking, power window winding. Sun/Moon Roof. Motorized rear view mirrors, reverse warning, Bumper collision warning. Other accessories in modern vehicles.

UNIT-IV

Fuel Cells: Thermodynamic aspects; types-hydrogen and methanol, power rating and performance. Various components and working of fuel cell, Heat dissipation.

Drive Motors and Controllers: Drive arrangements in Hybrid and Electric vehicles. Drive motors: types and construction. Controlling of motor operations. Motor-generator in hybrid vehicles and its controls.

Recommended Books

1. P.L. Kohli, 'Automotive Electrical Equipment', Tata McGraw Hill.
2. Chapman, 'Principles of Electricity and Electronics for the Automotive Technician', Thomson Asia, **2000**.
3. A.W. Judge, 'Modern Electrical Equipment of Automobiles', Chapman & Hall, London.
4. G.W. Vinal, 'Storage Batteries', John Wiley & Sons Inc.
5. W.H. Crouse, 'Automobile Electrical Equipment', McGraw Hill Book Co. Inc.
6. F.G. Spreadbury, 'Electrical Ignition Equipment', Constable & Co Ltd.

AUTOMOTIVE FUELS & EMISSIONS

Subject Code: BMEE3-415 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction to Fuels: Classification of automotive fuels and drivetrains, Scenario of conventional auto fuels, Oil reserves of the world fuel quality aspects related to emissions, technological up gradations required, Need for alternate fuel, business driving factors for alternative fuels, roadmap for alternative fuels, alternate fuel development worldwide. Automotive Fuels: Properties, production, storage, handling, performance and safety aspects, advantages and disadvantages, Emissions, Engine modifications of the following o Gaseous Automotive Fuels: Hydrogen, compressed natural gas, Liquefied petroleum gas: o Bio –Fuels o Biogas, Biodiesel: o Alcohols o Methanol, Ethanol, DEE, DME: o Synthetic alternate Fuels o Wood Gas, Tire Pyrolysis Oil: o Reformulated Conventional Fuels o Emulsified Fuels:

UNIT-II

Future Alternative Fuels: Ammonia: properties, ammonia in nature, hazards, carrier for hydrogen, storage, stationary engine application, ammonia for fuel cell vehicles. Boron: properties, overview of the boron – water process, features, analysis. Water: Japanese water car, water fuel cell, hydrogen boosters, water to gas technology.

UNIT-III

Introduction to Emission: Pollutants, sources, formation of HC and CO in SI engines, NO formation in SI and CI engines, Particulate emission from SI and CI engines, Smoke Emission in CI engines. Effect of operating variables on Emission formation, Transient operational effects on pollution SI Engine & CI Engines Combustion and Pollutant Formation Basic Chemistry combustion - HC and CO formation in 4-stoke and 2-stroke SI engines - NO formation, - Particulate emissions, - Effects of operating variables on emission formation. Smoke emissions, Color and aldehyde emissions. Photochemical smog, Sulphur, Phosphorus emissions.

UNIT-IV

Post Combustion Treatment: Introduction, physical conditions and exhaust gas compositions before treatment, catalytic mechanism. Thermal reactions, installation of catalyst in exhaust lines, NOx treatment in diesel engines. Diesel trap oxidizers Control Techniques Engine Emission Reduction Design changes - Optimization of operating factors - Exhaust gas recirculation - Fumigation - Air injection PCV system - Exhaust treatment in SI engines - Thermal reactors - Catalytic converters - Catalysts - Use of unleaded petrol. Test Procedure &

Instrumentation for Emission Measurement Test procedures, NDIR analyzer, thermal conductivity and flame ionization detectors, Chemiluminescent analyzer, analyzers for NOx, Gas chromatograph - Orsat apparatus -Smoke meters, spot sampling and continuous indication types like Bosch, Hart ridge.

Recommended Books

1. S.S. Thipse, 'Alternative Fuels', Jaico Publications.
2. B.P. Pundir, 'Engine Emissions: Pollutant Formation and Advances in Control Technology', Narosa Publications.
3. E.F. Oberts, 'Internal Combustion Engine and Air Pollution', Harper and Row Publisher.
4. H.H. Willard, 'Instrumental Method of Analysis', CBS Publishers and Distributors.
5. J.B. Heywood, 'Internal Combustion Engine Fundamentals', McGraw Hill.
6. 'Motor Vehicles Act / Emission Norms', Govt of India Publications.

AUTOMOTIVE CHASSIS SYSTEMS LAB.

Subject Code: BMEE3-416 **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of layout of a chassis and its different components, of a vehicle.
2. Trouble shooting in different types of steering systems - mechanical and power and various steering linkages.
3. Measurement of steering geometry angles – Wheel Alignment.
4. Study of impact of steering geometry angles on vehicle.
5. Study of different types of wheels (rims) and tires and their defects.
6. Conducting Wheel balancing of a given wheel assy.
7. Trouble shooting in Propeller Shafts and Drive shafts including constant velocity joints.
8. Trouble shooting in different types of dead axles (front or rear).
9. Trouble shooting in different types of live axles and Differential systems.
10. Trouble shooting in suspensions of following types:
    a) Leaf Spring
    b) Double Wishbone with Torsion Bar or Coil Spring
    c) McPherson Strut Type
    d) Five Bar Link type
    e) Air Suspension system
    f) A shock absorber (damper).

Trouble shooting in braking system in master and wheel cylinder, drum and disc brakes, overhauling and adjusting of system and its testing on brake tester.

FLUID MECHANICS AND MACHINERY LAB.

Subject Code: BMEE3-417 **L T P C**
0 0 2 1

EXPERIMENTS

1. To study the flow through a variable area duct and verify Bernoulli's energy equation.
2. To determine the coefficient of discharge for an obstruction flow meter (venturi meter/ orifice meter).

3. To study the transition from laminar to turbulent flow and to ascertain the lower critical Reynolds number.
4. To determine the hydraulic coefficients for flow through an orifice.
5. To determine the friction coefficients for pipes of different diameters.
6. To determine the head loss in a pipe line due to sudden expansion/ sudden contraction/ bend.
7. To determine the velocity distribution for pipeline flow with a pitot static probe.
8. To study the constructional features of reciprocating pump and to perform test on it for determination of pump performance.
9. To draw the various characteristics of Centrifugal pump.

AUTOMOTIVE ELECTRICAL SYSTEMS LAB.

Subject Code: BMEE3-418 **L T P C**
0 0 2 1

EXPERIMENTS

1. To understand the layout of complete wiring system of an automobile.
2. Perform the various tests for checking the battery condition.
3. To understand and test the charging circuit and charging motor.
4. To conduct performance test on a dynamo, alternator & starter motor.
5. To understand & test the starting circuit and trouble shooting in it.
6. Understand and test the conventional ignition system, setting of contact breaker points and spark plug gap.
7. Understand the working and testing of an Electronic Ignition system.
8. Understand and test the lighting circuit of a car.
9. Conduct headlamp focusing as per the procedure.
10. Study the working of different accessories of a modern car.
11. To study the layout / working of a Fuel Cell powered electric car.

VEHICLE BODY ENGINEERING

Subject Code: BMEE3-519 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Classification of automobiles on different basis, Types of vehicle bodies, requirements of automobile body, constructional details.
Car Body Details: Types: Saloon, hatchback, convertibles, Limousine, Estate Van, racing and sports car, etc. Car body construction types – frame and unitary (monocoque), various body panels and their constructional details.

UNIT-II

Bus Body Details: Types: Mini bus, single and double Decker, split level and articulated bus, Bus body lay out, Floor height, Engine location, Entrance and exit location, Seating dimensions, Constructional details: Frame construction, Double skin construction, Types of metal section used, Regulations, Conventional and integral type construction.
Commercial Vehicle Details: Types of commercial vehicles. Commercial vehicle body details, flat platform, drop side, fixed side, tipper body, tanker body, tractor trailer.

UNIT-III

Body Loads: Idealized structure, structural surface, shear panel method, symmetric and asymmetric vertical loads in a car, longitudinal load, and different loading situations.

Body Materials, Trim and Mechanisms: Carbon fibers, plastics, timber, GRP; ferrous and non-ferrous materials used in vehicle. Corrosion and anticorrosion method. Paint and painting process, Corrosion, Anticorrosion methods, Body trim items, Body mechanisms.

UNIT-IV

Special Purpose Vehicle Details: Various types, Needs and constructional details - Fire station vehicle, tankers, pumping vehicles, ladder vehicle, Concrete mixer transport vehicles; Ambulance, Towing vehicle, Road trains, Off road vehicles, cement trucks.

Safety in Vehicle Design: Basics of impacts protection, design for crashworthiness, front impact and side impact analysis, bumper system, energy absorbent forms. Indian Motor acts and its application- The motors vehicle acts 1988, Driving license, Registration of vehicles, Rules of the road, Motor Insurance.

Recommended Books

1. J. Powloski, 'Vehicle Body Engineering', Business Books Ltd., London.
2. Kirpal Singh, 'Automobile Engineering', Vol-1., Standard Publishers Distributor's.
3. J.B. Braithwaite, 'Vehicle Body Building and Drawing', Heinemann Educational Books Ltd., London.
4. Sydney F. Page, 'Body Engineering', Chapman & Hill Ltd., London.
5. John Fenton, 'Handbook of Automotive Body and Systems Design', Wiley.
6. Heinz Hezler, 'Advance Vehicle Technology'.

AUTOMOTIVE TRANSMISSIONS

Subject Code: BMEE3-520 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Need for Transmission system, Tractive effort and resistances to Motion of a Vehicle, Requirements of transmission system, Classification of Transmission systems, Different Wheel drive systems (Single, Two and Four), Drives (Belt, Chain, Shaft, Hydraulic and Electric drives), Multi-axle drives, Location of transmission system, Different Transmissions units in scooter, car, MUVs and different transport vehicles of Indian make.

UNIT-II

Clutch: Principle of operation, Constructional details, torque capacity and design aspects of different types of clutches, Operation of single plate: helical spring and diaphragm type, and multi-plate clutch, Centrifugal and Automatic Clutches, Dry and Wet type of clutch, Friction lining materials, Over-running clutches, Modes of Operating clutch – mechanical, hydraulic and electric, Dual Clutch transmission.

Gear Box: Determination of gear ratios for vehicles, Different types of gearboxes – sliding, constant and synchromesh type, need for double declutching and working of synchronizing unit, Power and economy modes in gearbox, transfer box, Transaxles, Overdrives, Gear shifting mechanisms – mechanical link and wire types, Paddle shift.

UNIT-III

Hydrodynamic Drive: Fluid coupling- principle of operation, constructional details, Torque capacity, Performance characteristics, Reduction of drag torque, Torque converter, converter coupling- Principle of operation, constructional details & performance characteristics.

Hydrostatic Drive: Hydrostatic drive, various types of hydrostatic systems, Principles of hydrostatic drive system, Advantages and limitations, Comparison of hydrostatic drive with hydrodynamic drive, Construction and working of typical Janny hydrostatic drive.

UNIT-IV

Electric Drive: Electric drive, Principle of early and modified Ward Leonard Control system, Advantage & limitations, Performance characteristics.

Automatic Transmission & Applications: Block diagrams of- Chevrolet "Turbo-glide" Transmission, Power-glide Transmission & Clutch Hydraulic Actuation system, Introduction to Toyota "ECT-i" Automatic Transmission with Intelligent Electronic controls system.

Recommended Books

1. Kirpal Singh, 'Automobile Engineering', Vol-1., Standard Publishers Distributor's.
2. S. Jaiganesh, 'Automotive Transmissions', (moallemy.persiangig.com/.../AUTOMOTIVE TRANSMISSION.pdf).
3. Newton and Steeds, 'Motor vehicles', llliffe Publishers.
4. A.W. Judge, 'Modern Transmission Systems', Chapman and Hall Ltd.
5. W.H. Crouse, D.L. Anglin, 'Automotive Transmission and Power Trains Construction', McGraw Hill.

HEAT TRANSFER

Subject Code: BMEE3-521 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Concept of heat transfer, Difference between the subject of "Heat Transfer" and its parent subject "Thermodynamics", Different modes of heat transfer - conduction, convection, radiation and Combine mode, Basic laws of conduction, convection & radiation, Effect of temperature and pressure on thermal conductivity of solids, liquids and gases and its measurement, Thermal diffusivity and its significance, Newtonian heating and cooling of solids.

UNIT-II

Conduction: Fourier's law of heat conduction, Three-dimensional general conduction equation in rectangular, cylindrical and spherical coordinates involving internal heat generation and unsteady state conditions. Derivation of equations for simple one dimensional steady state heat conduction from three dimensional equations for heat conduction though walls, cylinders and spherical shells (simple and composite), critical thickness of insulation layers on pipes carrying hot fluids. Internal generation cases along with some practical cases of heat conduction. Influence of variable thermal conductivity on conduction through simple cases of walls / cylinders and spheres.

UNIT-III

Theory of Fins: Fins, Types of Fins, Straight rod type of fins of uniform cross-section e.g. circular, rectangular or any other cross-section. Heat dissipation from an infinitely long fin, heat dissipation from a fin insulated at tip and loosing at tip. Optimum design of straight find of

rectangular and triangular profile cross-sections; fin effectiveness and fin efficiency for straight rod fins of rectangular and circular cross-section.

Heat Exchanger: Function of heat Exchanger, Classification, types and applications of heat Exchangers, elements of heat exchanger and Overall coefficient of heat transfer, Different design criterion for heat exchangers, Log mean temperature difference for evaporator and condenser tubes, Parallel and counter flow heat exchangers, NTU, Calculation of number and length of tubes in a heat exchanger.

UNIT-IV

Radiation: Process of heat flow in radiation, Definition of Emissivity, Absorptivity, reflectivity and transmissivity, Concept of black and grey bodies, Kirchoff's law and Stefan Boltzmann's law.

Convection Process and Properties: Free and forced convection, laminar and turbulent flow, Newton Rikhman Law, Nusselt Number, significance of dimensionless numbers.

Heat Transfer in IC Engines: Heat transfer and Engine energy balance, Temperature distribution and thermal stresses in piston, cylinder linear, cylinder head, and valves.

Recommended Books

1. D.S. Kumar, 'Fundamentals of Heat and Mass Transfer', S.K. Kataria and Sons.
2. S. Domkundwar, 'A Course in Heat and Mass Transfer', Dhanpat Rai and Sons.
3. J.P. Holmans, 'Heat Transfer', Tata McGraw Hill Publishing Company Ltd.
4. Vijay Gupta, 'Elements of Heat and Mass Transfer', New Age International Ltd.
5. J. Heywood, 'Fundamental of I.C. Engine', Tata McGraw Hill.
6. V. Ganesan, 'Internal Combustion Engines', Tata McGraw Hill.

DESIGN OF AUTOMOTIVE COMPONENTS

Subject Code: BMEE3-522 **L T P C** **3 1 0 4** **Duration: 45 Hrs.**

UNIT-I

Meaning of Design: Definition and understanding of various types of design, Elaborated Design process.

Design and Creativity: Systematic design conceptualization, product design definition & manufacturing considerations in design, underlying principles of design in Aesthetics and ergonomics, free body diagram for components design.

UNIT-II

General Design Considerations: Theory of Failure, Selection of materials, Basic criteria of selection of material for automotive parts like piston, cylinder, connecting rod, crankshaft and camshaft, mechanical properties of those materials in brief. Study of Stress concentration, factor of safety under different loading conditions,

UNIT-III

Design Against Static Loading: Bolted Joints- Understanding the various stresses/ failure in bolted joints, basic and eccentrically loaded bolts, Welded Joints- Design for various loading conditions in torsion, shear or direct loads.

Design Against Fluctuating Loading: Design of automobile coupling & Springs, Flywheel, Braking Systems, self-energizing brakes, shoe brakes - internal & external expanding, band brakes and disc brakes.

UNIT-IV

Transmission: Clutch-Design considerations for single plate clutch, centrifugal clutch, cone clutch, energy dissipated, torque transmission capacity of clutch. Gears - Design of spur, helical and straight bevel gears, Final Drive- Design consideration for different types of propeller shafts & rear axles. Bearing - Basics of bearings, their types, nomenclature and Selection criteria.

Recommended Books

1. Kirpal Singh, 'Automobile Engineering', Vol-1', Standard Publishers Distributor's.
2. N.K. Giri, 'Automotive Mechanics', Khanna Publisher.
3. R.C. Juvenal, 'Fundamental of Machine Component Design', John Wiley.
4. 'PSG Design Data', PSG College of Technology.
5. J.A. Charles, 'Selection & Use of Engineering Materials', Butterworth – Heinemann.
6. V.B. Bhandari, 'Design of Machine Elements', McGraw Hill, ED.
7. Joseph Edward, 'Mechanical Engg. Design', Shigley.

MEASUREMENTS AND INSTRUMENTATION

Subject Code: BMEE3-523 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Basic Statistical Concepts: Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean, Range, Deviation, Variance, Standard Deviation.

Instruments and their Representation: Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration Static and Dynamic Characteristics of Instruments: Range and span, accuracy and precision, calibration, hysteresis and dead zone, sensitivity and linearity, threshold and resolution; speed of response, lag, fidelity and dynamic error, dead time and dead zone. Zero, ramp and sinusoidal input signals.

UNIT-II

Errors in Measurement: Sources of errors, systematic and random errors; statistical analysis of test-data, probable error and probability tables, ejection of test data; curve fitting, error propagation; Design and planning of experiments and report writing.

Sensors and Transducers: Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive and reluctance type, Electromagnetic, Electrodynamics, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Temperature Compensation, Balancing and Calibration, Opto-Electrical Transducers, Photo Conductive Transducers, Photovoltaic Transducers, Digital Transducers, Frequency domain transducer, Vibrating string transducer, Data, Acquisition Systems, Data processing, Data Display and Storage, Modern Automotive Instrumentation, Study of automotive sensors and actuators.

UNIT-III

Position, Displacement, and Velocity Measurement: Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices.

Force, Acceleration and Torque Measurement: Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, Toque Meter.

Pressure Measurement: Moderate Pressure Measurement, Monometers, Piezo Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing.

UNIT-IV

Flow Measurement: Quantity Meters, Positive Displacement Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters, Pitot - static tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire Anemometer.

Temperature Measurement: Introduction, Measurement of Temperature, Non Electrical Methods, Solid Rod Thermometer, Bimetallic Thermometer, Liquid-in -Glass thermometer, Pressure Thermometer, Electrical Methods, Electrical Resistance Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo–Electric Sensors, Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer.

Recommended Books

1. D.S. Kumar, 'Mechanical Measurements', Kataria & Sons.
2. Doebelin, 'Measurement Systems Application and Design', Tata McGraw Hill, **2002**.
3. Francis S. Tse, Ivan E. Morse and Marcel Dekker, 'Measurement and Instrumentation in Engineering', CRC Publishers.
4. Alan S. Morris, 'Principles of Measurement and Instrumentation', Prentice Hall of India.
5. B.C. Nakra and K.K. Chaudhary, 'Instrumentation, Measurement and Analysis', Tata McGraw Hill.
6. 'Mechanical Measurements and Control', 4th Revised & Englarged Edn., Metropolitan Book Co. Pvt. Ltd., **2009**.

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C** **Duration: 26 Hrs.**
0 0 2 1

Course Objectives

The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organizations.

Course Outcomes

At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, John M., et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007**.

MEASUREMENTS AND INSTRUMENTATION LAB.

Subject Code: BMEE3-524 **L T P C**
0 0 2 1

EXPERIMENTS

1. Measurement with the help of Vernier caliper and micrometer.
2. Measurement of an angle with the help of sine bar.
3. Measurement of surface roughness.
4. Measurement of speed and torque of an engine.
5. Measurement of acceleration and vibrations of the vehicle.
6. Calibration of a pressure gauge with the help of a dead weight gauge tester.
7. Measurement of temperature using RTD / thermocouple.
8. Determination of frequency & phase angle using C.R.O.
9. Measurement of Inductance by Maxwell's Bridge.
10. Measurement of flow rate and quantity of air passing in the petrol.

AUTOMOTIVE TRANSMISSIONS LAB.

Subject Code: BMEE3-525 **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of a layout of transmission system for a front wheel drive, rear wheel drive and a four-wheel drive arrangement.
2. Trouble shooting in different types of friction clutches.

3. Study of layout of gears and shafts in a manual type gearbox and a transaxle & their troubleshooting.
4. Study of layout in a manual & automatic gearbox for a two wheeler & its troubleshooting.
5. Study of layout of an automatic gearbox.
6. Study of gear shifting controls in an automatic gearbox & its troubleshooting.
7. Study of a manual and electric transfer case & its troubleshooting.
8. Study of an electric drive in an Electric vehicle.

VEHICLE BODY ENGINEERING LAB.

Subject Code: BMEE3-526 **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of typical car body construction and propose new design sketches.
2. Study driver's seat position, passenger seat position, its requirement and construction of typical truck/bus body and propose new design sketches.
3. To prepare the analysis of the vehicle body weight and the weight distribution in different conditions and its effect on tractive performance.
4. Measurement of drag, lift force of a scaled model in wind tunnel.
5. Study the anti-corrosion and body painting and repainting procedures.
6. Study the construction of a special purpose vehicle.
7. To prepare the analysis of the vehicle body weight and the weight distribution in different conditions and its effect on steering performance.

COMPUTER AIDED AUTOMOTIVE DESIGN

Subject Code: BMEE3-628 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Study and selection of vehicle specifications - Choice of Cycle, fuel, speed, cylinder arrangement, number of cylinders, method of cooling, material, design variables and operating variables affecting performance and emission.

Bearing, Belts and Chains Systems: Design of sliding and rolling type of bearings, Details of design of bearing housings, Design for the selection of V-belt, toothed belt and chains, Design of pulley for belt, sprocket for chain.

UNIT-II

Engine Design: Design of Engine Components, Cylinder and Cylinder Liner, Piston, Piston Head or Crown, Piston Rings, Piston Skirt, Piston Pin, Connecting Rod, Crankshaft, Bearing Pressure and Stresses in Crankshafts, Design for Centre Crankshaft, Valve Gear Mechanism, Valves, Rocker Arm.

UNIT-III

Axle and Steering System: Study of loads, moments & stresses in different sections of front axle, king pin bearing and wheel spindle bearing, optimizing sizes of steering linkages, final drive design considerations in different types of propeller shafts, final drive & rear axle.

Resistance to Vehicle Motion: Calculation and plotting the curves of air, rolling and gradient resistances, driving force – Engine power, speed, rear axle ratio, Torque and mechanical efficiency at different vehicle speeds.

UNIT-IV

Performance Curves: Resistance, Power and torque curve, driving force against vehicle speed – Acceleration and grad-ability in different gears for a typical car or truck plotted from specifications.

Gear Ratios: Determination of Gear Ratios, Acceleration and grad-ability - typical problems.

Recommended Books

1. N.K. Giri, 'Automobile Mechanics', Khanna Publishers, New Delhi.
2. P.M. Heldt, 'High Speed Combustion Engine', Oxford & IBH Publishing Co., Calcutta.
3. 'Design Data Book', PSG College of Technology, Coimbatore.
4. R.C. Juvenal, 'Fundamental of Machine Component Design', John Wiley.
5. Kevin L. Hoag, 'Vehicular Engine Design', SAE Publication.
6. J.E. Shigley, 'Mechanical Engg. Design', McGraw Hill.

AUTOMOTIVE HEATING, VENTILATION AND AIR CONDITIONING

Subject Code: BMEE3-629 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Air Conditioning Fundamentals: Fundamentals of refrigeration, basics of vehicle air conditioning system, location of air conditioning component in a car – schematic layout of a refrigeration system, component like compressor, condenser, fan blower, expansion device – expansion valve calibration, evaporator pressure regulator, low and high pressure switch.

UNIT-II

Air Conditioning Heating System: Automotive heaters – manually controlled air conditioner – heater system –automatically control air conditioner – air conditioning protection with heater diagnosis chart.

Refrigerants: Introduction, classification, properties, selection criteria, commonly used refrigerants, eco-friendly refrigerants, global warming and ozone forming potential of refrigerants, containers, handling of refrigerants.

UNIT-III

Psychometry: Introduction, Psychometric properties, Inside and outside design conditions of air conditioning system. Air distribution: introduction, factors affecting design of air distribution system, types of air distribution system, air flow through the dashboard recalculating unit, duct system, ventilation, vacuum reserve.

UNIT-IV

Air Conditioning Maintenance and Service: Cause of air conditioner failure, trouble shooting of air conditioning system, servicing heater system, removing and replacing components, leak testing, compressor service, charging and discharging, performance testing.

Recommended Books

1. William H. Crouse, 'Automotive Air Conditioning', Tata McGraw Hill Publication.
2. 'Automotive Air Conditioning', Mitchell Information Service, PHI.
3. W.H. Hucho, 'Aerodynamic of Road Vehicles, Butterworths Co.

VEHICLE DYNAMICS

Subject Code: BMEE3-630 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Fundamental of vibration, Mechanical vibrating systems, Modeling and Simulation - Model of an automobile -Single, two and multi degrees of freedom systems – Free, forced and damped vibrations, Magnification factor -Transmissibility - Vibration absorber.

UNIT-II

Multi Degree of Freedom Systems: Closed coupled system - Eigen valve problems - Far coupled Systems - Orthogonality of mode shapes – Modal analysis - Forced vibration by matrix inversion. Approximate methods for fundamental frequency - Dunkerley's lower bound - Rayleigh's upper bound - Hozler method for close coupled and branched systems.

UNIT-III

Suspension and Tires: Requirements, Sprung mass frequency, Wheel hop, wheel wobble, wheel shimmy, Choice of suspension spring rate, Calculation of effective spring rate, Vehicle suspension in fore and apt directions. Ride characteristics of tire - Effect of driving and braking torque - Gough's tire characteristics.

UNIT-IV

Vehicle Handling: Over steer, under steer, steady state cornering, Effect of braking, driving torques on steering, Effect of camber, transient effects in cornering, Directional stability of vehicles.

Stability of Vehicles: Load distribution, Calculation of Tractive effort and reactions for different drives - Stability of a vehicle on a slope, on a curve and a banked road.

Recommended Books

1. T.D. Gillespie, ‘Fundamental of Vehicle Dynamics’, Society of Automotive Engineers, USA.
2. P.M. Heldt, ‘Automotive Chassis’, Chilton Co., New York.
3. Giles J.G. Steering, ‘Suspension and Tires’, llliffe Books Ltd., London.
4. N.K. Giri, ‘Automobile Mechanics’, Khanna Publishers, New Delhi.
5. J.S. Rao & K. Gupta, ‘Theory and Practice of Mechanical Vibrations’, Wiley Eastern Ltd., New Delhi.

AUTOMOTVE AERODYNAMICS

Subject Code: BMEE3-631 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and Internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics, engine cooling requirement, air flow to passenger compartment, duct for air conditioning, cooling of transverse engine and rear engine.

UNIT-II

Aerodynamic Drag of Cars: Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

Shape Optimization of Cars: Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners.

UNIT-III

Vehicle Handling: The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles.

UNIT-IV

Wind Tunnels for Automotive Aerodynamics: Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods.

Recommended Books

1. W.H. Hucho, 'Aerodynamic of Road Vehicles', Butterworths Co., Ltd.
2. A. Pope, 'Wind Tunnel Testing', 2nd Edn., John Wiley & Sons, New York.
3. 'Automotive Aerodynamic: Update SP-706', SAE.
4. Vehicle Aerodynamics - SP-1145', SAE.

VEHICLE SAFETY ENGINEERING

Subject Code: BMEE3-632 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Design of the body for safety, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumple zone, safety sandwich construction, monocoque chassis construction.

UNIT-II

Safety Concepts: Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behavior of vehicle body, and speed, stopping distance.

Safety Equipment: Seat belt, regulations, automatic seat belt tightening system, collapsible steering column, tilt-able steering wheel, air bags, electronic system for activating air bags, bumper design for safety, Anti-lock Braking System (ABS), introduction to Electronic Stability Programme (ESP) & Electronic Brake Force Distribution (EBD).

UNIT-III

Collision Warning and Avoidance: Collision warning system, causes of rear end collision, frontal object d etection, rear vehicle object detection system, object detection system with braking system interactions, pedestrian detection.

UNIT-IV

Comfort and Convenience System: Steering and mirror adjustment, central locking system, Garage door opening system, tire pressure control system, rain sensor system, environment information system.

Recommended Books

1. Bosch, 'Automotive Handbook'. 5th Edn., SAE Publication, **2000**.
2. J. Powloski, 'Vehicle Body Engineering', Business books Ltd., London, **1969**.
3. Ronald. K. Jurgen, 'Automotive Electronics Handbook', 2nd Edn., McGraw Hill Inc., **1999**.
4. W.H. Hucho, 'Aerodynamic of Road Vehicles', Butterworths Co., Ltd., **1997**.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C** **Duration: 26 Hrs.**
0 0 2 1

Course Objectives

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organization.

Course Outcomes

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

COMPUTER AIDED DESIGN AND MANUFACTURING LAB.

Subject Code: **BMEE3-633** **L T P C**
0 0 2 1

EXPERIMENTS

A: Introduction to Modeling (using any CAD software):

1. 2D drawing using sketcher – 2 Drawings 2 Hrs.
2. 3D modeling using 3D features (Modeling of Screw Jack, Brake Pedal, Clutch, Steering Linkage, Carburettor, F. I. P., any four components) 6 Hrs.
3. Assembling and drafting (any 2 above mentioned assemblies) with proper mating conditions and interference checking. 6 Hrs.
4. Surface modeling – (Any two of above assemblies) 4 Hrs.

B: Computer Aided Manufacturing:

1. Manual part programming on CNC Lathe and CNC Milling – (4 programs, 2 for each) 4 hrs.
2. Computer Aided part programming for CNC Lathe and CNC Milling to generate tool path, NC code, and Optimization of tool path (to reduce machining time) using any CAM software. 4 Hrs.

AUTOMOTIVE HEATING, VENTILATION AND AIR CONDITIONING LAB.

Subject Code: **BMEE3-634** **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of various elements of a vapour compression refrigeration system.
2. Study and performance testing of an automobile refrigerator system.
3. Study and performance testing of an automobile heating system.
4. Calculation/ Estimation of cooling load for a Vehicle.
5. Calculation/ Estimation of heating load for a Vehicle.
6. Study the performance of air-conditioning, heating and ventilation of two vehicles.

TRACTORS & EARTH MOVING MACHINERY

Subject Code: BMEE3-659 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I

Introduction: Classification of special purpose vehicles, wheel type, track type & their applications.

Working Principles: Study of working principles & design considerations of different systems like power system, lubrication, electrical, braking, steering system.

UNIT-II

Transmissions & Final Drive: Auxiliary transmission, compound transmission, twin & triple countershaft transmissions and planetary transmission, Final drives: types of reductions like single reduction, double reduction final drives and planetary final drives, PTO shaft. Earth Moving Machinery: Constructional & working features of Bull Dozer, Front end loader, ripper, shovel, excavator, dumper, forklift, scraper, compactors.

UNIT-III

Tractors & Agricultural Implements: Classification of tractors, main tractor assemblies, functions of farm tractors, types of engine & transmissions used, braking system, Specifications of wheels and tires, dual versus tandem tires, applications of tractors, forces acting on a tractor on move, parallel pull and rolling resistance, tractor stability and weight distribution, maintenance and operation of tractors, differential lock.

UNIT-IV

Mobile Cranes: Basic characteristics of truck cranes, stability & design features, control systems & safety devices.

Miscellaneous Topics: Tracked vehicles, articulated vehicles, multi-axle vehicles.

Recommended Books

1. C.P. Nakra, 'Farm Machines and Equipment', Dhanpat Rai Publications, New Delhi.
2. J. Konard, 'Manual of Tractors', Asia Publishing House.
3. Jain and Roy, 'Tractors and Agriculture Equipment'.
4. David A. Day, Neal B.H. Benjamin, 'Construction Equipment Guide', Wiley.

Total Contact Hours = 26 **Total Marks = 800** **Total Credits = 22**

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1- 516	Signals & Systems	3	1	0	40	60	100	4
BEEE1- 517	Power Electronics & Utilization	3	1	0	40	60	100	4
BEEE1- 518	Microprocessors and interfacing	3	1	0	40	60	100	4
BEEE1- 519	Microprocessors Lab	0	0	2	60	40	100	1
BEEE1-520	Training#	0	0	4	60	40	100	2
BHUM0-F93	Soft Skills-III	0	0	2	60	40	100	1
Department Elective – I (Select any one)		3	0	0	40	60	100	3
BEEE1-556	Sensors & Transducers							
BEEE1-557	Electrical Engineering Materials							
BEEE1-558	Generation and Economics of Electrical Power							
BEEE1-559	Modern Optimization Techniques							
Open Elective – I		3	0	0	40	60	100	3
Total		**15**	**3**	**8**	**380**	**420**	**800**	**22**

#Industrial training to be imparted at the end of 4th semester for six weeks

Total Contact Hours = 23 **Total Marks = 800** **Total Credits = 20**

SEMESTER 6th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1- 621	Non Linear & Digital Control Systems	3	1	0	40	60	100	4
BEEE1- 622	Power System-II	3	1	0	40	60	100	4
BEEE1- 623	Power System Lab	0	0	2	60	40	100	1
BEEE1- 624	Power Electronics Lab	0	0	2	60	40	100	1
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Department Elective – II		3	0	0	40	60	100	3
BEEE1-660	Fuzzy Logic Systems							
BEEE1-661	VLSI Design							
BEEE1-662	Energy auditing & Management							
BEEE1-663	Micro-controller and Embedded Systems							
Department Elective – III		3	0	0	40	60	100	3
BEEE1-664	Digital Signal Processing							
BEEE1-665	Remote control & Telemetry							
BEEE1-666	Non-Conventional Energy Resources							
BEEE1-667	Neural Networks							
Open Elective – II		3	0	0	40	60	100	3
Total		**15**	**2**	**6**	**380**	**420**	**800**	**20**

Students will undergo 8-week industrial training after end semester examinations after 6th semester and present a seminar along with submission of report in 7th semester

SIGNALS & SYSTEMS

Subject Code: BEEE1-516 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To be able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
3. To impart them knowledge of various types of noises.

Course Outcomes

1. An ability to analyze various types of signals in communication system.
2. Developing skills to understand random signals.
3. To understand various types of noises.
4. Understand signal transmission through linear networks.

UNIT-I (12 Hrs.)

Systems and Signal Analysis: Detailed Classification of Signals and Systems, Fourier Series and its properties, Fourier transform and its properties along with applications, Discrete Time Fourier Series (DTFS) and Discrete Time Fourier Transform (DTFT).

Correlation and Spectral Density: Definition of Correlation and Spectral Density, Analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

UNIT-II (12 Hrs.)

Random Signal Theory: Introduction to Probability Theory, Definition of Probability of Random Events. Joint and Conditional Probability, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Examples of PDF, Transformation of Random Variables. Random Processes, Stationary and Ergodicity.

UNIT-III (12 Hrs.)

Introduction to Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure. Experimental determination of Noise Figure, Pulse Response and Digital Noise and its elimination.

UNIT-IV (12 Hrs.)

Signal Transmission Through Linear Networks: Convolution Theorem and its graphical interpretation. The Sampling Theorem, Low Pass and Band Pass Networks, Matched Filter, Enveloped detector.

Recommended Books

1. B.P. Lathi, 'Digital and Analog Communication Systems', Oxford University Press.
2. Ravi Kumar, 'Signals and Systems', PHI Course.
3. Simon Haykin, 'Signals and Systems' Wiley.
4. D. Ganesh Rao and Satish Tunga, 'Signals and Systems', Pearson.

POWER ELECTRONICS AND UTILIZATION

Subject Code: BEEE1-517 **L T P C** **Duration: 45 Hrs**
3 1 0 4

Course Objectives

1. To introduce the students to Power Electronics and thyristor family of devices.
2. To make them to understand their switching characteristics and turn-on and turn-off methods
3. To develop the understanding about operational concepts of various types of convertors
4. To make them aware about use of thyristors in diverse applications.

Course Outcomes

1. Understand the Power Electronic devices and infer their usage as switches
2. Knowledge of various types of converters
3. Understand the use of converters in conversion and control of electrical power
4. Apply power electronics technology in efficient utilization of electrical power.

UNIT-I (11 Hrs.)

Thyristor Fundamentals: Construction of SCR, operating modes, Two Transistor Analogy, Static and Dynamic characteristics, Gate characteristics, Turn-on and Turn - off methods, Firing/Triggering circuits: R and RC type, UJT based triggering, Isolation of gate and base drive circuits using pulse transformer and optocouplers, Commutation circuits for thyristors.
Series and Parallel operation of SCRs: Need, string efficiency, Static and Dynamic equalizing circuits.
Ratings, di/dt and dv/dt rating, Snubber circuit and its design, Introduction to other members of Thyristor family such as SCR, DIAC, TRIAC, LASCR, GTO.

UNIT-II (11 Hrs.)

Phase Controlled (AC to DC) Converters: Principle of phase control, Single phase half wave circuit with different types of loads, Single phase and three phase full converter circuits with line commutation, Continuous and discontinuous load current, effect of Source impedance on single phase and three phase full converters, Single phase and three phase dual converters and their operation with circulating and non-circulating currents.
Chopper Circuits (DC to DC Converters): Types of chopper: step up, step down. Different classes of chopper circuits: Class A, B, C, D, E for R, R-L and RLE load. Voltage commutated Chopper.

UNIT-III (11 Hrs.)

Inverters (DC to AC Converters): 1-Ø voltage source bridge inverters and their steady state analysis, Fourier analysis of output voltage, Modified McMurray Half bridge inverter, 3-Ø bridge inverters with 180^o and 120^o modes, Voltage Control in single Phase Inverters: PWM techniques, Methods of Harmonic Reduction, Space Vector Modulation (SVM), Relationship between PWM and SVM, Introduction to Current Source Inverter and Series Inverter.

UNIT-IV (12 Hrs.)

(AC to AC Converters)
AC Voltage Controller: Types of single-phase voltage controllers, Single-phase voltage controller with R and RL type of loads.
Cycloconverters: Principles of operation, Single phase to single phase step up and step down Cyclo-converters. Three phase to single phase and three-phase to three-phase cyclo-converters, Output voltage equation for a cyclo-converter.

Utilization: Introduction to Speed control of AC and DC motor drives, Control of Electric heating, Welding, Illumination, Application in HVDC transmission, Reactive power control in power systems.

Recommended Books

1. P.S. Bimbhra,'Power Electronics', Khanna Publishers, New Delhi, **2012.**
2. Muhammad H. Rashid, 'Power Electronics – Circuits, Devices and Applications', Prentice Hall of India Private Limited, **2006.**
3. M.D. Singh and K.B. Khan, 'Power Electronics', TMH, New Delhi, **2007.**
4. G.K. Dubey, S.R. Doradla, A. Joshi and R.N.K. Sinha, 'Thyristorised Power Controllers', New Age International (P) Limited, **2004.**

MICROPROCESSOR AND INTERFACING

Subject Code: BEEE1-518 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To understand the basic architecture of 8 and 16-bit microprocessor.
2. To understand interfacing of microprocessor with memory and peripheral chips involving system design.
3. To understand the techniques for faster execution of instructions and improve the performance of microprocessor.
4. To understand the concepts of multi core processor.

Course Outcomes

1. The students will able to write program to run on 8085 microprocessor based systems.
2. Design system using memory chips and peripheral chips.
3. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.

UNIT-I (11 Hrs.)

Introduction: Introduction to microprocessor, Intel 8085 microprocessor architecture and pin diagram, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Bus timings, T state, machine cycle, timing diagram, Memories- RAM, DDR/SDR, ROM, EROM, EPROM, EEPROM, Flash Memory, Cache Memory.

UNIT-II (12 Hrs.)

Programming with 8085: Addressing modes, Detail study of 8085 instruction set. I/O and Memory mapping, Interfacing I/O Devices, Interrupts, stack and subroutines, Counter and Time Delays, Code conversion, BCD Arithmetic and 16-bit data operations, Programming techniques with additional instructions, Program Debugging.

UNIT-III (12 Hrs.)

Interfacing with 8085: Architecture, interfacing and programming of 8155/8156 (programmable I/O port timer), 8251(universal synchronous, asynchronous receiver transmitter), 8253/ 8254 (programmable interval timer), 8255 (programmable peripheral interface), 8279 (keyboard display controller), and 8257 (direct memory access controller).

UNIT-IV (10 Hrs.)

Other Microprocessor and interfacing: 8086 -Block diagram, Architecture, pipelining, flag register, register bank operation, memory segmentation, addressing modes. Introduction to 80186, 80286, 80386, 80486 and Pentium and their comparison, Comparative study of 8-bit microprocessors: Intel 8085, Motorola 6800, Zilog Z-80.

Recommended Books

1. R.S. Gaonkar, Microprocessor Architecture Programming and Applications with the 8085' Penram International.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware' McGraw Hill Co.
3. Barry B. Brey, 'The Intel Microprocessors, Architecture Programming and Interfacing', PHI.
4. B. Ram, 'Fundamentals of Microprocessor and Microcontrollers', Dhanpat Rai and Sons, New Delhi.

MICROPROCESSOR LAB.

Subject Code: BEEE1-519 **L T P C**
0 0 2 1

Course Objectives

The student should be made to:

1. Introduce assembling language Programming concepts and features
2. Write assembling language Programming for arithmetic and logical operations in 8085
3. Differentiate Serial and Parallel Interface
4. Interface different I/Os with Microprocessors

Course Outcomes

At the end of the course, the student should be able to:

1. Write assembling language Programmes for fixed and Floating Point and Arithmetic
2. Interface different I/Os with processor
3. Generate waveforms using Microprocessors
4. Execute Programs in 8085

EXPERIMENTS

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8086.
9. Write a program to find maximum and minimum from series using 8086.
10. Write a program to control the operation of stepper motor using 8085/8086
11. microprocessors and 8255 PPI.
12. Write a program to control speed of DC motor using 8085/8086 microprocessors and
13. 8255 PPI.

Note: At least 08 experiments are required to be performed.

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C**
0 0 2 1

Course Objectives
The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organisations.

Course Outcomes
At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, ‘Business Correspondence and Report Writing’, TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, ‘Creative English for Communication’, Macmillan.
4. Penrose, John M., et al., ‘Business Communication for Managers’, Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, ‘Corporate Conversations’, PHI, New Delhi, **2007**.

SENSORS AND TRANSDUCERS

Subject Code: BEEE1-556 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
1. Understanding the structural and functional principles of sensors and transducers used for various physical and nonelectric quantities and how to use them to measure these quantities.

2. Explain the principles of operation of the sensor parameters and generators
3. Interpretation of the measurement results by using transducers.
4. Development of measurement schemes for different non electrical quantities
5. Assimilating knowledge about the implementation of sensors and transducers into a control system structure.

Course Outcomes

1. To explain the structure of the Transducers and sensors.
2. To design applications using the sensors and transducers.
3. To enhance knowledge on various types of thermoelectric effects and devices.
4. To study the effects of various sensors and their applications.

UNIT-I (11 Hrs.)

Introduction to Sensors and Transducers, Basic elements of instrumentation system, Static and Dynamic characteristics of transducers, selection criterion, Mechanical and Electromechanical sensors. Resistive (potentiometric) type: resolution, accuracy, sensitivity. Strain Gauges: theory, types, sensitivity, gauge factor, variation with temperature. Inductive sensors: common types- reluctance change type, mutual inductance change type, transformer action type, magnetostrictive type. LVDT: Construction, output-input relationship, I/O curve, Proximity and Range sensors.

UNIT-II (11 Hrs.)

Capacitive Sensors: Variable distance- parallel plate type, Variable area- parallel plate, serrated plate/teeth type and cylindrical type. Variable Dielectric Constant Type: calculation of sensitivities Stretched Diaphragm type: microphones, response characteristics. Piezoelectric Elements: piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, ultrasonic sensors

UNIT-III (11 Hrs.)

Thermal sensors: Material expansion type: solid, liquid, gas and vapour Resistance change type: RTD, materials, construction, tip sensitive and stem sensitive type, Thermistor materials, shapes, ranges, accuracy specifications. Thermoemf sensors: types, thermoelectric powers, general consideration Junction semiconductor type IC and PTAT type Radiation sensors: types, characteristics and comparisons, Pyroelectric type.

UNIT-IV (12 Hrs.)

Magnetic sensors: Sensors based on Villari effect for assessment of force, torque, proximity; Wiedemann effect for yoke coil sensors, Thomson effect. Hall effect and Hall drive, performance characteristics Radiation sensors: LDR, photovoltaic cells, photodiodes, photo emissive cells- types, materials, construction, response Geiger counters, Scintillation detectors Introduction to Smart sensors, Humidity, pH, conductivity, Velocity, Acceleration: Electromagnetic velocity sensor; spring-mass-system, measurement of deflection principle of accelometers, sensitivity, Noise Flow: Pressure gradient technique; (orifice, venture, pitot,) rotameter thermal transport technique; electromagnetic sensor, laser Doppler anemometry; ultrasonic sensors.

Recommended Books

1. A.K. Sawhney, 'Electrical and Electronics Measurements and Instrumentation' Dhanpat Rai and Sons.
2. C.S. Rangan, G.R. Sarma, V.S.V. Mani, 'Instrumentation Devices and Systems', Tata McGraw Hill Publication.
3. B.C. Nakra, K.K. Chaudhary, 'Instrumentation Measurement and Analysis', McGraw Hill Publication Ltd.

4. D. Patranabis, 'Sensors and Transducers', Prentice Hall India Course Private Limited.
5. E.A. Doebelin, 'Measurement Systems: Application and Design', McGraw Hill, New York.
6. H.K.P. Neubert, 'Instrument Transducers', Oxford University Press, London and Calcutta.

ELECTRICAL ENGINEERING MATERIALS

Subject Code: BEEE1-557 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To provide knowledge about basics of electrical engineering materials.
2. Students will obtain skills of application of materials in daily life.

Course Outcomes

1. An ability to understand all types of magnetic and conducting materials.
2. To understand the various properties of electrical engineering materials.

UNIT-I (9 Hrs.)

Elementary Materials Science Concepts: Bonding and types of solids and its defects, resistivity, factors affecting resistivity, temperature dependence of resistivity, Skin Effect, Hall Effect.

UNIT-II (12 Hrs.)

Dielectric Properties of Insulators in Static and Alternating Field: Dielectric constant of gases, molecules and solids, internal field in solids and liquids, Properties of ferro-electric materials, polarization, types of polarizations, polarizability: atomic and molecular, frequency dependence of electronic and ionic polarizability, piezoelectricity and dielectric losses.

UNIT-III (13 Hrs.)

Magnetic Properties and Superconductivity: Magnetization of matter, magnetic material classification, ferromagnetic origin, Curie-Weiss law, soft and hard magnetic materials, Superconductivity and its origin, critical temperature, critical magnetic field, zero resistance and Meissner Effect, Type-I and Type-II superconductors, applications of superconductors.

UNIT-IV (11 Hrs.)

Conductivity of Metals: Drift velocity, relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.

Semiconductor Materials: Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, fermi level, applications of semiconductors in electrical engineering.

Recommended Books

1. S.P. Seth, 'A Course in Electrical Engineering Materials', Dhanpat Rai and Sons, **2001.**
2. Electrical Engineering Materials, T.T.T.I., Madras, **1998.**
3. K.B. Raina and S.K. Bhattacharya, 'Electrical Engineering Materials, S.K. Kataria and Sons, **2004.**
4. P.K. Palanisamy, 'Material Science for Electrical Engineering, Scitech Pub. (India) Pvt. Ltd., Chennai, **2011.**

GENERATION & ECONOMICS OF ELECTRICAL POWER

Subject Code: BEEE1-558 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. Define the performance characteristics and components of such power plants.
2. Estimate different efficiencies associated with such systems
3. Calculate present worth depreciation and cost of different types of power plants.
4. Estimate the cost of producing power per kW.

Course Outcomes

1. Discuss the environmental impact of electric power production on air quality, climate change, water, and land
2. Discuss power generation from renewable/alternate fuels and heat sources: bio fuels, synthetic fuels, geothermal, ocean thermal, solar thermal power plants.
3. Discuss the principles and potential of direct-electric power conversion systems, such as fuel-cell and solar photovoltaic units.
4. Explain the major types of hydro-power and wind-power turbines and estimate power generation potential.

UNIT-I (10 Hrs.)

Introduction: Energy sources and their availability, Principle types of power plants, Their special features and applications, Present status and future trends.

UNIT-II (13 Hrs.)

a) Conventional Power Generation:
Hydro Electric Power Plants: Essentials, Classifications, Hydroelectric survey, Rainfall run off, Hydrograph, Flow duration curve, Mass curve, Storage capacity, Site selection, Plant layout, various components, Types of turbines, Governor and speed regulation, Pumped storage, Small scale hydro–electric plants (mini and micro),

b) Steam Power Plant: General developing trends, Essentials, Plant layout, Coal–its storage, Preparation, Handling, Feeding and burning, Ash handling, Dust collection, High pressure boilers and steam turbines, Their main components like super heaters, Economizers, Pre–heaters etc., Fuel efficiency/heat balance, Layout of Gas turbine power plant and comparison with steam power plants.

c) Nuclear Power Plant: Nuclear fuels, Nuclear energy, Main components of nuclear power plant, Nuclear reactors types and applications, Radiation shielding, Radioactive and waste disposal safety aspect.

UNIT-III (10 Hrs.)

Non-Conventional Power Generation: Geothermal power plants, Electricity from biomass, direct energy conversion systems, Thermo-electric conversion system, Fuel cells, Magneto Hydro Dynamic system.

UNIT-IV (12 Hrs.)

Power Plant Economics: Cost of electrical energy, Selection of type of generation and generation equipment, Performance and operating characteristics of power plants, Economic scheduling principle, Load curves, Effect of load on power plant design, Methods to meet variable load, Load forecasting, Electric tariffs. Theory of peak load pricing, Theory and issues of real time pricing comparison of public supply and private generating units, Definition of Cogeneration and its scope, Cogeneration technologies, Sale of electricity and impact on cogeneration.

Recommended Books

1. S.C. Arora and S. Domkundawar, 'A course in Power Plant Engineering', Dhanpat Rai.
2. M.V. Deshpandey, 'Power Plant Engineering', Tata McGraw Hill, **2004.**
3. B.R. Gupta, 'Generation of Electrical Energy', S. Chand.
4. M.V. Deshpandey, 'Electrical Power System Design', McGraw Hill, **2004.**
5. A.J Wood and B.F. Wollenberg, 'Power Generation and Control', John Wiley, **2004.**
6. S.N. Singh, 'Electric Power Generation: Transmission and Distribution', PHI Course.

MODERN OPTIMIZATION TECHNIQUES

Subject Code: BEEE1-559 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

The general objectives of the course are:

1. To introduce the fundamental concepts of Optimization Techniques
2. To make the learners aware of the importance of optimizations in real scenarios
3. To provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable

Course Outcomes

Upon completion of this course, the students would be able to:

1. Formulate optimization problems for determining optimum state of the system.
2. Understand and apply the concept of optimality criteria for various type of optimization problems
3. Solve various constrained and unconstrained problems in single variable as well as multivariable
4. Apply the methods of optimization in real life situation.

UNIT-I (12 Hrs.)

Introduction to Optimization: Classification of Optimization, Design vector and constraints, Constraint surface, Objective function, Classification of Optimization Problems, problem formulation.

Classical Optimization Techniques: Introduction to Classical Methods, Single variable optimization, Multi-variable: Direct substitution method, Lagrange's method of multipliers, Karush-Kuhn-Tucker Conditions Calculus method, Method of Multipliers.

UNIT-II (10 Hrs.)

Linear Programming: Introduction to linear programming formulation of different models, Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex method, Exceptional cases in LP, Duality theory, Dual simplex method, Sensitivity analysis.

UNIT-III (12 Hrs.)

Single Variable Optimization: Problems Optimality Criterion, Bracketing Methods, Region Elimination Methods, Interval Halving Method, Fibonacci method, Golden section method. Gradient Based Methods: Newton-Raphson Method, Bisection Method, Secant Method, application to Root finding.

Multivariable Optimization: Algorithms Optimality Criteria, Unidirectional Search. Direct Search Methods: Hooke-Jeeves pattern search method, Random search methods, Grid search method, Powell's Conjugate Direction Method. Gradient Based Methods: Cauchy's Steepest Descent Method, Newton's method, Marquardt's Method.

UNIT-IV (11 Hrs.)

Transportation and Assignment Problem: Initial basic feasible solutions of balanced and unbalanced transportation/assignment problems, Optimal solutions.

Project Management: Construction of networks, Network computations, Floats (free floats and total floats), Critical path method (CPM), Crashing.

Recommended Books

1. S. Chandra, Jayadeva, Mehra, A., 'Numerical Optimization and Applications' Narosa Publishing House.
2. H.A. Taha, 'Operations Research-An Introduction', PHI.
3. S.S. Rao, 'Engineering Optimization', New Age International.
4. E.J. Haug and J.S. Arora, 'Applied Optimal Design', Wiley, New York.
5. Kalyanmoy Deb, 'Optimization for Engineering Design', Prentice Hall of India.

NON LINEAR & DIGITAL CONTROL SYSTEMS

Subject Code: BEEE1-621 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To explain the concepts of basic and modern control system for the real time analysis and design of control systems.
2. To explain the concepts of state variables analysis.
3. To study and analyse nonlinear systems.
4. To analyse the concept of stability for nonlinear systems and their categorization

Course Outcomes

1. To understand various terms of basic and modern control system for the real time analysis and design of control systems.
2. To perform state variables analysis for any real time system.
3. Apply the concept of optimal control to any system.
4. Able to examine a system for its stability, controllability and observability.
5. Implement basic principles and techniques in designing linear control systems.

UNIT-I (11 Hrs.)

Sampled Data Systems: Sampling process, mathematical analysis of sampling process, application of Laplace transform, zero order, first order hold. Z- transform definition, evaluation of Z-transform, limitations of Z-transform, inverse Z-transform, Reconstruction of sampled signal, pulse transfer function, Stability analysis of sampled data control system.

UNIT-II (12 Hrs.)

State Variable Techniques: State space representation, Concept of state, transfer function decomposition, solution of state equations, transfer matrix, State variable formulation of discrete time systems, solution of discrete time state equations. Stability definition, Jury's test of stability, extension of Routh-Hurwitz criterion to discrete time systems, State variable representation of systems by various methods, solution of state variable model, Controllability and observability.

UNIT-III (11 Hrs.)

Phase Plane Analysis: Singular points, Method of isoclines, delta method, phase trajectory, phase portrait of second order nonlinear systems, limit cycle.

Lyapunov's Stability Method: Lyapunov's direct method, generation of Lyapunov's function by Krasovskii's and Variable Gradient methods.

UNIT-IV (11 Hrs.)

Describing Function Analysis: characteristics of nonlinear system and its properties, Definition, limitations, use of describing function for stability analysis, describing function of ideal relay, relay with hystersis, dead zone, saturation, coulomb friction and backlash.

Recommended Books

1. Ogata K., 'Modern Control Engineering', Prentice Hall (India).
2. I.J. Nagrath and M. Gopal, 'Control System Engineering', New Age Publications.
3. M. Gopal, 'Digital Control and State Variable Methods', Tata McGraw Hill.
4. B.C. Kuo and Golnaraghi F, 'Automatic Control System', Wiley.
5. R.V. Dorf and R.H. Bishop, 'Modern Control Systems', Adison Wesle.
6. K.K. Aggarwal, 'Control Systems Analysis and Design', Khanna Publisher.
7. S. Hasan Saeed, 'Automatic Control Systems (With Matlab Programs)', S.K. Kataria & Sons.

POWER SYSTEM – II

Subject Code: BEEE1-622 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To know about substation equipment and need for protection
2. To study and operation of circuit isolation devices
3. To understand the application operation of protective relays
4. To know about grounding practices and protection against over voltages

Course Outcomes

1. Skill to understand basic need for protection schemes
2. Skill to understand functioning of isolators, fuses and circuit breakers
3. An ability to understand protection of feeders, transmission lines, Generators and Transformers.
4. Students will be able to understand protection against over voltages

UNIT- I (12 Hrs.)

Introduction: Principles and need for protective schemes, Types of Faults, Causes and Effects, Primary and Backup Protection, Basic Connection of Trip Circuit.

Sub-Station: Layout of Substation, Types, Main equipment in Substation, Busbar-arrangements.

UNIT- II (12 Hrs.)

Isolators and Fuses: Isolating switches functions, Types, Rating and operation. Fuse-types, Rating, Selection, theory and characteristics, applications.

Circuit Breakers: Need for Circuit Breakers, Arc phenomenon, Theory of Arc Interruption, Recovery Voltage and Restriking Voltage, Various Types of Circuit Breakers, Principles and Constructional Details of Air Blast, Minimum Oil, SF6, Vacuum Circuit Breakers etc.

UNIT- III (12 Hrs.)

Protective Relays: Introduction, classification, constructional features; and Characteristics of Electromagnetic, Induction, Thermal, Overcurrent relays, Directional relays, Distance relays, Differential, Translay Scheme, introduction to static and microprocessor-based relays.

Protection of Feeders: Time graded protection, Differential and Distance protection of feeders, choice between Impedance, Reactance and Mho relays, Elementary idea about carrier current protection of lines.

UNIT IV (12 Hrs.)

Protection of Generators and Transformers: Types of faults on alternator, Stator and rotor protection, Negative sequence protection, Loss of excitation and overload protection. Types of fault on transformers, percentage differential protection, Gas relays.

Protection against Over Voltages: Ground wires, Rod gap, Impulse gap, Valve type and Metal Oxide Arresters, Line Arrester/Surge Absorber. Ungrounded neutral system, Grounded neutral system and Selection of Neutral Grounding. Solid, resistance and reactance Earthing

Recommended Books

1. C.L Wadhwa, 'Electrical Power System', New Age International (P) Limited.
2. Sunil S. Rao, 'Switchgear Protection and Power Systems', Khanna Publishers.
3. S.L. Uppal, 'Electrical Power', Khanna Publishers.
4. Badri Ram, 'Power System Protection and Switchgear', Tata McGraw Hill.
5. N. Veerappan & S.R. Krishnamurthy, 'Power System Switchgear & Protection', S. Chand.
6. Ravinderpal Singh, 'Switchgear & Power System Protection', PHI.
7. Sunil S. Rao, 'Switchgear Protection & Power System', Khanna Publishers.

POWER SYSTEM LAB.

Subject Code: BEEE1-623 **L T P C**
0 0 2 1

Course Objectives

1. To provide practical knowledge about transmission systems.
2. To impart knowledge about performance of different types of Relays.
3. To develop understanding about operation of Circuit Breakers.
4. To provide knowledge about insulators, conductors and cables used in transmission and distribution.

Course Outcomes

1. Skill to understand practical transmission system
2. Skill to understand performance and operation of different types of Relays and Circuit Breaker
3. Skill to understand about construction of insulators, conductors and cables used in power system

EXPERIMENTS

1. Visit Local substation and draw layout of local substation
2. To find the earth resistance using three spikes
3. To study the performance of medium transmission line as π model and compute its ABCD parameters.
4. To study the performance of medium transmission line as T model and compute its ABCD parameters.
5. Verification of Ferranti Effect of a Long transmission line
6. To study various types of Insulators used in transmission and distribution.
7. To study various types of conductors used in transmission and distribution
8. To study the different types of faults on transmission line demonstration panel/model.
9. To study the radial feeder performance when
   a) Fed at one end
   b) Fed at both ends
10. To study the performance of Distance Relay
11. To study the performance of Differential Relays

12. To study operation of Bucholz Relay
13. To study operation of IDMT relay
14. To study the operation of Vacuum Circuit Breaker
15. To study the operation of SF_6 Circuit Breaker

Note: At least ten experiments should be performed in a semester

POWER ELECTRONICS LAB.

Subject Code: BEEE1-624 **L T P C**
0 0 2 1

Course Objectives

1. To develop the understanding of students about the behaviour of various type of
2. Thyristors by obtaining V-I characteristics.
3. To familiarize the performance of firing circuits and commutation circuits.
4. To check the output waveforms of converter circuits.
5. To introduce the students to some practical applications of Thyristors.

Course Outcomes

1. Ability to simulate characteristics of SCR.
2. Ability to understand speed control of induction motors using thyristor.

EXPERIMENTS

1. To obtain V-I characteristics of SCR and measure latching and holding currents.
2. To Draw V-I Characteristics of UJT.
3. To obtain the characteristics of TRIA
4. To obtain triggering wave forms of SCR for different types of firing circuits such as R, RC, UJT etc.
5. To obtain output voltage waveforms of single phase half wave controlled rectified for R-L load.
6. To obtain output voltage waveforms of single phase Full wave controlled rectified for R-L load.
7. To obtain output voltage waveforms of single phase ac voltage regulator with R-L load.
8. To study different types of chopper circuit and obtain output voltage waveforms.
9. To Study and obtain the output voltage waveform of single phase cycloconverter
10. Speed control of electric motor using thyristor.
11. To simulate single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
12. To simulate single phase inverter using different modulation techniques and obtain load voltage and load current waveform for different types of loads.
13. Illumination control using SCR

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C**
0 0 2 1

Course Objectives

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organisation.

Course Outcomes

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

FUZZY LOGIC SYSTEMS

Subject Code: BEEE1-660 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. Provide an understanding of the basic mathematical elements of the theory of fuzzy sets
2. Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories.
3. Cover fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems.
4. Provide a brief introduction to fuzzy arithmetic concepts.
5. Provide an insight into fuzzy inference applications in the area of control and robotics.

Course Outcomes

1. To learn crips and fuzzy set theory and decide the difference between crips set and fuzzy set theory.
2. To make calculation on fuzzy set theory.
3. To recognize fuzzy logic membership function.
4. To make applications on Fuzzy logic membership function and fuzzy inference systems.

UNIT-I (11 Hrs.)

Theory of Fuzzy Sets and Fuzzy Relations: Fuzzy Reasoning-Fuzzy Rules-Fuzziness compared to randomness- Introduction - Classical sets and fuzzy sets-operations on both-properties of fuzzy sets-classical relations and fuzzy relations- cardinality of fuzzy relations-Fuzzy Cartesian product and composition–fuzzy tolerance and equivalence relations- value assignments - cosine amplitude-max-min method.

UNIT-II (12 Hrs.)

Fuzzification and De-fuzzification: Formation of Fuzzy Rule Base-Membership functions - features –standard forms–fuzzification - membership value assignments - intuition – inference-rank ordering - angular fuzzy sets - inductive reasoning -fuzzy to crisp conversion – lambda/alpha cuts for fuzzy sets and fuzzy relations - defuzzification methods.

UNIT-III (12 Hrs.)

Fuzzy Logic: Classical logic and fuzzy logic –fuzzy rule based systems - approximate reasoning – canonical rule forms - decomposition of compound rules - likelihood and truth classification - aggregation of fuzzy rules – fuzzy inference systems- Mamdani and Takagi-Sugeno fuzzy models- fuzzy control Models-P-1-D like fuzzy control rules – implementation. Computer based Simulation-Language based programming in C/C++-Use of Simulation Tools.

UNIT-IV (10 Hrs.)

Fuzzy nonlinear simulation- fuzzy classification - clustering – fuzzy pattern recognition - fuzzy control systems- fuzzy optimization - case studies – Fuzzy Logic combined with Neural Networks and Genetic Algorithms-Soft Computing Techniques- Fuzzy measures (brief introduction only).

Recommended Books

1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', McGraw Hill, **2007.**
2. Guanrong Chen & Trung Tat Pham, 'Introduction to Fuzzy Systems', Chapman & Hall CRC, **2006.**
3. D. Driankov, H. Hellendoorn, M. Reinfrank, 'An Introduction to Fuzzy Control', Narosa Publications.
4. Robert Babuska, 'Fuzzy Modeling for Control', International Series in Intelligent Technologies, Kluwer Academic Publications'.
5. Ronald R. Yager and Dimitar P. Filev, 'Essentials of Fuzzy Modelling & Control', John Wiley & Sons, Inc, **2002.**
6. B. Kosko, 'Fuzzy Engineering', Prentice Hall, **1997.**

VLSI DESIGN

Subject Code: BEEE1-661 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. In this course, the MOS circuit realization of the various building blocks that is common to any digital VLSI circuit is studied.

2. Architectural choices and performance trade-offs involved in designing and realizing the circuits in CMOS technology are discussed.

Course Outcomes

Upon completion of the course, students should

1. Explain the basic CMOS circuits and the CMOS process technology.
2. Discuss the techniques of chip design using programmable devices.
3. Model the digital system using Hardware Description Language.

UNIT-I (11 Hrs)

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture Declaration Introduction to behavioural, dataflow and structural models

VHDL Statements: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

UNIT-II (10 Hrs.)

Applications of VHDL: Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

UNIT-III (12 Hrs.)

Review of MOS Devices: MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.

Basic Electrical Properties and Circuit Concepts: The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.

UNIT-IV (12 Hrs.)

Circuit Characterization and Performance Estimation: Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Recommended Books

1. Bhasker, 'A VHDL Primmer', Prentice Hall.
2. Weste and Eshrighian, 'Principle of CMOS VLSI Design', Pearson Education.
3. D.A. Pucknell and K. Eshraghian, 'Basic VLSI Design', Prentice Hall India, New Delhi.
4. Brown and Vranesic, 'Fundamentals of Digital Logic with VHDL Design', TMH.
5. S.M. Kang, Y. Lebiebici, 'CMOS Digital Integrated Circuits Analysis & Design', TMH.

ENERGY AUDITING AND MANAGEMENT

Subject Code: BEEE1-662 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To understand and appreciate the energy crisis and environmental concerns associated with the energy management, and the importance of energy conservation.
2. To know the techniques of energy analysis and the associated energy efficient technologies for the routinely used thermal and electrical energy systems.
3. To understand the energy management systems and their essential elements.

4. To acquire the knowledge and the basic skills for energy monitoring, energy bench marking, energy action planning and energy auditing.

Course Outcomes

1. Becoming aware of the energy crisis, and of environmental and sustainability concerns associated with the energy management.
2. Becoming aware of the Energy Conservation Act, 2001, and of the legal energy requirements applicable to the routinely used thermal and electrical energy systems Aware
3. Exposure to the most used energy planning and management softwares.
4. Able to carry out development, implementation and maintenance of ISO 50001 based Energy Management System.
5. Able to utilize the techniques and skills of Energy Management System Auditing.
6. Able to utilize the techniques and skills of energy analysis of organizations and development of energy baseline of organizations.

UNIT-I (12 Hrs.)

Energy Scenario: Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act-2001 and its features.

Energy Management and Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments.

UNIT-II (10 Hrs.)

Material and Energy Balance: Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams.

Financial Management: Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of ESCOs.

UNIT-III (11 Hrs.)

Electrical System: Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement issues, energy efficient motors. Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues.

UNIT-IV (12 Hrs.)

Compressed Air System: Types of air compressors, Compressor efficiency, Efficient compressor operation, Compressed air system components, Capacity assessment, Leakage test Factors affecting the performance and efficiency

HVAC and Refrigeration System**:** Vapor compression refrigeration cycle, Refrigerants, Coefficient of performance, Capacity, Factors affecting refrigeration and air conditioning system performance and savings opportunities, Vapor absorption refrigeration system: Working principle, Types and comparison with vapor compression system, Saving potential, Fans, Blowers and pumps- Types, Performance evaluation, Efficient system operation, Flow control strategies and energy conservation opportunities.

Recommended Books

1. Y.P. Abbi and S. Jain, 'Handbook on Energy Audit and Environment Management', Teri Bookstore, **2006.**
2. P. Diwan, 'Energy Conservation', Pentagon Press, **2008.**
3. Thumann and W.J. Younger, 'Handbook of Energy Audits', Fairmont Press, Georgia, USA.

MICROCONTROLLER AND EMBEDDED SYSTEMS

Subject Code: BEEE1-663 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

The student should be made to:
1. Study the Architecture of 8051 microcontroller.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.

Course Outcomes

At the end of the course, the student should be able to:
1. Design and implement 8051 microcontroller based systems.
2. Serial communication 0f 8051.
3. Interfacing with 8051.

UNIT-I (10 Hrs.)

Introduction: 8051 microcontroller, comparison of microcontroller and microprocessors, Embedded Systems, 8051 Microcontroller: Architecture and Pin Diagram, Program Counter and RAM Spaces, Data types and Directives, Flag Bits and PSW Register, Register Banks and Stack, interrupt.

UNIT-II (12 Hrs.)

Programming: Basic assembly language programming concepts Addressing Modes, Arithmetic, Logical instructions and Programming, I/O Port Programming, BCD and ASCII application programs, Single-bit instruction programming, Timers and Counter Programming, Jump and loop Instructions, Introduction of 8051 Programming in C.

UNIT-III (11 Hrs.)

Serial Communication of 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, serial communication programming, Programming of timer interrupts, Programming of External hardware interrupts, Interrupt priority.

UNIT-IV (12 Hrs.)

Interfacing with 8051: LCD and Keyboard Interfacing, interfacing with external memory and 8051 data memory space, interfacing with 8255, Sensors Interfacing and Signal Conditioning, interfacing with Stepper Motor and Servo motors, DS12887 RTC Interfacing and its programming.

Recommended Books

1. Mazidi Muhammad Ali, 'The 8051 Microcontroller and Embedded Systems', Pearson Publications.
2. Joseph Yiu, 'The Definitive Guide to ARM Cortex-M3 processors' Newnes Publication.
3. Jonathan W. Valvano, **'**Introduction to ARM Cortex-M Microcontrollers', Vol. 1.
4. Jonathan W. Valvano. **'**Real-Time Interfacing to ARM Cortex-M Microcontrollers'.

DIGITAL SIGNAL PROCESSING

Subject Code: BEEE1-664 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To learn discrete Fourier transform and its properties
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals
3. To understand Finite word length effects
4. To study the concept of Multirate and adaptive filters

Course Outcomes

Upon completion of the course, students will be able to

1. Apply DFT for the analysis of digital signals & systems
2. Design IIR and FIR filters
3. Characterize finite Word length effect on filters.

UNIT-I (11 Hrs.)

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Concept of Frequency in Continuous Time and Discrete Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Applications of Signal Processing.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time systems, Correlation of Discrete Time Signals.

UNIT-II (12 Hrs.)

The Z-transform and its Application to the Analysis of LTI Systems: The z-Transform, Properties of z-Transforms, Inversion of z-Transform, One-sided z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous –Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform for Discrete Time Signals. Frequency Domain Characteristics of Linear Time-Invariant Systems, Linear Time-Invariant Systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

UNIT-III (10 Hrs.)

The Discrete Fourier Transform- its Properties and Applications: Frequency Domain Sampling: The discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods based on the DFT. Frequency Analysis of Signals Using the DFT.

Efficient Computation of DFT- Fast Fourier Transforms: Efficient Computation of DFT: FFT Algorithms, Application of FFT Algorithms, A Linear Filtering Approach to Computation of DFT. Quantization Effect in the Computation of DFT.

UNIT-IV (12 Hrs.)

Implementation of Discrete Time Systems: Structures for the realization of Discrete Time Systems, Structures for FIR Systems, Structures for IIR Systems, Representation of Numbers, Quantization of Filter Coefficients, Round off Effect in Digital Filters.

Design of Digital Filters: General Considerations like causality etc., Design of FIR Filters, Design of IIR Filters from Analog Filters, Frequency Transformations, Design of Digital Filters Based on Linear Squares Method.

Sampling and Reconstruction of Signals: Sampling of Bandpass Signals, Analog-to-Digital Conversion, Digital-to-Analog Conversion.

Recommended Books

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Applications', Prentice Hall.
2. S.K. Mitra, 'Digital Signal Processing: A Computer Based Approach', TMH.
3. A.V. Oppenheim, R.W. Schafer and J.R. Buck, 'Discrete-time Signal Processing', PHI.
4. A. Widrow and S.D. Stearns, 'Adaptive Signal Processing', Prentice Hall.

REMOTE CONTROL AND TELEMETRY

Subject Code: BEEE1-665 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To learn various types of telemetry required in instrumentation system
2. To study data acquisition
3. To understand the data analysis methods
4. To lean about the basics of Photo-grammetry

Course Outcomes

After study of this subject students will have skill

1. About the setup of telemetry system
2. To analyse the data from remote location
3. To acquire the data in real time system
4. To design Photo-grammetry system

UNIT-I (12 Hrs.)

Introduction: classification of telemetry systems - voltage, current, position, frequency and time. Components of tele-metering and remote control systems, Quantization theory - sampling theorem, sample and hold, data conversion-coding.

Remote Sensing: Introduction of Remote Sensing, Electro Magnetic Spectrum -Effects of Atmosphere-Scattering –Absorption-Atmospheric Window-Energy interaction with surface features – Spectral reflectance of earth objects and land covers Resolution concepts –types – Satellites, orbits and missions.

UNIT-II (10 Hrs.)

Data Acquisition and Distribution System: Fundamentals of audio-telemetry system - R.F. links. Telemetry design system, Standard for telemetry e.g. JRIG, Microwave links, Pulse code modulation (PCM) techniques, Practical telemetry system - pipe line telemetry, power system telemetry, supervisory tele-control systems, Introduction to ISDN.

UNIT-III (11 Hrs.)

Data Analysis: Sources of Errors –scene, sensor and atmospheric causes -correction: geometric and Radiometric –visual and digital interpretation-elements of interpretation – interpretation keys -digital analysis and classification –image formation, visualization: Image enhancement, filters–Baye‟s theorem Image classification: unsupervised and supervised – thematic mapping -
accuracy assessment.

UNIT-IV (12 Hrs.)

Photo-grammetry: Principles –aerial photo-aerial camera -Scale –overlaps –stereoscopy – concepts –viewing and measuring systems –image and object co-ordinates–transformation -

floating mark –parallax equation –height information -Flight planning –computation for flight plan –photo control

Recommended Books

1. Robert A. Schowen Gerdt, 'Remote Sensing: Models and Methods for Image Processing', Academic Press, **2007.**
2. Gottfried Konecny, 'RS, Photogrammetry and Geographic Information Systems', CRC, **2009.**
3. M. Schwartz, 'Information Transmission - Modulation & Noise', McGraw Hill, **1970.**
4. D. Patranabis, 'Telemetry Principles', Tata McGraw Hill.
5. A.K. Sawhney, 'A course in Electrical and Electronic Measurements and Instrumentation' Dhanpat Rai, New Delhi.

NON CONVENTIONAL ENERGY RESOURCES

Subject Code : BEEE1-666 **L T P C** **Duration : 48 Hrs.**
3 1 0 4

Course Objectives

1. To understand conventional and nonconventional sources of energy.
2. To evaluate different sources of energy
3. To persuade community to use renewable energy sources

Course Outcomes

1. Students would become aware about Non-conventional Energy sources and Solar energy, different types of collectors, their uses, wind energy, tidal energy, geothermal energy, Thermo Nuclear Fusion, Cold Fusion.
2. Students will develop the use of wind energy and Biomass energy
3. Students would become aware about potential of energy present under earth surface and about energy of oceanic water tides.
4. Students would develop the understanding about Nuclear energy, Hydrogen energy etc.

UNIT-I (12 Hrs.)

Introduction: Energy sources and availability, new energy techniques, Renewable energy sources, Solar Energy; Solar constant, Radiation geometry, Solar energy collectors, Concentrated and flat plate, Energy balance and collector efficiency, Solar energy storage, Application to space heating, distillation, cooking and green house effect,

UNIT-II (10 Hrs.)

Wind Energy: Basic principle, site selection, Aerodynamic analysis of blades,
Bio-energy; Biomass conversion technology, photosynthesis, Biogas plant, thermal gasification.

UNIT-III (11 Hrs.)

Geothermal Energy: Sources, hydrothermal sources, hot dry rock resources, geothermal fossil system, prime movers for geothermal energy
Energy from ocean; Ocean thermal electric conversion, energy from tides, small scale hydroelectric development.

UNIT-IV (12 Hrs.)

Hydrogen energy sources; Production, storage, utilization, magneto hydrodynamic power, thermo ionic generation, Nuclear fusion energy, Energy storage. Energy conservation.

Recommended Books

1. G.D. Rai, 'Non-Conventional Energy Sources', Khanna Publishers, Delhi.

2. S. Rao, B.B. Parulekar, 'Energy Technology: Non-Conventional Renewable and Conventional', Khanna Publishers, Delhi.
3. H.P. Garg & Jai Prakash, 'Solar Energy: Fundamentals and Applications', Tata McGraw Hill, N. Delhi.
4. Sutton, 'Direct Energy Conversion', McGraw Hill Inc., **1966.**
5. Duffie and Beckman, 'Solar Energy Thermal Processes', John Wiley, **1974**.
6. R.K. Rajput, 'Non-Conventional Energy Sources and Utilization (Energy Engineering)', S. Chand Publishers.

NEURAL NETWORKS

Subject Code : BEEE1-667 **L T P C** **Duration : 45 Hrs.**
3 1 0 4

Course Objectives

1. Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
2. Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.
3. Basic Course algorithms: the delta Course rule, the back propagation algorithm, self-organization Course, the r4-rule, etc.
4. Applications: pattern recognition, function approximation, information visualization, etc.

Course Outcomes

1. To learn basic neural network architecture
2. To learn basic Course algorithms
3. To understand data pre and post processing
4. To learn training, verification and validation of neural network models
5. To design Engineering applications that can learn using neural networks

UNIT-I (12 Hrs.)

Introduction to Neural Networks: Human brain and Biological Neuron, Artificial Neural Network, ANN Terminology, McCulloch- Pitts Neural Model, Activation functions, Topology, Feedforward Neural Networks, ANN Course: Supervised, Un-supervised, Competitive Course, Reinforcement Course, Knowledge representation.

UNIT-II (11 Hrs.)

Course Laws: Hebb's rule, Delta rule, Widrow & Hoff LMS Course rule, Correlation Course rule, Instar and Outstar Course rules, Back-propagation Neural Networks, K-means clustering algorithm, Kohenen's feature maps, Associative Memories

UNIT-III (10 Hrs.)

Radial Basis Neural Networks: Function Neural Networks, Basic Course laws in RBF Nets, Recurrent Networks, Recurrent Backpropagation, Counter-Propagation Networks, CMAC Networks, ART Networks.

UNIT-IV (12 Hrs.)

Associative-Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Course, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis

Recommended Books

1. Laurene Fausett, 'Fundamentals of Neural Networks', Pearson Education, **2004.**
2. Simon Haykin, 'Neural Networks- A comprehensive foundation,'Pearson Education, **2003**.
3. S. Rajasekharan and G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy logic, Genetic Algorithms: Synthesis and Applications', PHI Publication, **2004.**
4. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill Inc., **2000.**

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

Total Contact Hours = 30 Total Marks = 900 Total Credits = 25

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-301	Object Oriented Programming	3	1	0	40	60	100	4
BECE1-302	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE1-303	Network Analysis and Synthesis	3	1	0	40	60	100	4
BECE1-304	Electronic Instrumentation	3	1	0	40	60	100	4
BECE1-305	Signals and Systems	3	1	0	40	40	100	1
BECE1-306	Electronic Devices and Circuits - I Lab.	0	0	2	60	40	100	1
BECE1-307	Object Oriented Programming Lab	0	0	2	60	40	100	4
BHUM0-F91	Soft Skills-I	0	0	2	60	40	100	1
BECE1-308	Training – I#	0	0	4	60	40	100	2
Total		**15**	**5**	**10**	**440**	**460**	**900**	**25**

 # Training of 4 Weeks during summer vacations after 2nd semester

Total Contact Hours = 27 Total Marks = 900 Total Credits = 23

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-409	Electronic Devices and Circuits –II	3	1	0	40	60	100	4
BECE1-410	Analog Communication Systems	3	1	0	40	60	100	4
BECE1-411	Digital Electronics	3	1	0	40	60	100	4
BECE1-412	Electromagnetic Field Theory	3	1	0	40	60	100	4
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BECE1-456	Neural Networks and Fuzzy Logic							
BECE1-457	Data Structures and Algorithms							
BECE1-458	RADAR and SONAR Engineering							
BECE1-459	Web Technologies							
BECE1-413	Electronic Devices and Circuits -II Lab.	0	0	2	60	40	100	1
BECE1-414	Analog Communication Systems Lab.	0	0	2	60	40	100	1
BECE1-415	Digital Electronics Lab.	0	0	2	60	40	100	1
BHUM0-F92	Soft Skills -II	0	0	2	60	40	100	1
Total		**15**	**4**	**8**	**440**	**460**	**900**	**23**

Total Contact Hrs. = 30 **Total Marks = 1000** **Total Credits = 24**

Semester 5th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-516	Linear Integrated Circuits	3	1	0	40	60	100	4
BECE1-517	Microprocessor and Interfacing	3	1	0	40	60	100	4
BECE1-518	Digital Communication Systems	3	1	0	40	60	100	4
BECE1-519	Linear Integrated Circuits Lab.	0	0	2	60	40	100	1
BECE1-520	Microprocessor Lab.	0	0	2	60	40	100	1
BECE1-521	Digital Communication Systems Lab.	0	0	2	60	40	100	1
BECE1-522	Training –II#	0	0	4	60	40	100	2
BHUM0-F93	Soft Skills -III	0	0	2	60	40	100	1
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BECE1-560	Data Communication Networks							
BECE1-561	Human Resource Management							
BECE1-562	Digital System Design							
BECE1-563	Biomedical Electronics and Instrumentation							
BECE1-564	Micro-electronics							
Open Elective – I		3	0	0	40	60	100	3
Total		**15**	**3**	**12**	**500**	**500**	**1000**	**24**

 # Training of 6 Weeks during summer vacations after 4th semester

Total Contact Hrs. = 24 **Total Marks = 800** **Total Credits = 21**

Semester 6th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1-623	Microwave and Antenna Theory	3	1	0	40	60	100	4
BECE1-624	Microcontroller and Embedded System	3	1	0	40	60	100	4
BECE1-625	Linear Control System	3	1	0	40	60	100	4
BECE1-626	Microwave Engineering Lab.	0	0	2	60	40	100	1
BECE1-627	Microcontroller Lab.	0	0	2	60	40	100	1
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Departmental Elective-III (Select any one)		3	0	0	40	60	100	3
BECE1-665	Nano Science and Nano-Technology							
BECE1-666	Advanced Microprocessor							
BECE1-667	Image and Speech Processing							
BECE1-668	Optical Fibre Communication							
BECE1-669	Operation Research							
Open Elective – II		3	0	0	40	60	100	3
Total		**15**	**3**	**6**	**380**	**420**	**800**	**21**

Total Contact Hrs. = 28 Total Marks = 700 Total Credits = 23

Semester 7th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1- 728	Wireless Communication Systems	3	1	0	40	60	100	4
BECE1- 729	Digital Signal Processing	3	1	0	40	60	100	4
BECE1- 730	Digital Signal Processing Lab	0	0	2	60	40	100	1
BECE1- 731	Minor Project	0	0	4	60	40	100	4
BECE1- 732	Training-III#	0	0	8	60	40	100	4
Departmental Elective-IV (Select any one)		3	0	0	40	60	100	3
BECE1-770	Cognitive Radio							
BECE1-771	Relational Data Base Management System							
BECE1-772	Computer Architecture and Organization							
BECE1-773	Soft Computing							
Open Elective – III		3	0	0	40	60	100	3
Total		**12**	**2**	**14**	**340**	**360**	**700**	**23**

 # In House / Industrial Training of 8 Weeks during summer vacations after 6th semester

Total Contact Hrs. = 21 Total Marks = 400 Total Credits = 14

Semester 8th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE1- 833	VLSI Design	3	1	0	40	60	100	4
BECE1- 834	VLSI Design Lab.	0	0	2	60	40	100	1
BECE1- 835	Major Project	0	0	12	60	40	100	6
Departmental Elective-V (Select any one)		3	0	0	40	60	100	3
BECE1-874	Cellular and Mobile Communication							
BECE1-875	Wireless Sensor Networks							
BECE1-876	Information Theory and Coding							
BECE1-877	Operating Systems							
BECE1-878	Satellite Communication							
Total		**6**	**1**	**14**	**200**	**200**	**400**	**14**

Total Credits

Semester	Credits
I	25
II	25
III	25
IV	23
V	24
VI	21
VII	23
VIII	14
Total	**180**

OBJECT ORIENTED PROGRAMMING

Subject Code: BECE1-301 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge regarding the Object oriented programming C++, data types and about classes.
2. To provide understanding of inheritance and memory management in C++.
3. To describe how to represent pointers, and understanding the concept of binding and polymorphism.
4. To make the students familiar with the File handling and generic functions.

Course Outcomes:

1. After undergoing the course students will be able to develop various programs and flow charts using C++.
2. Apply the concepts of data encapsulation, inheritance, and polymorphism to large-scale software.
3. Enable students to develop their skills in programming with C++.
4. Design and develop object-oriented computer programs.

Unit-I (12 Hrs.)

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and members functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of constkeyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

Unit-II (12 Hrs.)

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, need for destructors.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Unit-III (12 Hrs.)

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, object composition and delegation, order of execution of constructors and destructors.

Unit-IV (12 Hrs.)

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Files: File streams, hierarchy of file stream classes, reading/writing of files, error handling during file operations, accessing records, randomly, updating files.

Recommended Books:

1. I.E. Balagurusamy, 'Object Oriented Programming with C++', Tata McGraw Hill.
2. R.S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House.
3. R. Lafore, 'Object Oriented Programming in C++', Waite Group.
4. 'The Complete Reference to C++ Language', McGraw Hill-Osborne.
5. F.B. Lippman, 'C++ Primer', Addison Wesle.

ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code: BECE1-302 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

This course is meant to provide fundamental knowledge to students for understanding of the various electronic devices, their circuits & behaviour under various conditions.

1. To aware the students about the various electronic devices and their circuits.
2. To impart knowledge of BJTs and FETs.
3. To provide the students detailed concepts of CMOS and MOSFET.
4. To analyze low and high frequency transistor models.

Course Outcomes:

After undergoing this course student will be able to:

1. Understand the concepts of junction diodes and their applications.
2. Analyze BJT characteristics and determine their behaviour under low and high frequencies.
3. Analyze various concepts of FETs and their characteristics.
4. Design low and high frequency models and observe and its various characteristics.

Unit-I (12 Hrs.)

Semiconductor Diodes: Semi-conductor materials and their characteristics, PN junction Diode - VI characteristics, Breakdown mechanism in diode, effect of temperature on diode qualitative and quantitative analysis of its behaviour, Diode resistance, Transition capacitance and Diffusion capacitance, clippers, clampers, rectifiers. Special purpose diodes - Zener diode, varactor diode, Schottky diode.

Unit-II (12 Hrs.)

Bipolar Junction Transistor: BJT – Transistor current components, BJT configurations – CE, CB, CC and their characteristics. Transistor Biasing –Operating point determination, fixed bias, emitter bias, voltage-divider bias. Bias stability –Stabilization against variation in Ico, V_{BE} and β, Bias compensation.

Unit-III (12 Hrs.)

Field-Effect Transistor: The junction FET - construction, operation, characteristics, parameters, Biasing of JFET, Small signal analysis of JFET as an amplifier- common source and common drain amplifiers.

Metal Oxide Semiconductor FET: MOSFET- construction, operation, characteristics, parameters, CMOS devices, CMOS inverter characteristics, metal semiconductor.

Unit-IV (12 Hrs.)

Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters.

Recommended Books:

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', Pearson Education.
4. Sedra, Adel S. and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: BECE1-303 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide the knowledge to students about the various network theorems.
2. To make the students aware about the various transient responses for various signals.
3. To provide them basic concepts of different types of two port networks and their synthesis.
4. To impart knowledge about different passive filter design.

Course Outcomes:

1. An ability to design, analyze and synthesis of various networks and circuits.
2. Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.
3. Synthesis of networks using fundamental concepts.
4. To understand, design and analysis of various passive filter design.

Unit-I (12 Hrs.)

Laws and Basic Theorems: Fundamental Laws and Concepts – Kirchoff's current and voltage laws, Node and mesh analysis using classical method and Laplace transform, Concept of independent and dependent sources, Analysis of special signal waveforms, Duality in networks. Network Theorems –Superposition, Reciprocity, Thevenin's, Norton's, Millman's, Maximum power transfer, Tellegan's, Circuit analysis using these theorems.

UNIT-II (12 Hrs.)

Transient Analysis: Fundamental signals and their mathematical expressions, Transient response analysis of RL, RC and RLC for various signals using differential equations and Laplace transform.

UNIT-III (12 Hrs.)

Two Port Networks: Fundamental concepts of network synthesis, Hurwitz Polynomials, Positive real functions, Properties of RC, RL & LC networks, Foster and Cauer forms of realization, Transmission zeroes, Synthesis of transfer functions.

UNIT-IV (12 Hrs.)

Passive Filter Design: K-derived, m-derived, Low pass filter, High pass filter, Band pass filter, Band stop filter, their magnitude and phase response

Recommended Books:

1. Vanvalkenburg, 'Network Analysis', Prentice Hall of India Pvt. Ltd., New Delhi.
2. D. RoyChoudhary, 'Network and Systems', New Age International Publisher.
3. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley.
4. Someshwar C. Gupta, 'Circuit Analysis - with Computer Applications to Problem Solving', Jon W. Bayless.

ELECTRONIC INSTRUMENTATION

Subject Code: BECE1-304 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about different types of measuring, waveform generation, and analysis of electronic instruments.
2. Exposure to various analog measuring instruments.
3. To provide detailed knowledge about different bridges.
4. To understand CRO and its operation.

Course Outcomes:

After undergoing this course student will be able to:

1. Analyze operation of different instruments and able to describe different terminology related to measurements.
2. Recognize and understand various analog measuring instruments.
3. Measure resistance using various methods.
4. Find various measurements using CRO.

Unit–I (12 Hrs.)

Units, Dimensions and Standards: SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

General Theory of Analog Instruments: Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/ weight ratio, pointers and scales.

Unit–II (12 Hrs.)

Analog Measuring Instruments: Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/ applications.

Unit – III (12 Hrs.)

Measurement of Resistances: Low, Medium & High Resistance their measurement.

Bridges: Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

Unit-IV (12 Hrs.)

Cathodes Ray Oscilloscopes: Principles and working of CRO, CRO probes, Measurement of voltage, frequency and phase angle with CRO.

Recommended Books:

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai & Publishers.
2. J.B. Gupta, 'A Course in Electrical and Electronics Measurement & Instrumentation', S.K. Kataria & Sons.
3. W.D. Cooper1, 'Electronic Instrumentation and Measurement Techniques', Prentice Hall.

SIGNAL AND SYSTEMS

Subject Code: BECE1-305 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To make the students aware about the signal transmission through linear networks
3. Tobe able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
4. To impart them knowledge of various types of noises.

Course Outcomes:

1. Ability to analyse various types of signals in communication system.
2. Developing skills to understand random signals.
3. To understand various types of noises.
4. Understand signal transmission through linear networks.

Unit-I (12 Hrs.)

Systems and Signal Analysis: Detailed Classification of Signals and Systems, Fourier Series and its properties, Fourier transform and its properties along with applications, Discrete Time Fourier Series (DTFS) and Discrete Time Fourier Transform (DTFT).

Correlation and Spectral Density: Definition of Correlation and Spectral Density, Analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

Unit-II (12 Hrs.)

Random Signal Theory: Introduction to Probability Theory, Definition of Probability of Random Events. Joint and Conditional Probability, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Examples of PDF, Transformation of Random Variables. Random Processes, Stationary and Ergodicity.

Unit-III (12 Hrs.)

Introduction to Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure. Experimental determination of Noise Figure, Pulse Response and Digital Noise and its elimination.

Unit-IV (12 Hrs.)

Signal Transmission Through Linear Networks: Convolution Theorem and its graphical interpretation. The Sampling Theorem, Low Pass and Band Pass Networks, Matched Filter, Enveloped detector.

Recommended Books:

1. B.P. Lathi, 'Digital and Analog Communication Systems', Oxford University Press.
2. Ravi Kumar, 'Signals and Systems', PHI Learning.
3. Simon Haykin, 'Signals and Systems', John Wiley.
4. George R. Cooper, 'Probabilistic Methods of Signals and System Analysis', Oxford University Press.

ELECTRONIC DEVICES AND CIRCUITS LAB. - I

Subject Code: BECE1-306 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. Able to understand and identification of various electronic components.
2. To understand and plot characteristics of various semiconductor devices.
3. To understand the applications of Transistors as amplifier in various configurations.

Course Outcomes:

1. An ability to understand all types of electronics devices and circuits
2. An ability to conduct experiments, as well as to analyze and interpret various data sheets.

EXPERIMENTS

1. To perform & analyze the use of Zener diode as voltage regulator.
2. To observe the characteristics and behavior of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To observe the characteristics of a Class- A amplifier.
5. To observe the characteristics of Class- B amplifier.
6. To observe the characteristics of Class- B push-pull amplifier.
7. To observe the characteristics of complementary symmetry amplifier.
8. To plot a load line for a CE amplifier and show effect of input signal on Q-point.
9. To Observe use of a BJT in a CE amplifier circuit configuration and study its frequency response.
10. To demonstrate use of a BJT in a CC amplifier circuit configuration and study its frequency response.
11. To perform an experiment to observe the working of BJT as an amplifier.

Note: At least 08 experiments are required to be performed.

OBJECT ORIENTED PROGRAMMING LAB.

Subject Code: BECE1-307 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To provide the basic knowledge about control statements, looping statements, various I/O statements and various data structures.
2. To describe how to create classes in C++ for understanding of basic OOPS features.
3. To discuss various concepts of data hiding, function overloading and operator overloading.

Course Outcomes:

1. Enable students to develop their skills in programming with C++.
2. To describe functions of creating constructors, destructor, inheritance, polymorphism and file handling programs
3. Formulate problems as steps so as to be solved systematically.
4. Integrate robustness, reusability, and portability into large-scale software development.

EXPERIMENTS

1. [Classes and Objects] Write a program that uses a class where the member functions are defined inside a class.
2. [Classes and Objects] Write a program that uses a class where the member functions are defined outside a class.
3. [Classes and Objects] Write a program to demonstrate the use of static data members.
4. [Classes and Objects] Write a program to demonstrate the use of const data members.
5. [Constructors and Destructors] Write a program to demonstrate the use of zero argument and parameterized constructors.
6. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
7. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
8. [Initializer Lists] Write a program to demonstrate the use of initializer list.
9. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
10. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
12. [Typecasting] Write a program to demonstrate the typecasting of basic type to class type.
13. [Typecasting] Write a program to demonstrate the typecasting of class type to basic type.
14. [Typecasting] Write a program to demonstrate the typecasting of class type to class type.
15. [Inheritance] Write a program to demonstrate the multilevel inheritance.
16. [Inheritance] Write a program to demonstrate the multiple inheritances.
17. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
18. [Polymorphism] Write a program to demonstrate the runtime polymorphism.
19. [Exception Handling] Write a program to demonstrate the exception handling.
20. [Templates and Generic Programming] Write a program to demonstrate the use of function template.

21. [Templates and Generic Programming] Write a program to demonstrate the use of class template
22. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
23. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.

Note: At least 15 experiments are required to be performed.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C**
0 0 2 1

Course Objectives
The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes
At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

ELECTRONIC DEVICES AND CIRCUITS - II

Subject Code: BECE1-409 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To aware the students about Basic Electronic Circuits.
2. To update the Knowledge about small signal & large signal amplifier.
3. To analyze various types of circuits to generate signals.
4. Selection and specification of electronic components for industrial applications.
5. To understand working of switching circuits.

Course Outcomes:

1. After the completion of the course, the students could have learnt about the basic Electronic Circuits, their operational characteristics and their applications.
2. To generate ability to understand various amplifiers including push pull and complementary symmetry.
3. Design different types of feedback amplifiers and oscillator circuits.
4. To understand and analyze a stable multivibrators.

Unit-I (12 Hrs.)

Single Stage Amplifiers: Classification of Amplifiers - Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Multistage Amplifiers: Frequency response – Single stage amplifiers, multistage amplifiers. Couplings – Various coupling methods for multistage amplifiers.

Unit-II (12 Hrs.)

Transformer coupled audio amplifier: construction, working, efficiency & distortion analysis: Classifications: class-A, Class-B, class-AB and Class-C amplifiers, efficiency.

Push-Pull Amplifiers – operation of Class-B push-pull amplifier, crossover distortion, transistor phase inverter, complementary symmetry amplifier.

UNIT-III (12 Hrs.)

Feedback Amplifiers – Feedback concept, advantages and disadvantages of negative and positive feedback. Analysis of R_i, R_o, A_i, A_v with and without feedback

Oscillators: Classification of Oscillators, frequency and frequency stability of oscillatory circuits, Hartley Oscillator, Colpitts Oscillators, Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator.

Unit-IV (12 Hrs.)

A Stable Multivibrators: A stable Collector coupled and emitter coupled multivibrator, complementary Transistor A stable multivibrator.

Switching Characteristics of Devices: Diode and transistor as electronic switch.

Recommended Books:

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', Pearson Education.

4. Sedra, S. Adel and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

ANALOG COMMUNICATION SYSTEMS

Subject Code: BECE1-410 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. To understand various wave propagation concepts.
2. To provide the students about the concepts of analog modulation techniques
3. To provide the detailed knowledge about AM transmission and AM reception
4. To impart the knowledge about FM transmission and FM reception.

Course Outcomes:
1. An ability to learn analog communication system and modulation techniques
2. An ability to understand design of useful circuits required in analog communication system.
3. An ability to explore working of transmitter and receiver circuits used in communication.
4. To analyze the performance of AM/FM transmission and reception.

Unit-I (12 Hrs.)

Analog Modulation Techniques: Introduction, Theory of Amplitude Modulation: AM Power Calculations, AM Modulation with a Complex wave, Theory of Frequency Modulation (FM): Spectra of FM Signals, Narrow Band and Wide Band FM, Theory of Phase Modulation, Comparison of AM and FM, Comparison of PM and FM, Concepts of VSB/ISB/SSB, Pre-emphasis and De-emphasis.

SSB Transmission/SSB Reception: Advantages of SSB transmission, Generation of SSB: Independent Side-Band Systems (ISB), Vestigial Side-Band Modulation (VSB). SSB Product Demodulator, Balanced Modulator as SSB Demodulator, ISB/Suppressed Carrier receiver, Applications of FM with Band ranges.

Unit-II (12 Hrs.)

AM Transmission/AM Reception: Introduction, Generation of Amplitude Modulation, Basic Principles of AM Generation: Square law Diode Modulation, Suppressed Carrier AM Generation, Ring Modulator, Balanced Modulator. Tuned Radio Frequency (TRF) Receiver, Basic Elements of AM Super-heterodyne receiver: RF Amplifiers Characteristics-Sensitivity, Selectivity, Image Frequency Rejection, Mixers, Tracking and Alignment, Local Oscillator, IF Amplifier, AM Detectors: Envelope or Diode Detector, AGC, AM Receiver using Transistors Communication Receiver, Applications of AM with different Band ranges

Unit-III (12 Hrs.)

FM Transmission/FM Reception: Generation of FM by Direct Methods. Indirect Generation of FM: The Armstrong Method, FM Stereo Transmission.FM Receiver Direct Methods of Frequency Demodulation: Slope Detector, Travis Detector Foster Seeley or Phase Discriminator, Indirect methods of FM Demodulation: FM Detector using PLL and Stereo FM Multiplex Reception.

Unit-IV (12 Hrs.)

Wave Propagation: Free space equation, Reflection from earth's surface, Surface and Space wave propagation, Range of space wave propagation, Effective earth's radius, Duct propagation, Troposphere propagation. Structure of ionosphere, propagation of radio waves

through ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field.

Recommended Books:

1. George Kennedy, 'Electronic Communication System', McGraw Hill.
2. Gary M. Miller and Jeffery S. Beasley, 'Modern Electronic Communications', PHI.
3. Simon Haykin, 'Communication Systems', \Wiley.
4. Wayne Tomasi, 'Electronics Communication systems', Pearson Publishers.
5. Proakis, 'Communication Systems', McGraw Hill.

DIGITAL ELECTRONICS

Subject Code: BECE1- 411 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about basics of digital electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Course Outcomes:

1. Students will simplify a digital design problem as part of the systematic approach to solve a problem.
2. To analyze and understand various sequential circuits & various Digital Logic families.
3. To design Analog to Digital and Digital to Analog converters and finite state machines.

Unit-I (12 Hrs.)

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

Unit-II (12 Hrs.)

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

Unit-III (12 Hrs.)

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

Unit-IV (12 Hrs.)

A/D and D/A Converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs. **Finite State Machines**: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

Recommended Book:

1. R.P. Jain, 'Modern Digital Electronics', Tata McGraw Hill.
2. Malvino & Leach, 'Digital Principles and Applications', McGraw Hill.
3. Taub & Schilling, 'Digital Integrated Electronics', Tata McGraw Hill.

ELECTROMAGNETIC FIELD THEORY

Subject Code: BECE1-412 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
2. Study of physical concept and all the important fundamental parameters of transmission lines and waveguides.

Course Outcomes:

1. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
2. An ability to understand the concepts of magnetic field and magnetic field intensity.
3. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
4. To understand transmission lines and smith chart.

Unit-I (12 Hrs.)

Introduction: Fundamental of vector algebra, Scalar & vector fields, Introduction and transformation on different coordinate systems: (rectangular, cylindrical and spherical co-ordinate system). Introduction to line, surface and volume integrals, definition of gradient, divergent and curl of a vector and their physical significance.

Unit-II (12 Hrs.)

Electrostatics: Principal of Coulomb's law, definition of electric field intensity from point charges, field due to continuous distribution of charges on an infinite and finite line, Electric Field due to an infinite uniformly charged sheet. Gauss law and its applications, Electric flux density, potential fields due to electric dipole, Laplace and Poison equations.

Magneto statics: Definition and explanation on Magnetic Field intensity due to a finite and infinite wire carrying current. Magnetic field intensity on rectangular loop carrying current, Amperes Circuital law and its applications, Biot-savart law, the Lorentz force equation for a moving charge, Magnetic Vector Potential.

Unit-III (12 Hrs.)

Time Varying EM Fields: Maxwell's equation in differential and integral vector form and their interpretations, continuity of currents, conduction and displacement current, boundary conditions, Helmholtz equations, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for

normal incidence and surface impedance. Energy Flow and Poynting theorem, interpretation of E×H, Simple application, complex pointing vector.

Unit-IV (12 Hrs.)

Transmission Lines: Transmission line model, parameters and properties of transmission line equations, reflections in transmission lines: voltage, current and impedance relations-open, short circuit and matched lines, Standing wave ratio: impedance matching, quarter and half wave lines, single stub and double stub matching: circle diagram –Smith chart.

Recommended Books:

1. Matthew N.O. Sadiku, 'Elements of Engineering Electromagnetics', Oxford University Press.
2. William Hayt, 'Engineering Electromagnetics', Tata McGraw-Hill.
3. N. Narayana Rao, ‘'Elements of Engineering Electromagnetics', Pearson Education.
4. R.F. Jordan, 'Electromagnetic Waves & Radio System', Prentice Hall India.
5. Bhag Singh Guru and Hüseyin R. Hiziroglu, 'Electromagnetic Field Theory Fundamentals, Cambridge University Press.

NEURAL NETWORKS AND FUZZY LOGIC

Subject Code: BECE1-456 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

The students should be made to:

1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn about the concepts of Fuzzification and De-Fuzzification.
4. Describe various optimization techniques.

Course Outcomes:

Students will be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic and Fuzzy rules.
4. Learn and understand various optimization techniques.

UNIT-I (12 Hrs.)

Neural Networks: History, Overview of Biological Neuro-System, Terminology of Artificial Neural Network, Comparison of BNN and ANN, Mathematical Models of Neuron, ANN Architecture, Topology, Fundamental Learning Laws, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning.

UNIT-II (12Hrs)

Perceptron Architecture: Single layer perceptron, Perceptron Learning Rules, Multi-layer perceptron, Back Propagation Algorithm, Associative Memories, Hopfield Networks, Competitive Learning, Self-organizing Maps, ART Networks, Applications of Artificial Neural Networks.

UNIT-III (12 Hrs.)

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Linguistic Variables, Membership Function, Fuzzification, De-Fuzzification to Crisp Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation

Operations, Fuzzy rule generation (IF-THEN), Applications of Fuzzy Logic.

UNIT-IV (12 Hrs.)

Neuro-Fuzzy System: Introduction and Architecture of Neuro-Fuzzy Networks.

Introduction to different Optimization Techniques: Genetic Algorithm, Particle Swarm Optimization, Biogeography Based Optimization, Bacterial Forging Optimization, Detailed study of Genetic Algorithm, GA in problem solving, Implementation of GA.

Recommended Books:

1. N. Yegnanarayana, 'Artificial Neural Network', PHI.
2. LaureneFausett, 'Fundamental of Neural Networks', Pearson.
3. Simon Haykin, 'Neural Networks', Pearson.
4. S. Rajasekaran and GA Vijayalakshmi, 'Neural Networks, Fuzzy Logic and Genetic Algorithms', PHI.
5. Timothy J. Ross, 'Fuzzy Logic with Engineering', John Wiley.
6. S.N. Sivanandam, 'Introduction to Fuzzy Logic using MATLAB', Springer.
7. Ahmad M. Ibrahim, 'Introduction to Applied Fuzzy Electronics', PHI.

DATA STRUCTURES AND ALGORITHMS

Subject Code: BECE1-457 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand basic data structures and algorithms.
2. To use object oriented programming to implement data structures.
3. To introduce linear, non-linear data structures and their applications.
4. To understand the different methods of organizing large amount of data.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Select basic data structures and algorithms for autonomous realization of simple programs or program parts.
2. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.
3. Demonstrate advantages and disadvantages of specific algorithms and data structures.
4. To evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

Unit-I (12 Hrs.)

Introduction: Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

Development of Algorithms: Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.

Unit-II (12 Hrs.)

Linked Lists: Singly linked lists, linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction.

Trees: Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees(AVL), B-trees, B+ -trees.

Unit-III (12 Hrs.)

Graphs: Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and biconnected components, graph matching.

Unit-IV (12 Hrs.)

Sorting and Searching Techniques: Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Recommended Books:

1. J.P. Tremblay and P.G. Sorenson, 'An Introduction to Data Structures with Applications', Tata McGraw Hill.
2. S. Sahni, 'Data Structures, Algorithms ad Applications in C++', WCB/McGraw Hill.
3. Aho, Ullman and Hopcroft, ' Data Structures and Algorithms', Addison-Wesley.
4. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, 'Data Structures using C', Pearson Education.
5. Richard F. Gilberg, Behrouz A. Forouzan, 'Data Structures – A Pseudocode Approach with C', Thomson Brooks / COLE.

RADAR AND SONAR ENGINEERING

Subject Code: BECE1-458 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand theoretical principals underlying RADAR.
2. To understand the modern navigation system and general propagation phenomena.
3. Learn the fundamentals of physical acoustics and SONAR.

Course Outcomes:

1. Develop basic understanding of various types of RADARs and its applications.
2. Develop the ability to understand and design basic RADAR and SONAR systems.
3. Use of physical acoustics, electromagnetic, wireless communication and mathematics to understand fundamentals of RADAR and SONAR.

Unit-I (12 Hrs.)

Introduction to Radar: Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

Radar Equation: Simple form of Radar Equation, Prediction of Range performance, Minimum Detectable signal, Receiver noise, Signal to Noise ratio, Transmitter Power, Pulse repetition frequency &range ambiguities, System losses, Propagation effects.

Unit-II (12 Hrs.)

Continuous Wave (CW) &Frequency Modulated Radar: The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

MTI & Pulse Doppler RADAR: Introduction, Delay Line Cancellers, Multiple or staggered, Pulse repetition frequencies, Range-Gated Doppler Filters, Digital Signal Processing, Other

MTI delay line, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler Radar, MTI from a moving platform.

Tracking RADAR: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range.

Unit-III (12 Hrs.)

Types of SONAR Systems: active and passive, sonar equations, propagation characteristics of the medium, transmission loss and spreading effects, beam forming and steering, detection threshold, square law detector, cross-correlation detector.

Unit-IV (12 Hrs.)

Modern SONAR systems: signal and noise models, temporal sampling and quantization-spatial sampling and beam forming, band shifting, filtering and smoothing, decision processing, block diagram of active and passive sonars.

Correlation Receivers and Matched Filters: Advanced Sonar Signal Processing functions, adaptive beam forming, synthetic aperture arrays, automated decision-making.

Recommended Books:

1. Byron's Edde, 'Radar Principles technologies', Pearson.
2. Merrill I. Skolnik, 'Introduction to Radar Systems', Tata McGraw Hill.
3. K.K. Sharma, 'Fundamentals of Radar and Sonar Engineering', S.K. Kataria & Sons.

WEB TECHNOLOGIES

Subject Code: BECE1-459 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To learn the concepts of www including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user friendly web pages.
3. To define the Cascading Style Sheets(CSS) with its types and use them to provide the styles to the web pages at various levels.
4. To use the JavaScript to develop the dynamic web pages.

Course Outcomes:

After completion of the course students will be able to:

1. Describe the concepts of WWW including browser and HTTP protocol.
2. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
3. Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.
4. Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Unit-I (12 Hrs.)

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

Unit-II (12 Hrs.)

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

Unit-III (12 Hrs.)

Style Sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

Unit-IV(12Hrs.)

JavaScript: Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web.

Recommended Books:

1. Ralph Moseley and M.T. Savaliya, 'Developing Web Applications', Wiley-India.
2. Joel Sklar, 'Web Design', Cengage Learning.
3. Harwani, 'Developing Web Applications in PHP and AJAX', McGraw Hill.
4. P.J. Deitel & H.M. Deitel, 'Internet and World Wide Web How to program', Pearson.

ELECTRONICS DEVICES AND CIRCUITS LAB - II

Subject Code: BECE1-413 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To understand the characteristics of various semiconductor devices
2. To understand various sources of oscillations
3. Able to understand, identification and selection of various amplifiers.
4. To make the students aware about the various multivibrator circuits.

Course Outcomes:

1. An ability to understand different types of electronics devices and circuits
2. An ability to design and conduct experiments, as well as to analyse and interpret output.

EXPERIMENTS

1. To study frequency response of a tuned amplifier.
2. To demonstrate and study a two stage RC coupled amplifier.
3. To demonstrate and study a Transformer coupled amplifier.
4. To observe the response of RC phase shift oscillator and determine frequency of oscillation.
5. To observe the response of Hartley oscillator and determine frequency of oscillation.
6. To observe the response of Colpitt's oscillator and determine frequency of oscillation.
7. To observe the response of Wien Bridge oscillator and determine frequency of oscillation
8. To demonstrate working of a JFET and study its V-I characteristics.
9. To experimentally study working of JFET as an amplifier.
10. To understand and plot working of Astable Multivibrator.
11. To understand and plot working of Monostable Multivibrator.

Note: At least 08 experiments are required to be performed.

ANALOG COMMUNICAION SYSTEM LAB

Subject Code: BECE1-414 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To familiarize with modulation & demodulation techniques and study their waveforms on oscilloscope.
2. To impart working knowledge of Voltage Controlled Oscillator.
3. To familiarize students with the functions of oscillators, filters, amplifiers, LC networks, modulators, limiters, mixers, and detectors in AM, FM, PM, SSB, and PLL circuits.

Course Outcomes:

1. An ability to perform transmission of signals from transmitter to receiver using various analog
   modulation and demodulation techniques.
2. Study of transmission and reception process.

EXPERIMENTS

1. To study Amplitude Modulation using a transistor and determine depth of modulation.
2. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
3. Frequency Modulation using Voltage Controlled Oscillator.
4. Generation of DSB-SC signal using Balanced Modulator.
5. Generation of Single Side Band (SSB) signal.
6. Study of Phase Lock Loop (PLL) and detection of FM Signal using PLL.
7. Measurement of Noise Figure using a noise generator.
8. Study functioning of Super heterodyne AM Receiver.
9. Familiarization of PLL, measurement of lock/captures range, frequency demodulation, and frequency multiplier using PLL.
10. Measurement of Sensitivity, Selectivity and Fidelity of radio receivers.

Note: At least 08 experiments are required to be performed.

DIGITAL ELECTRONICS LAB

Subject Code: BECE1-415 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To give students a practical knowledge about all types of digital circuits.
2. To give students a working knowledge to connect digital circuits and verify their truth tables.
3. To give students a knowledge about integrated circuits of different combinational and sequential circuits.

Course Outcomes:

1. An ability to test and verify working and truth tables of combinational and sequential circuits.
2. Working knowledge of different converters.
3. To perform multiplexer and demultiplexer.

EXPERIMENTS

1. To Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and their Realization of OR, AND, NOT and XOR functions using universal gates.
2. To Realize of Half Adder using Logic gates.
3. To Realize of Full Adder using Logic gates.
4. To Realize of Half Subtractor using Logic gates
5. To Realize of Full Subtractor using Logic gates
6. To Design 4-Bit Binary-to-Gray Code Converter.
7. To Design 4-Bit Gray-to-Binary Code Converter.
8. To study and design 4-Bit magnitude comparator using logic gates.
9. To study and design multiplexer Truth-table and their verification.
10. Realization of Half adder and Full adder using MUX.
11. To study and design Demultiplexer Truth table and their verification
12. Realization of Half subtractor and Full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers, viz. SIPO, SISO, PIPO, PISO.

Note: At least ten experiments are required to be performed.

SOFT SKILLS-II

Subject Code: **BHUM0-F92** **L T P C**
0 0 2 1

Course Objectives

The course aims to address various challenges of communication as well as behavioural skills faced by individual at work place and organisations. Also, it aims to enhance the employability of the students.

Course Outcomes

At the end of the course the student will be able to understand the importance of goal setting. They will also be able to handle stress in their lives and future in a better way.

UNIT-1

DEVELOPING POSITIVE ATTITUDE- Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.
IMPROVING PERCEPTION- Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

CAREER PLANNING-Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

ART OF READING-Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

STRESS MANAGEMENT - Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

LINEAR INTEGRATED CIRCUITS

Subject Code: BECE1-516 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the basic building blocks of linear integrated circuits.
2. To learn the linear and non-linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To learn the theory of ADC and DAC.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes:

Upon Completion of the course, the students will be able to:

1. Design linear and nonlinear applications of op – amps.
2. Design applications using analog multiplier and PLL.
3. Design ADC and DAC using op – amps.
4. Generate waveforms using op – amp circuits.
5. Analyse special function ICs.

Unit–I (10 Hrs.)

Introduction to Op–Amp: Operational Amplifier, Block diagram, analysis and its schematic symbol, interpretation of IC 741 datasheet and characteristics, practical op–amp, all important electrical parameters and their values, Op-amp applications in open loop configuration.

Concept of Feedback, Op–Amp with Negative Feedback: Introduction and Block diagram representation of feedback configurations, Voltage Series feedback amplifier, Voltage Shunt feedback and derivation of important electrical parameters.

Unit-II (14 Hrs.)

Introduction to Operational Amplifiers and Characteristics: Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations.

The Practical op-amp: Introduction, input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, transient response, interpretation of TL082 datasheet.

Unit-III (14 Hrs.)

Amplifiers and Oscillators: Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, isolation amplifiers, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO.

Active Filters: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, notch filter: all pass filters, self-tuned filters.

Unit-IV (10 Hrs.)

Advanced applications: Applications as Frequency Divider, PLL, AGC, AVC using op-AMP and analog multipliers, Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, ADC TL0820 & DAC- 7821.

Recommended Books:

1. Ramakant A. Gayakward, 'Op–Amps & Linear Integrated Circuits', Pearson Education.
2. William D. Stanley, 'Operational Amplifiers with Linear Integrated Circuits', Merrill Publishing Company.
3. Millman & Grabal, 'Micro Electronics', Tata McGraw Hill.

MICROPROCESSOR AND INTERFACING

Subject Code: BECE1-517 **L T P C** **3 1 0 4** **Duration: 48 Hrs.**

Course Objectives:

1. To understand the basic architecture of 8 and 16-bit microprocessor.
2. To understand interfacing of microprocessor with memory and peripheral chips involving system design.
3. To understand the techniques for faster execution of instructions and improve the performance of microprocessor.
4. To understand the concepts of multi core processor.

Course Outcomes:

1. The students will able to write program to run on 8085 microprocessor based systems.
2. Design system using memory chips and peripheral chips.
3. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.

UNIT-I (10 Hrs.)

Introduction: Introduction to microprocessor, Intel 8085 microprocessor architecture and pin diagram, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Bus timings, T state, machine cycle, timing diagram, Memories- RAM, DDR/SDR, ROM, EROM, EPROM, EEPROM, Flash Memory, Cache Memory.

UNIT-II (14 Hrs.)

Programming with 8085: Addressing modes, Detail study of 8085 instruction set. I/O and Memory mapping, Interfacing I/O Devices, Interrupts, stack and subroutines, Counter and Time

Delays, Code conversion, BCD Arithmetic and 16-bit data operations, Programming techniques with additional instructions, Program Debugging.

UNIT-III (14 Hrs.)

Interfacing with 8085: Architecture, interfacing and programming of 8155/8156 (programmable I/O port timer), 8251(universal synchronous, asynchronous receiver transmitter), 8253/ 8254 (programmable interval timer), 8255 (programmable peripheral interface), 8279 (keyboard display controller), and 8257 (direct memory access controller).

UNIT IV (10 Hrs.)

Other Microprocessor and interfacing: 8086 -Block diagram, Architecture, pipelining, flag register, register bank operation, memory segmentation, addressing modes. Introduction to 80186, 80286, 80386, 80486 and Pentium and their comparison, Comparative study of 8-bit microprocessors: Intel 8085, Motorola 6800, Zilog Z-80.

Recommended Books:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications with the 8085' Penram International Pub.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware', McGraw Hill Co.
3. Barry B. Brey, 'The Intel Microprocessors, Architecture Programming and Interfacing, PHI Publications.
4. B. Ram, Dhanpat Ra, 'Fundamentals of Microprocessor and Microcontrollers'.

DIGITAL COMMUNICATION SYSTEMS

Subject Code: BECE1-518 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about basics of Communication system and various digital modulation and demodulation techniques.
2. To learn design of useful circuits required in communication system.
3. To provide knowledge about various transmitter and receiver circuits used in communication.
4. To provide students with tools for communication signal analysis.

Course Outcomes:

1. To understand the various blocks/stages in a digital communication system.
2. Analyze the performance of a baseband and pass band digital communication system.
3. Perform the time and frequency domain analysis of the signals in a digital communication system.
4. Analyze the performance of various multiplexing techniques.

Unit-I (10 Hrs.)

Introduction: Block Diagram of Digital Communication System, Advantages of Digital communication system over Analog communication systems, Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Bandpass Signal, Aliasing Problem, Uniform and Non-uniform quantization. Signal to Quantization ratio of Quantized Signal.

Unit-II (12 Hrs.)

Baseband Transmission: Line Coding & its properties. Various types of PCM waveforms. Attributes of PCM waveforms, M-ary Pulse Modulation waveforms, Differential pulse code modulation, Multiplexing PCM signals, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, Adaptive DPCM, Comparison of PCM and DM.

Unit-III (10 Hrs.)

Baseband Detection: rror performance degradation in communication systems, E_b/N_O parameter, Matched filter and its derivation, Inter-Symbol Interference (ISI), Nyquist criterion for zero ISI & raised cosine spectrum, Correlation detector decision threshold and error probability for binary unipolar (on-off) signaling.

Unit-IV (16 Hrs.)

Band-pass Modulation and Demodulation: Types of digital modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques.

A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non-Coherent reception of ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Error probability for QPSK.

Multiplexing Techniques: Time division multiplexing, Frequency division multiplexing, code division multiplexing, Introduction to upcoming techniques of transmission.

Recommended Books:

1. Simon Haykin, 'Communication Systems', Wiley Publication.
2. Bernard Sklar, 'Digital Communication-Fundamentals and Applications', Pearson Education India.
3. Miller Gary M., 'Modern Electronic Communication', Prentice Hall.
4. John Proakis, 'Digital Communications', Tata McGraw Hill.
5. Wayne Tomsi, 'Electronic Communication Systems, Fundamentals Through Advanced', Pearson Education.

LINEAR INTEGRATED CIRCUITS LAB

Subject Code: BECE1-519 **L T P C** **Duration: 21 Hrs.**
0 0 2 1

Course Objectives:

1. To study the applications of op-amp as summing, scaling, averaging, instrumentation amplifiers, saw-tooth generator, zero-crossing detector and Schmitt trigger.
2. To study design of delay circuit using 555 timer and design a series regulator.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design oscillators and amplifiers using operational amplifiers.
2. Design filters using Op-amp and perform experiment on frequency response.
3. Analyze the working of voltage control oscillator.
4. Design DC power supply using ICs.

EXPERIMENTS

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. To study frequency response of an Op Amp
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Application of Op Amp as Log and Antilog amplifier. Design Low pass, High pass and Band pass 1st order butterworth active filters using Op Amp.
9. Design Phase shift oscillator using Op-Amp.
10. Design Wein Bridge oscillator using Op-Amp.
11. Application of Op Amp as Sawtooth wave generator.
12. Application of Op Amp as Zero Crossing detector and window detector.
13. Application of Op Amp as Schmitt Trigger.
14. Design a delay circuit using 555 timer.
15. Design of a function generator
16. Design of a Voltage Controlled Oscillator

Note: At least 12 experiments are required to be performed.

MICROPROCESSOR LAB.

Subject Code: BECE1-520 **L T P C** **Duration: 21 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. Introduce assembling language Programming concepts and features.
2. Write assembling language Programming for arithmetic and logical operations in 8085.
3. Differentiate Serial and Parallel Interface.
4. Interface different I/Os with Microprocessors.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write assembling language Programmes for fixed and Floating Point and Arithmetic
2. Interface different I/Os with processor.
3. Generate waveforms using Microprocessors.
4. Execute Programs in 8085.

EXPERIMENTS

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8086.

9. Write a program to find maximum and minimum from series using 8086.
10. Write a program to control the operation of stepper motor using 8085/8086 microprocessors and 8255 PPI.
11. Write a program to control speed of DC motor using 8085/8086 microprocessors and 8255 PPI.

Note: At least 08 experiments are required to be performed.

DIGITAL COMMUNICATION LAB

Subject Code: BECE1-521 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1.To know the principles of sampling & quantization.
2.To study the various waveform coding schemes.
3.To learn the various baseband transmission schemes.
4.To understand the various Band pass signaling schemes.
5.To know the fundamentals of channel coding.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Design PCM systems.
2. Design and implement base band transmission schemes.
3. Design and implement band pass signaling schemes.
4. Analyze the spectral characteristics of band pass signaling schemes and their noise performance.

EXPERIMENTS

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation: error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

Note: At least 08 experiments are required to be performed.

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C**
0 0 2 1

Course Objectives
The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organisations.

Course Outcomes
At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, John M., et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007**.

DATA COMMUNICATION NETWORKS

Subject Code: BECE1-560 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The students should be made to:

1. Understand the division of network functionalities into layers.
2. Be familiar with the components required to build different types of networks.
3. Be exposed to the required functionality at each layer.
4. Learn the flow control and congestion control algorithms.

Course Outcomes:

At the end of the course, the students should be able to:

1. Identify the components required to build different types of networks.
2. Choose the required functionality at each layer for given application.
3. Identify solution for each functionality at each layer.
4. Trace the flow of information from one node to another node in the network.

Unit-I (12 Hrs.)

Introduction to Data Communication: Goals and Applications of Networks, Wireless Network, Interfaces and services. Reference Models: The OSI reference model, TCP/IP reference model.

Physical Layer: Data and Signals, Digital and Analog transmission, Transmission Media, Wireless transmission, Switching.

Unit-II (14 Hrs.)

Data Link Layer: Data link layer design issues, Services provided to Network layers, Framing, Error control, Flow control, Error detection and correction, Elementary data link protocols, an unrestricted Simplex protocol, A Simplex Stop-and-Wait protocol, Simplex Protocol for a noisy channel, Sliding Window protocols, A protocol using go-back-N, A protocol using selective repeat, Example data link protocol-HDLC, PPP.

Unit-III (12 Hrs.)

Medium Access Sublayer: Channel Allocations, Random Access, ALOHA, Carrier Sense Multiple Access Protocols, Collision free Protocols, Limited contention protocols, Controlled Access, Channelization, Wired LANs: Ethernet, Wireless LANs.

Unit-IV (10 Hrs.)

Network Layer: Network Layer Design issue, Logical Addressing, Address Mapping, Error Reporting and Multicasting, Delivery Forwarding and Routing.

Transport Layer: Process to Process Delivery: UDP, TCP and SCTP.

Application Layer: Design issues of the layer, Domain Name systems, File Transfer, http, web documents, Virtual Terminals.

Recommended Books:

1. J. Frauzon, 'Computer Communication and Networks', Tata McGraw Hill.
2. W. Stallings, 'Data and Computer Communication', PHI.
3. S. Keshav, 'An Engineering Approach on Computer Networking', Addison Welsey.
4. Wayne Tomasi, 'Introduction to Data Communications and Networking', Pearson.
5. A.S. Tanenbaum, 'Computer Networks', PHI.

HUMAN RESOURCE MANAGEMENT

Subject Code: BECE1-561 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives: Understand and apply the policies and practices of the primary areas of human resource management, including staffing, training, Integration, management and compensation**.**

Course Outcomes:

1. Apply effective written and oral communication skills to business situations.
2. Analyze the global business environment.
3. Analyze the local business environment.
4. Use critical thinking skills in business situations.
5. Apply an ethical understanding and perspective to business situations.

Unit-I (12 Hrs.)

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement: Need for Human Resource Planning: Process of Human Resource Planning: Methods of Recruitment: Psychological tests and interviewing: Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970.

Unit-II (12 Hrs.)

Training & Development: Difference between training and Development: Principles of Training: Employee Development: Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job Analysis & Design: Job Analysis: Job Description & Job Description, Job Specification.

Job Satisfaction: Job satisfaction and its importance: Motivation, Factors affecting motivation, introduction to Motivation Theory: Workers ' Participation, Quality of work life.

The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961.

Unit-III (12 Hrs.)

Integration: Human Relations and Industrial Relations: Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry: Employee Employer Relationship Causes and Effects of Industrial disputes: Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective

Bargaining: Role of trade unions in maintaining cordial Industrial Relations.

Unit-I (12 Hrs.)

Maintenance: Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948: Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Recommended Books:

1. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
2. Lowin B. Flippo, 'Principles of Personnel Management', McGraw Hill.
3. R.C. Saxena, 'Labour Problems and Social Welfare', K. Math & Co.
4. A. Minappa and M.S. Saiyada, 'Personnel Management', Tata McGraw Hill.
5. C.B. Mamoria, 'Personnel Management', Himalaya Publishing House, Bombay.
6. T.N. Bhagotiwal, 'Economics of Labour and Industrial Relations', Sahitya Bhawan Agra.

DIGITAL SYSTEM DESIGN

Subject Code: BECE1-562 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
2. To introduce the concept of memories and programmable logic devices.
3. To illustrate the concept of synchronous and asynchronous sequential circuits.

Course Outcomes:

Students will be able to:

1. Design and implement Combinational circuits.
2. Design and implement synchronous and asynchronous sequential circuits.
3. Multi-input system controller design.
4. Write simple HDL codes for the circuits.

UNIT-I (12 Hrs.)

Introduction to Digital Design Concepts: Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals.

Clocked Sequential Finite State Machines: State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers.

UNIT-II (12 Hrs.)

Multi-input System Controllers Design: System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling, state assignment concepts, flip-flop level implementation using VEM's.

Sequential Design using LSI & MSI circuits: Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs).

UNIT-III (12 Hrs.)

Asynchronous Sequential Finite State Machines: Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design.

UNIT-IV (12 Hrs.)

VHDL: Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioural, dataflow and structural models.

Recommended Books:

1. William I. Fletcher, 'An Engineering Approach to Digital Design', PHI.
2. M. Morris Mano, 'Digital Design', Pearson Education.
3. Z. Navabi 'VHDL-Analysis and Modeling of Digital Systems', McGraw Hill.
4. Kevin Skahill, 'VHDL for Programmable Logic', Pearson Education.
5. Jr. Charles H. Roth, 'Fundamentals of Logic Design', Jaico Publishers.
6. John Wakerly, 'Digital Design, Principles and Practices', Pearson Education.

BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

Subject Code: BECE1-563 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
This course introduces general biological concepts:
1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Use bioinstrumentation, required in cellular or molecular biology investigations
2. Apply the concepts of engineering in different streams of biomedical field.
3. To explore and understand different biomedical instruments used in practice.
4. Understands different bio signals / potentials

UNIT-I (10 Hrs.)

Biomedical Signals: Origins of Bioelectric Signals, Human body, Heart and Circulatory System, Electrodes, Transducers, ECG, EMG.

UNIT-II (14 Hrs.)

Recording & Monitoring Instruments: Recording Electrodes, Physiological Transducers, Biomedical Recorders, Biomedical Recorders, Heart rate measurement, Temperature measurement, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Biomedical Telemetry.

UNIT-III (12 Hrs.)

Imaging System: Working with X-Rays, CT scanner, NMR, NMR, Ultrasonic System, Ultrasonic System, Ultrasonic System.

UNIT-IV (12 Hrs.)

Therapeutic & Physiotherapy Equipment's: Cardiac Pacemakers, Cardiac defibrillator, SW Diathermy & MW Diathermy.

Patient Safety: Electric Shock Hazards, Test Instruments, Biomedical Equipment's, Biomedical Equipment's.

Recommended Books:
1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation by', Tata McGraw Hill.
2. Leslie Cromwell, 'Biomedical Instrumentation and Measurements', PHI.
3. T.K. Attuwood, 'Introduction to bioinformatics', Pearson Education.
4. Joseph J. Carr & John M Brown, 'Introduction to Biomedical Equipment Technology', Pearson Education.

MICRO-ELECTRONICS

Subject Code: BECE1-564 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
This course introduces general biological concepts:
1. It helps students to understand importance of Microelectronics.

2. To understand IC fabrication, crystal growth, epitaxy, oxidation, photolithography and etching.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Review different IC's and its fabrication steps.
2. Understand need for crystal growth and epitaxial techniques.
3. Different silicon oxidation processes.
4. Steps behind photolithography and etching technique.

UNIT-I (12 Hrs.)

Introduction: Advantages of IC's, General classification of IC's (Linear/Digital IC's, Monolithic/ Hybrid IC's), Basic IC fabrication steps.

UNIT-II (12 Hrs.)

Crystal Growth and Epitaxy: Starting material for formation of crystal, Horizontal Bridgeman Method, Czochralski growth, Distribution of dopants, Zone refining, Silicon Float Zone process, Si-Wafer preparation, Epitaxial growth, Techniques used for epitaxial, growth (LPE, VPE, MBE).

UNIT-III (12 Hrs.)

Silicon Oxidation: Thermal oxidation process (Kinetics of growth, Thin oxide growth), Effect of impurities on the oxidation rate, Preoxidation Cleaning, Various oxidation techniques, Masking properties of SiO2.

Photolithography and Etching: Pattern generation/Mask making, Contact and Proximity printing, Photoresist, Photolithography Process (Lift off technology, Fine line photolithography), Wet/Dry etching, Reactive Plasma etching techniques and applications

UNIT-IV (12 Hrs.)

Diffusion and Ion Implantation: Basic diffusion process (Diffusion equation, Diffusion profiles), Extrinsic diffusion, Lateral Diffusion, Ion Implantation Process (Ion distribution, Ion Stopping), Implant Damage and Annealing process (Furnace and RTA).

IC Packaging: Isolation Techniques, Testing of the Chip, Wire Bonding techniques, Flip Chip technique, Various Packaging methods and Materials.

Fabrication of Monolithic Components: Fabrication of Diodes, Resistors, capacitors and inductors, Fabrication of BJT and FET, Fabrication of MOS Devices, CMOS fabrication techniques (n-well and p-well process sequences), Introduction to MEMS.

Recommended Books:

1. Gray S. May and Simon M. Sze, 'Fundamental of Semiconductor Fabrication', John Wiley & Sons.
2. Sze, 'VLSI Technology', McGraw Hill Publisher.
3. Jacob and Millman, 'Microelectronics', McGraw Hill Publisher.

MICROWAVE AND ANTENNA THEORY

Subject Code: BECE1-623 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To inculcate understanding of the basics required for circuit representation of RF networks.
2. To deal with the issues in waveguides and different modes.
3. To provide knowledge on the different antenna parameters and antenna types.

4. To explore designing of antenna arrays.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Explain the active & passive microwave devices & components used in Microwave communication systems.
2. Analyze the various Microwave tubes.
3. To understand various antenna parameters and different kinds of antennas.
4. To analyze different antenna arrays.

Unit-I (10 Hrs.)

Waveguides: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, characteristic impedance, introduction to circular waveguides and planar transmission lines.

Unit-II (14 Hrs.)

Microwave Components: Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators, mixers & detectors, matched Load, phase shifter, wave meter, Ferrite devices: Isolators, circulators.

Microwave Tubes: Limitation of conventional tubes: Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO, crossed field amplifiers.

Unit-III (14 Hrs.)

Antenna Parameters: Radiation pattern, Gain, Directive gain, Directivity, effective aperture, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle.

Broadband Antennas: Helical antennas, frequency independent antennas, Log - periodic antennas. Aperture antennas, smart antennas. Long Wire antenna, folded dipole antenna, Yagi-Uda antenna, Slot antenna, Micro Strip or Patch antennas, Antenna measurements.

Unit-IV (10 Hrs.)

Antenna Arrays: Various forms of antenna arrays, arrays of point sources, non-isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing, Dolph-Tchebysceff arrays, continuous arrays, rectangular arrays.

Recommended Books:

1. Samuel Liao, 'Microwave Devices and Circuits', PHI.
2. M. Kulkarni, Umesh, 'Microwave Devices & Radar Engg.'.
3. A.K. Maini, 'Microwaves and Radar', Khanna Publishers.
4. Balanis A. Constantine, 'Antenna Theory, Analysis and Design', Wiley, New York.

MICROCONTROLLER AND EMBEDDED SYSTEM

Subject Code: BECE1-624 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

The students should be made to:

1. Study the Architecture of 8051 microcontrollers.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.

Course Outcomes:

At the end of the course, the students should be able to:

1. Design and implement 8051 microcontroller based systems.
2. Serial communication 0f 8051.
3. Interfacing with 8051.

Unit-I (12 Hrs.)

Introduction: 8051 microcontroller, comparison of microcontroller and microprocessors, Embedded Systems, 8051 Microcontroller: Architecture and Pin Diagram, Program Counter and RAM Spaces, Data types and Directives, Flag Bits and PSW Register, Register Banks and Stack, interrupt.

Unit-II (12 Hrs.)

Programming: Basic assembly language programming concepts Addressing Modes, Arithmetic, Logical instructions and Programming, I/O Port Programming, BCD and ASCII application programs, Single-bit instruction programming, Timers and Counter Programming, Jump and loop Instructions, Introduction of 8051 Programming in C.

Unit-III (12 Hrs.)

Serial communication of 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, serial communication programming, Programming of timer interrupts, Programming of External hardware interrupts, Interrupt priority.

Unit-IV (12 Hrs.)

Interfacing with 8051: LCD and Keyboard Interfacing, interfacing with external memory and 8051 data memory space, interfacing with 8255, Sensors Interfacing and Signal Conditioning, interfacing with Stepper Motor and Servo motors, DS12887 RTC Interfacing and its programming.

Recommended Books:

1. Mazidi Muhammad Ali, 'The 8051 Microcontroller and Embedded Systems', Pearson Publications.
2. Manish K Patel, 'The 8051 Microcontroller Based Embedded Systems', McGraw Hill Publications.
3. Scot MacKenzie, Raphael C.W Phan, 'The 8051 Microcontroller', Pearson Publications.
4. Kenneth J. Ayala, 'The 8051 Microcontroller', Thomson Publishers.

LINEAR CONTROL SYSTEM

Subject Code: BECE1-625 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the elements of control system and their modeling using various Techniques.
2. To introduce methods for analyzing the time response, the frequency response and the stability of systems
3. To introduce the state variable analysis method.
4. Design the compensation technique that can be used to stabilize control systems.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Perform time domain and frequency domain analysis of control systems required for stability analysis.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.

3. Express and solve system equations in state-variable form (state variable models).
4. Determine the (absolute) stability of a closed-loop control system
5. Apply root-locus technique to analyze and design control systems.

Unit-I (8 Hrs.)

Basic Concepts: Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems.

Unit-II (12 Hrs.)

Mathematical Models of Control System: Linear and non-linear systems, Transfer function, Mathematical modelling of electrical, mechanical and thermal systems, Analogies, Block diagrams and signal flow graphs.

Control Components: DC servomotor, AC servomotor, Potentiometers, Synchronous, Stepper-motor.

Unit-III (14 Hrs.)

Time and Frequency Domain Analysis: Transient and frequency response of first and second order systems, Correlation ship between time and frequency domain specifications, Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

Stability Analysis: Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

Unit-IV (14 Hrs.)

State Variable Analysis: Introduction, Concept of State, State variables & State models, State Space representation of linear continuous time systems. State models for linear continuous – time systems, State variables and linear discrete time systems, Solution of state equations, Concept of Controllability & Observability.

Recommended Books:

1. K. Ogata, 'Discrete time Control Systems', Prentice Hall International.
2. Nagrath and Gopal, 'Control System Engineering', New Age International.
3. Warwick, Kevin, 'An Introduction to Control Systems', World Scientific Publishing Co. Pvt. Ltd.
4. W.S. Levine, 'Control System Fundamentals', CRC Press.
5. Williams, Ivan J. Distefano, Joseph J. Stubberud, Allen R., 'Feedback and Control Systems', Schaum's Outlines.

MICROWAVE ENGINEERING LAB.

Subject Code: BECE1-626 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. Know about the behavior of microwave components.
2. Practice microwave measurement procedures.

Course Outcomes:

At the end of the course, the student should be able to:

1. Test& analyze various microwave components.
2. Analyze the radiation pattern of antenna.

EXPERIMENTS

1. Study of wave guide components.

2. To study the characteristics of reflex Klystron and determine its tuning range.
3. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space waves length and guide wavelength.
4. To measure VSWR of unknown load and determine its impedance using a smith chart.
5. To match impedance for maximum power transfer using slide screw tuner.
6. To measure VSWR, insertion losses and attenuation of a fixed and variable attenuator.
7. To measure coupling and directivity of direction couplers.
8. To measure insertion loss, isolation of a three port circulator.
9. To measure the Q of a resonant cavity.
10. To study the V-I characteristics of GUNN diode.
11. To study the radiation pattern of Horn Antenna.

Note: At least 08 experiments are required to be performed.

MICROCONTROLLER LAB.

Subject Code: BECE1-627 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
The student should be made to:
1. Introduce microcontroller concepts and features.
2. Introduce the practical concepts to control speed of DC and stepper motor.

Course Outcomes:
At the end of the course, the student should be able to:
1. Write programs for 8051 micro controller kit.
2. Understand programs for speed control of DC motor.
3. Understanding to control the speed of stepper motor.

EXPERIMENTS

1. Study of 8051 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
5. Write a program to show the use of INT0 and INT1.
6. Write a program of Flashing LED connected to port 1 of the Micro Controller
7. Write a program to generate a Ramp waveform using DAC with micro controller.
8. Write a program to interface the ADC.
9. Write a program to control a stepper motor in direction, speed and number of steps.
10. Write a program to control the speed of DC motor.
11. Interfacing of high power devices to Micro-controller port-lines, LED, relays and LCD display

Note: At least 08 experiments are required to be performed.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C**
0 0 2 1

Course Objectives

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organisation.

Course Outcomes

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

NANO SCIENCE AND NANO TECHNOLOGY

Subject Code: BECE1-665 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To create awareness about nanotechnology issues.
2. To impart knowledge about carbon age and nano tubes.
3. To create awareness about Quantum computing**.**
4. To study the various characterization techniques in nano-electronics

Course Outcomes:

Students shall be able to:

1. Understand the fundamentals and basics of nanotechnology.
2. Understand significance and potential opportunities to create better materials and products.
3. Describe different nano-scale devices.

UNIT I (12 Hrs.)

Basics and Scale of Nanotechnology: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress.

UNIT II (12 Hrs.)

The Carbon Age and Nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical vapor deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics: Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs.)

Nano-scale Devices: Introduction: Quantum Electron Devices: High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing: Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books:

1. C.P. Polle and F.J. Owens, 'Introduction to Nanotechnology' Willey India Pvt. Ltd.
2. Daniel Minoli, 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd.
3. Manasi Karkare, 'Nano Technology: Fundamentals and Applications', I.K. International Pvt. Ltd.
4. Lynn E. Foster, 'Nano Technology', Pearson India.

ADVANCED MICROPROCESSOR

Subject Code: BECE1-666 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

Microprocessors and Microcontrollers are widely used in modern society with applications ranging from automatic gadgets to medical applications. The purpose of this course is to:

1. Introduce students with the advanced technology in embedded systems.
2. The objective is to make students understand architecture and programming of embedded processors.
3. Students will able to interface various circuits with advanced processors.

Course Outcomes:

1. Students will have ability to deal with 16 bit microprocessors.
2. They will be familiar with latest microprocessor.
3. Students will have skills to interface any peripheral devices with different microprocessors.

Unit I (12 Hrs.)

Microprocessor 8086: Block diagram, Architecture & Pin diagram of 8086, pipelining process, flag register. Register details of 8086, operation, different addressing modes.

Unit II (12 Hrs.)

8086 Assembly Language Programming: 8086 flags, JUMP operations, STRING operations, CALL & RET operations, STACK operations, Instruction set of an 8086, 8086 hardware configuration, addressing memory & ports, 8086 Interrupts and interrupt responses, Interrupt system based on 8259 A**.**

Unit III (12 Hrs.)

Interfacing with 8086 Microprocessor: Concept of programmable devices, architecture and programming of programmable I/O port timer, programmable interval timer, programmable peripheral interface, its interfacing with 8086 microprocessor.

Unit IV (12 Hrs.)

Introduction to Advanced Microprocessors: Architectures of 80186-286-386-486, Pentium Processors, Dual core processors, Core to duo, I5 and I-7 Processors.

Recommended Books:

1. Douglas V. Hall, 'Microprocessor & Interfacing: Programming & Hardware', Tata McGraw Hill.
2. M.A. Mazidi, J.G. Mazidi, R.D. McKinlay, 'The 8051 Micro Controllers & Embedded Systems', Indian Reprint, Pearson Education.
3. Kenneth J, Ayala, '8051 Microcontroller: Architecture, Programming and Application', Delmar Learning.
4. Brey, 'Intel Micropocessors, The 8056/8055, 80186/80188, 8028, /80386, 80486, Pentium & Pentium Pro, Pentium II, III, IV: Architecture, Programming and Interfacing', PHI.
5. Myke Predko, 'Programming and Customizing the ARM7 Microcontroller', McGraw Hill.
6. John Morton, 'The PIC Microcontroller: Your Personal Introductory Course', Newnes an Imprint of Butterworth-Heinemann Ltd.

IMAGE AND SPEECH PROCESSING

Subject Code: BECE1-667 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The student should be made to:
1. Learn digital image fundamentals.
2. Be familiar with image compression and segmentation techniques.
3. To introduce speech production and related parameters of speech.
4. To show the computation and use of techniques used in image compression and enhancement.
5. To understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Discuss digital image and speech fundamentals.
2. Apply image enhancement and restoration techniques.
3. Model speech production system and describe the fundamentals of speech.
4. Extract and compare different speech parameters.

Unit-I (12 Hrs.)

Introduction to Image Processing: Historical background, visual perception, image formation, Elements of Storage, sampling & Quantization, Relationships between pixels-neighbors of pixel, connectivity labelling of connected components, Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging, application of image Processing.

Unit-II (12 Hrs.)

Image Enhancement: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo-morphic felling, generation of spatial marks, Colour image processing.

Unit-III (12 Hrs.)

Image Compression: Redundancy models, error free compression, Lossy compression, Image compression standards.

Image Segmentation: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation, use of motion in segmentation.

Unit-IV (12 Hrs.)

Speech Processing: Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis Speech Recognition-speech in the computer-human interface.

Recommended Books:
1. Rafact Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Society.
2. Keenneth R. Castleman, 'Digital Image Processing', Pearson Education Society.

3. A.K. Jain, 'Fundamental of Digital Image Processing', PHI.
4. Iain Murray, 'Speech and Audio Processing for multimedia PC's', Pearson Education Society.

OPTICAL FIBER COMMUNICATION

Subject Code: BECE1-668 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. To Facilitate the knowledge about optical fiber sources and transmission techniques.
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
3. To explore the trends of optical fiber measurement systems.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
2. Explain the various optical sources and optical detectors and their use in the optical communication system.
3. Analyze the digital transmission and its associated parameters on system performance

Unit-I (12 Hrs.)

Introduction to Optical Communication Systems: Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Optical Fibers: Optical fibers structures and their types, fiber characteristics: attenuation, scattering, absorption, fiber bend loss, dispersion, fiber couplers and connectors

Unit-II (12 Hrs.)

Led Light Source: Light emitting diode: recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

Unit-III (12 Hrs.)

Laser Light Source: Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

Unit-IV (12 Hrs.)

Avalanche and Pin Photodetectors: Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

Recommended Books:
1. John M Senior, 'Optical Fiber Communications', PHI.
2. Gerd Keiser, 'Optical Fiber Communications', TMH

OPERATION RESEARCH

Subject Code: BECE1-669 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. To Facilitate the knowledge about decision making systems.
2. To Enrich the idea of different models.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Identify and develop role of operations in decision making system.
2. Understand the deterministic models.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the waiting line model and project line.
5. Understanding to the decision-making processes.

Unit-I (12 Hrs.)

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on operation research model building –Types & methods.

Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, problems.

Unit-II (12 Hrs.)

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, stepping stone method, MODI methods, degeneracy, assignment, travelling salesman, problems.

Advanced Topic of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

Unit-III (12 Hrs.)

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources levelling in project, problems.

Unit-IV (12 Hrs.)

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.

Decision Theory: Decision process, SIMON model, types of decision making environment - certainty, risk, uncertainty, decision making with utilities, problems.

Recommended Books:
1. TAHA, 'Operation Research', PHI, New Delhi.
2. Ackoff, Churchaman, Arnoff, 'Principle of Operations Research', Oxford IBH, Delhi.
3. Vohra, 'Quantitative Techniques', TMH.
4. H.M. Wagher, 'Principles of operation Research (with Applications to Managerial Decisions), Prentice Hall of India.
5. Philips, Revindran, Solgeberg, 'Operation Research', Wiley ISE.

WIRELESS COMMUNICATION SYSTEMS

Subject Code: BECE1-728 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
The student should be made to:
1. Know the characteristic of wireless channel.
2. Learn the various cellular architectures.
3. Understand the concepts behind various digital signaling schemes for fading channels.
4. Be familiar the various multipath mitigation techniques.
5. Understand the various multiple antenna systems.

Course Outcomes:
At the end of the course, the student should be able to:
1. Characterize wireless channels.
2. Design and implement various signaling schemes for fading channels.
3. Compare multipath mitigation techniques and analyze their performance.
4. Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance.

Unit-I (12 Hrs.)

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit-II (12 Hrs.)

Introduction To Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit-III (12 Hrs.)

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signalling, ISDN (Integrated Services Digital Networks), advanced intelligent networks.

Unit-IV (12 Hrs.)

Intelligent Cell Concept and Application: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

Recommended Books:
1. Theodore S. Rappaport, 'Wireless Communications', Pearson.

2. W.C.Y. Lee, 'Mobile Cellular Telecommunication', McGraw Hill.
3. Jochen Schiller, 'Mobile Communications', Pearson.

DIGITAL SIGNAL PROCESSING

Subject Code: BECE1-729 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To learn discrete Fourier transform and its properties.
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals.
3. To understand Finite word length effects.
4. To study the concept of Multirate and adaptive filters.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Apply DFT for the analysis of digital signals & systems.
2. Design IIR and FIR filters.
3. Characterize finite Word length effect on filters.

Unit-I (12 Hrs.)

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Concept of Frequency in Continuous Time and Discrete Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Applications of Signal Processing.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time systems, Correlation of Discrete Time Signals.

Unit-II (12 Hrs.)

The Z-transform and Its Application to the Analysis of LTI Systems: The z-Transform, Properties of z-Transforms, Inversion of z-Transform, One-sided z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous –Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform for Discrete Time Signals. Frequency Domain Characteristics of Linear Time-Invariant Systems, Linear Time-Invariant Systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

Unit-III (12 Hrs.)

The Discrete Fourier Transform its Properties and Applications: Frequency Domain Sampling: The discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods based on the DFT. Frequency Analysis of Signals Using the DFT.

Efficient computation of DFT: Fast Fourier Transforms: Efficient Computation of DFT: FFT Algorithms, Application of FFT Algorithms, A Linear Filtering Approach to Computation of DFT. Quantization Effect in the Computation of DFT.

Unit-IV (12 Hrs.)

Implementation of discrete time systems: Structures for the realization of Discrete Time Systems, Structures for FIR Systems, Structures for IIR Systems, Representation of Numbers, Quantization of Filter Coefficients, Round off Effect in Digital Filters.

Design of Digital Filters: General Considerations like causality etc., Design of FIR Filters, Design of IIR Filters from Analog Filters, Frequency Transformations, Design of Digital Filters Based on Linear Squares Method.

Sampling and Reconstruction of Signals: Sampling of Bandpass Signals, Analog-to-Digital Conversion, Digital-to-Analog Conversion.

Recommended Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Applications', Pearson Prentice Hall.
2. S.K. Mitra, 'Digital Signal Processing: A Computer Based Approach', TMH.
3. A.V. Oppenheim, R.W. Schafer and J.R. Buck, 'Discrete-time Signal Processing', Prentice Hall.
4. B. Widrow and S.D. Stearns, 'Adaptive Signal Processing', Prentice Hall.

DIGITAL SIGNAL PROCESSING LAB

Subject Code: BECE1-730 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. To implement Linear and Circular Convolution.
2. To implement FIR and IIR filters.
3. To study the architecture of DSP processor.
4. To demonstrate Finite word length effect.

Course Outcomes:

Students will be able to:

1. Carry out simulation of DSP systems.
2. Demonstrate their abilities towards DSP processor based implementation of DSP systems.
3. Analyze Finite word length effect on DSP systems.
4. Demonstrate the applications of FFT to DSP.

EXERCISES

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. Write a program in MATLAB to generate standard sequences.
3. Write a program in MATLAB to compute power density spectrum of a sequence.
4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
5. Write a program in MATLAB to verify linear convolution.
6. Write a program in MATLAB to verify the circular convolution.
7. To develop program for finding magnitude and phase response of LTI system Described by system function H(z).
8. To develop program for finding response of the LTI system described by the difference equation.
9. To develop program for computing inverse Z-transform.
10. To develop program for computing DFT and IDFT.
11. To develop program for conversion of direct form realization to cascade form realization.
12. To develop program for cascade realization of IIR and FIR filters.

13. To develop program for designing FIR filter.
14. To develop program for designing IIR filter.
15. To write a MATLAB program for noise reduction using correlation and autocorrelation methods.
16. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response
    from the given transfer function of a discrete-time causal system.
17. Write a program in MATLAB to find frequency response of different types of analog filters.
18. Write a program in MATLAB to design FIR filter (LP/HP) through Window technique.
    a. Using rectangular window.
    b. Using triangular window.

Note: At least 12 experiments are required to be performed.

MINOR PROJECT

Subject Code: BECE1-730 **L T P C**
0 0 8 4

The students are required to undergo Minor Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

COGNITIVE RADIO

Subject Code: BECE1-770 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The student should be made to:
1. Know the basics of the software defined radios.
2. Learn the design of the wireless networks based on the cognitive radios.
3. Understand the concepts of wireless networks and next generation networks.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Describe the basics of the software defined radios.
2. Design the wireless networks based on the cognitive radios.
3. Explain the concepts behind the wireless networks and next generation networks.

Unit-I (12 Hrs.)

Spectrum Scarcity: history and background leading to cognitive radios, Software define radios (SDRs), basic architecture of SDR, power control in cognitive transceivers, Dynamic Spectrum Access, new opportunities, spectrum management.
Cognitive Radios: Scarcity problems, network protocols, standardization, security issues.

Unit-II (12 Hrs.)

Spectrum Sensing: ideal spectrum sensing, Spectrum sensing techniques: Transmission detection (Energy detection, cyclostationary detection, matched filter detection), feature based detection, interference detection, spectrum sensing in fading environment.

Unit-III (12Hrs)

Cooperative Sensing: Importance of cooperative sensing, advantages of spectrum sensing, need of co-operations, centralized cooperative sensing, distributed spectrum sensing. Fusion rules: hard fusion, soft fusion rules.

Unit-IV (12 Hrs.)

Spectrum Management: Spectrum handoff management, spectrum mobility, spectrum sensing in ad-hoc network, spectrum sharing.

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Recommended Books:

1. Bruce A. Fette, 'Cognitive Radio Technology', Elsevier Publication.
2. Ekram Hossain, Dusit Niyato, Zhu Han, 'Dynamic Spectrum Access and Management in Cognitive Radio Networks', Cambridge University Press.
3. Kwang-Cheng Chen, Ramjee Prasad, 'Cognitive Radio Networks', John Wiley & Sons Ltd.
4. Huseyin Arslan, 'Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems', Springer.
5. Linda Doyle, 'Essentials of Cognitive Radio', Cambridge University Press.

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Subject Code: BECE1-771 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the concept of database systems
2. To prepare the student to be in a position to use and design databases for different applications.

Course Outcomes:

1. Master the basic concepts and appreciate the applications of database systems.
2. Be familiar with a relational model.
3. Design principles for relational query language.

Unit-I (12 Hrs.)

Introduction to Database Systems: File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

Physical Data Organization:

File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

Unit-II (12 Hrs.)

Data Models: Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities,

Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

The Relational Model:

Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

Unit-III (12 Hrs.)

Relational Query Languages:

SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

Database Design:

Functional Dependencies, reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions.

Unit-IV (12 Hrs.)

Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, 2PL protocol.

Database Protection: Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital Signatures.

Recommended Books:

1. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', Pearson Education.
2. C.J. Date 'An Introduction to Database Systems', Pearson Education.
3. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press.
4. S. K. Singh, 'Database Systems Concepts, Design and Applications', Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', Tata McGraw Hill.
6. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, 'Database System Concepts', Tata McGraw Hill.

COMPUTER ARCHITECTURE AND ORGANIZATION

Subject Code: BECE1-772 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To expose the students to the concept of pipelining.
5. To familiarize the students with hierarchical memory system including cache memories and virtual memory.

6. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design arithmetic and logic unit.
2. Design and analysis of pipelined control units
3. Evaluate performance of memory systems.
4. Understand parallel processing architectures**.**

Unit-1 (12 Hrs.)

Basic Principles: Boolean algebra and Logic gates, Combinational logic blocks (Adders, Multiplexers, Encoders, de-coder), Sequential logic blocks (Latches, Flip-Flops, Registers, Counters)

General System Architecture: Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD): Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language: structured organization: CPU, caches, main memory, secondary memory units & I/O: Performance metrics: MIPS, MFLOPS.

Unit-II (12 Hrs.)

Instruction Set Architecture: Instruction set based classification of processors (RISC, CISC, and their comparison): addressing modes: register, immediate, direct, indirect, indexed: Operations in the instruction set: Arithmetic and Logical, Data Transfer, Control Flow: Instruction set formats (fixed, variable, hybrid): Language of the machine: 8086: simulation using MSAM.

Unit-III (12 Hrs.)

Basic non pipelined CPU Architecture: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage): microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining.

Memory Hierarchy & I/O Techniques: The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit): Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types): Cache memory (Associative & direct mapped cache organizations.

Unit-IV (12 Hrs.)

Introduction to Parallelism: Goals of parallelism (Exploitation of concurrency, throughput enhancement): Amdahl's law: Instruction level parallelism (pipelining, super scaling –basic features): Processor level parallelism (Multiprocessor systems overview).

Computer Organization [8086]: Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts: Memory Hierarchy.

Recommended Books:

1. David A. Patterson and John L. Hennessy, 'Computer Organization and Design', Morgan, Kauffmann, Elsevier Publisher.
2. John P. Hayes, 'Computer Architecture and Organization', TMH.

3. William Stallings, 'Operating Systems Internals and Design Principles', Prentice Hall Upper Saddle River, New Jersey.

SOFT COMPUTING

Subject Code: BECE1-773 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The students should be:
1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn genetic programming.

Course Outcomes:
Upon completion of the course, the student should be able to:
1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic.
4. Apply genetic programming.

Unit-I (12 Hrs.)

Neural Networks: Fundamentals of Neural Networks – History- Architectures- Learning methods- XOR Problem-Delta rule- Derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM- energy function- problems-applications of associative memories- ART1- ART2- applications of adaptive networks.

UNIT-II (12 Hrs.)

Fuzzy Logic: Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems- Crisp logic – predicate logic – fuzzy logic- fuzzy based systems - Defuzzification methods – applications.

Unit-III (12 Hrs.)

Genetic Algorithms: Fundamentals of GA – creation of offspring – encoding – fitness function reproduction – crossover- insertion& deletion- mutation- bitwise operators – applications.

UNIT-IV (12 Hrs.)

Programming Using Mat Lab: Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directed search toolbox.

Recommended Books:
1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley Publications.
2. Yagna Narayanan, 'Artificial Neural Networks', PHI.
3. Bart Kosko, 'Neural Networks & Fuzzy Logic', Prentice Hall
4. Simon Haykin, 'Neural Networks', Prentice Hall.

VLSI DESIGN

Subject Code: BECE1-833 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. In this course, the MOS circuit realization of the various building blocks that is common to any digital VLSI circuit is studied.

2. Architectural choices and performance trade-offs involved in designing and realizing the circuits in CMOS technology are discussed.

Course Outcomes:

Upon completion of the course, students should:

1. Explain the basic CMOS circuits and the CMOS process technology.
2. Discuss the techniques of chip design using programmable devices.
3. Model the digital system using Hardware Description Language.

Unit-I (12 Hrs.)

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture declaration Introduction to behavioural, dataflow and structural models.

VHDL Statements: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

Unit-II (12 Hrs.)

Applications of VHDL: Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

Unit-III (12 Hrs.)

Review of MOS Devices: MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.

Basic Electrical Properties and Circuit Concepts: The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.

Unit-IV (12 Hrs.)

Circuit Characterization and Performance Estimation: Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Recommended Books:

1. Bhasker, 'A VHDL Primmer', Prentice Hall.
2. Weste and Eshrighian, 'Principle of CMOS VLSI Design', Pearson Education.
3. D.A. Pucknell and K. Eshraghian, ‘Basic VLSI Design’, Prentice Hall India, New Delhi.
4. Brown and Vranesic, 'Fundamentals of Digital Logic with VHDL Design', TMH.
5. S.M. Kang, Y. Lebiebici, 'CMOS Digital Integrated Circuits Analysis & Design', TMH.

VLSI DESIGN LAB.

Subject Code: BECE1-834 **L T P C** **Duration: 24 Hrs**
0 0 2 1

Course Objectives:

1. To learn Hardware Descriptive Language(Verilog/VHDL)
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain
3. To familiarize fusing of logical modules on FPGAs
4. To provide hands on design experience with professional design (EDA) platforms.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write HDL code for basic as well as advanced digital integrated circuits.
2. Import the logic modules into FPGA Boards.
3. Synthesize Place and Route the digital IPs.
4. Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

EXPERIMENTS

1. Design of basic Gates: AND, OR, NOT.
2. Design of universal gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Substractor, Full Substractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Design of 4 Bit Binary to BCD Converter using sequential statement
10. Design an 8 Bit parity generator (with for loop and Generic statements)
11. Design of 2,s Complementary for 8-bit Binary number using Generate statements

SEQUENTIAL DESIGN EXPERIMENTS

1. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs
2. Design of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
3. Design of Synchronous 8-bit Johnson Counter.
4. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3- state
5. output (IC 74299)
6. Design of 4 Bit Binary to BCD Converter using sequential statement.
7. Design counters (MOD 3, MOD 5, MOD 8, MOD 16)
8. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
9. Design 3-line to 8-line decoder with address latch

Note: At least 12 experiments are required to be performed.

MAJOR PROJECT

Subject Code: BECE1-874 **L T P C**
0 0 12 6

The students are required to undergo Major Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

CELLULAR AND MOBILE COMMUNICATION

Subject Code: BECE1-874 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the radio wave propagation and interference in mobile communications.
2. To understand the basic knowledge about the generations of mobile communication.
3. To study different architectures of mobile communication and its related parameters.
4. To impart the knowledge about applications of mobile communication.

Course Outcomes:

Student shall be able to:

1. Understand the cellular systems
2. Analyse the concept of switching systems and base station subsystem.

Unit–I (12 Hrs.)

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface – specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features. 3G Systems: UMTS & CDMA 2000 standards and specifications.

Unit –II (12 Hrs.)

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co–channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co–channel interference, real time co–channel interference, co–channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co–channel interference – different types.

Unit –III (12 Hrs.)

Cell Coverage for Signal &Traffic: General introduction, obtaining the mobile point to point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Unit –IV (12 Hrs.)

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non–fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls: hand off, types of handoff and their characteristics, dropped call rates &their evaluation.

Optional Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Books:

1. Kamilo Feher, 'Wireless and Digital Communications', PHI.
2. T.S. Rappaport, 'Wireless Communication, Principles & Practice'.
3. William, C.Y. Lee, 'Mobile Cellular Telecommunications', McGraw Hill.

WIRELESS SENSORS NETWORKS

Subject Code: BECE1-875 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. This course introduces advances in wireless, sensor networks.
2. Wireless Sensor Networks provide opportunities even outside their usual application domain of environmental monitoring.
3. To track all activities, and check for errors that might occur in the process of handling and distributing goods.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand the existing applications of wireless sensor actuator networks.
2. Understand the elements of distributed computing and network protocol design and will learn to apply these principles in the context of wireless sensor networks.
3. Identify the various hardware, software platforms that exist for sensor networks.

Unit-I (12 Hrs.)

Introduction to Wireless Sensor Networks: Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness Advantages of sensor networks, Sensor network applications.

Unit-II (12 Hrs.)

Topology Control: Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF), GEAR, Connectivity driven, SPAN, ASCENT.

Unit-III (12 Hrs.)

WSN Sensors: Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols &Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address & Name management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing.

Unit IV (12 Hrs.)

WSN Platforms & Tools: Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Recommended Books:

1. Holger Karl & Andreas Willig, 'Protocols & Architectures for Wireless Sensor Networks', John Wiley.
2. Feng Zhao & Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach'.
3. Waltenegus Dargie and Christian Poella Bauer, 'Fundamentals of Wireless Sensor Networks Theory and Practice', John Wiley and Sons.
4. Holger Karl and Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley and Sons.

INFORMATION THEORY AND CODING

Subject Code: BECE1-876 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To aware the students about the information theory.
2. To provide the basic concepts of channel capacity.
3. To impart knowledge about linear block codes.
4. To study convolution and BCH codes.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of entropy, mutual information and divergence.
2. Apply and analyze the principles of channel capacity.
3. Use various types of check metrics, linear and cyclic codes.
4. Understand working principle of convolution codes.

Unit-I (12 Hrs.)

Information Theory: Definition of Information, Entropy, Mutual Information, Properties of Mutual Information, Fundamental Inequality, I.T. Inequality, Divergence, Properties of Divergence, Divergence Inequality, Relationship between entropy and mutual information, Chain Rules for entropy, relative entropy and mutual information.

Unit-II (12 Hrs.)

Channel Capacity: Uniform Dispersive Channel, Uniform Focusing Channel, Strongly Symmetric Channel, Binary Symmetric Channel, Binary Erasure Channel. Channel Capacity of the all these channels, Channel Coding Theorem, Shannon-Hartley Theorem.

Data Compression: Kraft inequality, Huffman codes, Shannon-Fano coding, Arithmetic Coding.

UNIT-III (12 Hrs.)

Linear Block Codes: Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, Hamming Code.

Cyclic Codes: Description of Cyclic codes, Generator and parity check matrices of cyclic codes, error detection decoding of cyclic codes.

UNIT-IV (12 Hrs.)

Convolution Codes: Encoding of convolution codes, structural properties of Convolution codes, Distance Properties of convolution codes.

Recommended Books:

1. Arijit Saha, 'Information Theory, Coding & Cryptography', Pearson Education.
2. Ranjan Bose, 'Information Theory, Coding and Cryptography', Tata McGraw Hill.
3. Thomas M. Cover, Joy A. Thomas, 'Elements of Information Theory', Wiley India Pvt.
4. J. Mary Jones, 'Information and Coding Theory', Springer.

OPERATING SYSTEMS

Subject Code: BECE1-877 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. General understanding of structure of modern computers
2. Purpose, structure and functions of operating systems
3. 3.Illustration of key Operating system aspects by example

Course Outcomes:
By the end of the course you should be able to:
1. Describe the general architecture of computers
2. Describe, contrast and compare differing structures for operating systems
3. Understand and analyze theory and implementation of: processes,
4. Resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

Unit-I (12 Hrs.)

Operating System Concepts an Introduction: What is an OS, Need of OS, Different views of an OS, Evolution of OS, Batch Processing, Multiprocessing, Multiprogramming, Time Sharing, Real Time Systems, Network OS, Parallel Processing, Distributed Processing.

Operating System Structures: OS services, System Calls, System Structures, Layered Architecture of an OS.

Introduction to process: Concept of process, Process states and their transitions, PCB, Process Scheduling, Operations on process: Process creation and termination, Threads: User level and kernel level threads.

Unit-II (12 Hrs.)

CPU Scheduling: Introduction, CPU scheduler, Scheduling criteria, Scheduling algorithms: FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

Process Synchronization: Co-operating process, Concurrency, Semaphores.

Deadlocks: Introduction, Deadlock characteristics, Recognition methods, Dealing with deadlocks, Deadlock prevention, avoidance, detection and deadlock recovery.

Unit-III (12 Hrs.)

Memory Management Basics: Introduction, Logical vs. physical address space, Program relocation & management techniques, Continuous storage allocation, Fixed partition contiguous storage allocation, Variable partition CSA, Non-contiguous storage allocation, paging, segmentation.

Virtual Memory: Introduction, Swapping, Demand paging, Pure demand paging FIFO, Optimal.

File System Interface & implementation: File concepts, File naming, File attributes, File access methods, Directory structure.

Unit-IV (12 Hrs.)

Device Mgmt & Storage Structure: I/O subsystems, I/O channels, Secondary storage, Disk structure, Disk scheduling, FIFO, Shortest seek time first SSTF scan, C-SCAN, Look &C-look Disk scheduling algo's.

Protection & Security Introduction: Introduction, Goals of protection, Access rights, Access matrix, Security & its goals, Authentication, Passwords, Encryption, Viruses, worms, Dealing with viruses.

Case Study: UNIX &WIN NT.

Recommended Books:

1. Peter Galvin, 'Operating systems Concepts', Addison Wessly.
2. Ekta Walia, 'Operating systems Concepts', Khanna Publisher.

SATELLITE COMMUNICATION

Subject Code: BECE1-878 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To introduce various aspects in the design of systems for satellite communication.
2. Students will be able to understand link design for satellite communication.
3. To provide the knowledge of various multiple access techniques.

Course Outcomes:

Students will be:

1. Able to learn the dynamics of the satellite.
2. Able to understand the communication satellite design.
3. Able to understand how analog and digital technologies are used for satellite communication networks.
4. Able to learn the design of satellite links.
5. Able to study the design of Earth station and tracking of the satellites.

Unit-I (12 Hrs.)

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & ionosphere effects on link design, complete link design, interference effects on complete link design, earth station parameters.

Unit-II (14 Hrs.)

Satellite Analog & Digital Communication: Baseband analog(voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques: TDMA frame structure, burst structure, frame efficiency, super frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

Unit-III (10 Hrs.)

Laser & Satellite Communication: Link analysis, optical satellite link Transmitter & Receiver, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fiber CAT system.

Unit-IV (12 Hrs.)

Satellite Applications: Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Books:

1. Timothy Pratt, 'Satellite Communication', John Wiley & Sons.
2. D.C. Aggarwal, 'Satellite Communication', Khanna Publishers.

B. TECH. ELECTRONICS & TELECOMMUNICATION ENGINEERING

Total Contact Hours = 30 **Total Marks = 900** **Total Credits = 25**

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2-301	Object Oriented Programming	3	1	0	40	60	100	4
BECE2-302	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE2-303	Network Analysis and Synthesis	3	1	0	40	60	100	4
BECE2-304	Electronic Instrumentation	3	1	0	40	60	100	4
BECE2-305	Signals and Systems	3	1	0	40	40	100	1
BECE2-306	Electronic Devices and Circuits - I Lab.	0	0	2	60	40	100	1
BECE2-307	Object Oriented Programming Lab	0	0	2	60	40	100	4
BHUM0-F91	Soft Skills-I	0	0	2	60	40	100	1
BECE2-308	Training – I#	0	0	4	60	40	100	2
Total		**15**	**5**	**10**	**440**	**460**	**900**	**25**

After 2nd Sem, During Summer Vacation

Total Contact Hours = 27 **Total Marks = 900** **Total Credits = 23**

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2-409	Electronic Devices and Circuits –II	3	1	0	40	60	100	4
BECE2-410	Analog Communication Systems	3	1	0	40	60	100	4
BECE2-411	Digital Electronics	3	1	0	40	60	100	4
BECE2-412	Electromagnetic Field Theory	3	1	0	40	60	100	4
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BECE2-456	Neural Networks and Fuzzy Logic							
BECE2-457	Data Structures and Algorithms							
BECE2-458	RADAR and SONAR Engineering							
BECE2-459	Web Technologies							
BECE2-413	Electronic Devices and Circuits -II Lab.	0	0	2	60	40	100	1
BECE2-414	Analog Communication Systems Lab.	0	0	2	60	40	100	1
BECE2-415	Digital Electronics Lab.	0	0	2	60	40	100	1
BHUM0-F92	Soft Skills -II	0	0	2	60	40	100	1
Total		**15**	**4**	**8**	**440**	**460**	**900**	**23**

In House / Industrial Training of 6 Weeks during Summer vacations after 4th semester

Total Contact Hrs. = 30 **Total Marks = 1000** **Total Credits = 24**

Semester 5th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2-516	Linear Integrated Circuits	3	1	0	40	60	100	4
BECE2-517	Microprocessor and Interfacing	3	1	0	40	60	100	4
BECE2-518	Digital Communication Systems	3	1	0	40	60	100	4
BECE2-519	Linear Integrated Circuits Lab.	0	0	2	60	40	100	1
BECE2-520	Microprocessor Lab.	0	0	2	60	40	100	1
BECE2-521	Digital Communication Systems Lab.	0	0	2	60	40	100	1
BECE2-522	Training –II#	0	0	4	60	40	100	2
BHUM0-F93	Soft Skills -III	0	0	2	60	40	100	1
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BECE2-560	Data Communication Networks							
BECE2-561	Human Resource Management							
BECE2-562	Digital System Design							
BECE2-563	Biomedical Electronics and Instrumentation							
BECE2-564	Micro-electronics							
Open Elective – I		3	0	0	40	60	100	3
Total		**15**	**3**	**12**	**500**	**500**	**1000**	**24**

After 4th Sem, During Summer Vacation

Total Contact Hrs. = 24 **Total Marks = 800** **Total Credits = 21**

Semester 6th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2-623	Microwave and Antenna Theory	3	1	0	40	60	100	4
BECE2-624	Microcontroller and Embedded System	3	1	0	40	60	100	4
BECE2-625	Linear Control System	3	1	0	40	60	100	4
BECE2-626	Microwave Engineering lab	0	0	2	60	40	100	1
BECE2-627	Microcontroller Lab.	0	0	2	60	40	100	1
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Departmental Elective-III (Select any one)		3	0	0	40	60	100	3
BECE2-665	Nano Science and Nano-Technology							
BECE2-666	Advanced Microprocessor							
BECE2-667	Image and Speech Processing							
BECE2-668	Optical Fibre Communication							
BECE2-669	Operation Research							
Open Elective – II		3	0	0	40	60	100	3
Total		**15**	**3**	**6**	**380**	**420**	**800**	**21**

In House / Industrial Training of 8 Weeks during summer vacations after 6th semester

Total Contact Hrs. = 28 Total Marks = 700 Total Credits = 23

Semester 7th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2-728	Wireless Communication Systems	3	1	0	40	60	100	4
BECE2-729	Digital Signal Processing	3	1	0	40	60	100	4
BECE2-730	Digital Signal Processing Lab	0	0	2	60	40	100	1
BECE2-731	Minor Project	0	0	4	60	40	100	4
BECE2-732	Training-III#	0	0	8	60	40	100	4
Departmental Elective-IV (Select any one)		3	0	0	40	60	100	3
BECE2-770	Cognitive Radio							
BECE2-771	Relational Data Base Management System							
BECE2-772	Computer Architecture and Organization							
BECE2-773	Soft Computing							
Open Elective – III		3	0	0	40	60	100	3
Total		**12**	**2**	**14**	**340**	**360**	**700**	**23**

After 6th Sem, During Summer Vacation

Total Contact Hrs. = 21 Total Marks = 400 Total Credits = 14

Semester 8th		Contact Hours			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE2- 833	VLSI Design	3	1	0	40	60	100	4
BECE2- 834	VLSI Design Lab	0	0	2	60	40	100	1
BECE2- 835	Major Project	0	0	12	60	40	100	6
Departmental Elective-V (Select any one)		3	0	0	40	60	100	3
BECE2-874	Cellular and Mobile Communication							
BECE2-875	Wireless Sensor Networks							
BECE2-876	Information Theory and Coding							
BECE2-877	Operating Systems							
BECE2-878	Satellite Communication							
Total		**6**	**1**	**14**	**200**	**200**	**400**	**14**

Total Credits

Semester	Credits
I	25
II	25
III	25
IV	23
V	24
VI	21
VII	23
VIII	14
Total	**180**

OBJECT ORIENTED PROGRAMMING

Subject Code: BECE2-301 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge regarding the Object oriented programming C++, data types and about classes.
2. To provide understanding of inheritance and memory management in C++.
3. To describe how to represent pointers, and understanding the concept of binding and polymorphism.
4. To make the students familiar with the File handling and generic functions.

Course Outcomes:

1. After undergoing the course students will be able to develop various programs and flow charts using C++.
2. Apply the concepts of data encapsulation, inheritance, and polymorphism to large-scale software.
3. Enable students to develop their skills in programming with C++.
4. Design and develop object-oriented computer programs.

Unit-I (12 Hrs.)

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and members functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of constkeyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

Unit-II (12 Hrs.)

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, need for destructors.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Unit-III (12 Hrs.)

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, object composition and delegation, order of execution of constructors and destructors.

Unit-IV (12 Hrs.)

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Files: File streams, hierarchy of file stream classes, reading/writing of files, error handling during file operations, accessing records, randomly, updating files.

Recommended Books:

1. I.E. Balagurusamy, 'Object Oriented Programming with C++', Tata McGraw Hill.
2. R.S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House.
3. R. Lafore, 'Object Oriented Programming in C++', Waite Group.
4. 'The Complete Reference to C++ Language', McGraw Hill-Osborne.
5. F.B. Lippman, 'C++ Primer', Addison Wesle.

ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code: BECE2-302 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

This course is meant to provide fundamental knowledge to students for understanding of the various electronic devices, their circuits & behaviour under various conditions.

1. To aware the students about the various electronic devices and their circuits.
2. To impart knowledge of BJTs and FETs.
3. To provide the students detailed concepts of CMOS and MOSFET.
4. To analyze low and high frequency transistor models.

Course Outcomes:

After undergoing this course student will be able to:

1. Understand the concepts of junction diodes and their applications.
2. Analyze BJT characteristics and determine their behaviour under low and high frequencies.
3. Analyze various concepts of FETs and their characteristics.
4. Design low and high frequency models and observe and its various characteristics.

Unit-I (12 Hrs.)

Semiconductor Diodes: Semi-conductor materials and their characteristics, PN junction Diode - VI characteristics, Breakdown mechanism in diode, effect of temperature on diode qualitative and quantitative analysis of its behaviour, Diode resistance, Transition capacitance and Diffusion capacitance, clippers, clampers, rectifiers. Special purpose diodes - Zener diode, varactor diode, Schottky diode.

Unit-II (12 Hrs.)

Bipolar Junction Transistor: BJT – Transistor current components, BJT configurations – CE, CB, CC and their characteristics. Transistor Biasing –Operating point determination, fixed bias, emitter bias, voltage-divider bias. Bias stability –Stabilization against variation in Ico, V_{BE} and β, Bias compensation.

Unit-III (12 Hrs.)

Field-Effect Transistor: The junction FET - construction, operation, characteristics, parameters, Biasing of JFET, Small signal analysis of JFET as an amplifier- common source and common drain amplifiers.

Metal Oxide Semiconductor FET: MOSFET- construction, operation, characteristics, parameters, CMOS devices, CMOS inverter characteristics, metal semiconductor.

Unit-IV (12 Hrs.)

Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters.

Recommended Books:

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', Pearson Education.
4. Sedra, Adel S. and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: BECE2-303 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide the knowledge to students about the various network theorems.
2. To make the students aware about the various transient responses for various signals.
3. To provide them basic concepts of different types of two port networks and their synthesis.
4. To impart knowledge about different passive filter design.

Course Outcomes:

1. An ability to design, analyze and synthesis of various networks and circuits.
2. Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.
3. Synthesis of networks using fundamental concepts.
4. To understand, design and analysis of various passive filter design.

Unit-I (12 Hrs.)

Laws and Basic Theorems: Fundamental Laws and Concepts – Kirchoff's current and voltage laws, Node and mesh analysis using classical method and Laplace transform, Concept of independent and dependent sources, Analysis of special signal waveforms, Duality in networks. Network Theorems –Superposition, Reciprocity, Thevenin's, Norton's, Millman's, Maximum power transfer, Tellegan's, Circuit analysis using these theorems.

UNIT-II (12 Hrs.)

Transient Analysis: Fundamental signals and their mathematical expressions, Transient response analysis of RL, RC and RLC for various signals using differential equations and Laplace transform.

UNIT-III (12 Hrs.)

Two Port Networks: Fundamental concepts of network synthesis, Hurwitz Polynomials, Positive real functions, Properties of RC, RL & LC networks, Foster and Cauer forms of realization, Transmission zeroes, Synthesis of transfer functions.

UNIT-IV (12 Hrs.)

Passive Filter Design: K-derived, m-derived, Low pass filter, High pass filter, Band pass filter, Band stop filter, their magnitude and phase response

Recommended Books:

1. Vanvalkenburg, 'Network Analysis', Prentice Hall of India Pvt. Ltd., New Delhi.
2. D. RoyChoudhary, 'Network and Systems', New Age International Publisher.
3. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley.
4. Someshwar C. Gupta, 'Circuit Analysis - with Computer Applications to Problem Solving', Jon W. Bayless.

ELECTRONIC INSTRUMENTATION

Subject Code: BECE2-304 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about different types of measuring, waveform generation, and analysis of electronic instruments.
2. Exposure to various analog measuring instruments.
3. To provide detailed knowledge about different bridges.
4. To understand CRO and its operation.

Course Outcomes:

After undergoing this course student will be able to:

1. Analyze operation of different instruments and able to describe different terminology related to measurements.
2. Recognize and understand various analog measuring instruments.
3. Measure resistance using various methods.
4. Find various measurements using CRO.

Unit–I (12 Hrs.)

Units, Dimensions and Standards: SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

General Theory of Analog Instruments: Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/ weight ratio, pointers and scales.

Unit–II (12 Hrs.)

Analog Measuring Instruments: Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/ applications.

Unit – III (12 Hrs.)

Measurement of Resistances: Low, Medium & High Resistance their measurement.

Bridges: Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

Unit-IV (12 Hrs.)

Cathodes Ray Oscilloscopes: Principles and working of CRO, CRO probes, Measurement of voltage, frequency and phase angle with CRO.

Recommended Books:

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai & Publishers.
2. J.B. Gupta, 'A Course in Electrical and Electronics Measurement & Instrumentation', S.K. Kataria & Sons.
3. W.D. Cooper1, 'Electronic Instrumentation and Measurement Techniques', Prentice Hall.

SIGNAL AND SYSTEMS

Subject Code: BECE2-305 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To make the students aware about the signal transmission through linear networks
3. Tobe able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
4. To impart them knowledge of various types of noises.

Course Outcomes:

1. Ability to analyse various types of signals in communication system.
2. Developing skills to understand random signals.
3. To understand various types of noises.
4. Understand signal transmission through linear networks.

Unit-I (12 Hrs.)

Systems and Signal Analysis: Detailed Classification of Signals and Systems, Fourier Series and its properties, Fourier transform and its properties along with applications, Discrete Time Fourier Series (DTFS) and Discrete Time Fourier Transform (DTFT).

Correlation and Spectral Density: Definition of Correlation and Spectral Density, Analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

Unit-II (12 Hrs.)

Random Signal Theory: Introduction to Probability Theory, Definition of Probability of Random Events. Joint and Conditional Probability, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Examples of PDF, Transformation of Random Variables. Random Processes, Stationary and Ergodicity.

Unit-III (12 Hrs.)

Introduction to Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure. Experimental determination of Noise Figure, Pulse Response and Digital Noise and its elimination.

Unit-IV (12 Hrs.)

Signal Transmission Through Linear Networks: Convolution Theorem and its graphical interpretation. The Sampling Theorem, Low Pass and Band Pass Networks, Matched Filter, Enveloped detector.

Recommended Books:

1. B.P. Lathi, 'Digital and Analog Communication Systems', Oxford University Press.
2. Ravi Kumar, 'Signals and Systems', PHI Learning.
3. Simon Haykin, 'Signals and Systems', John Wiley.
4. George R. Cooper, 'Probabilistic Methods of Signals and System Analysis', Oxford University Press.

ELECTRONIC DEVICES AND CIRCUITS LAB. - I

Subject Code: BECE2-306 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. Able to understand and identification of various electronic components.
2. To understand and plot characteristics of various semiconductor devices.
3. To understand the applications of Transistors as amplifier in various configurations.

Course Outcomes:

1. An ability to understand all types of electronics devices and circuits
2. An ability to conduct experiments, as well as to analyze and interpret various data sheets.

EXPERIMENTS

1. To perform & analyze the use of Zener diode as voltage regulator.
2. To observe the characteristics and behavior of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To observe the characteristics of a Class- A amplifier.
5. To observe the characteristics of Class- B amplifier.
6. To observe the characteristics of Class- B push-pull amplifier.
7. To observe the characteristics of complementary symmetry amplifier.
8. To plot a load line for a CE amplifier and show effect of input signal on Q-point.
9. To Observe use of a BJT in a CE amplifier circuit configuration and study its frequency response.
10. To demonstrate use of a BJT in a CC amplifier circuit configuration and study its frequency response.
11. To perform an experiment to observe the working of BJT as an amplifier.

Note: At least 08 experiments are required to be performed.

OBJECT ORIENTED PROGRAMMING LAB.

Subject Code: BECE2-307 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To provide the basic knowledge about control statements, looping statements, various I/O statements and various data structures.
2. To describe how to create classes in C++ for understanding of basic OOPS features.
3. To discuss various concepts of data hiding, function overloading and operator overloading.

Course Outcomes:

1. Enable students to develop their skills in programming with C++.
2. To describe functions of creating constructors, destructor, inheritance, polymorphism and file handling programs
3. Formulate problems as steps so as to be solved systematically.
4. Integrate robustness, reusability, and portability into large-scale software development.

EXPERIMENTS

1. [Classes and Objects] Write a program that uses a class where the member functions are defined inside a class.
2. [Classes and Objects] Write a program that uses a class where the member functions are defined outside a class.
3. [Classes and Objects] Write a program to demonstrate the use of static data members.
4. [Classes and Objects] Write a program to demonstrate the use of const data members.
5. [Constructors and Destructors] Write a program to demonstrate the use of zero argument and parameterized constructors.
6. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
7. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
8. [Initializer Lists] Write a program to demonstrate the use of initializer list.
9. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
10. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
12. [Typecasting] Write a program to demonstrate the typecasting of basic type to class type.
13. [Typecasting] Write a program to demonstrate the typecasting of class type to basic type.
14. [Typecasting] Write a program to demonstrate the typecasting of class type to class type.
15. [Inheritance] Write a program to demonstrate the multilevel inheritance.
16. [Inheritance] Write a program to demonstrate the multiple inheritances.
17. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
18. [Polymorphism] Write a program to demonstrate the runtime polymorphism.
19. [Exception Handling] Write a program to demonstrate the exception handling.
20. [Templates and Generic Programming] Write a program to demonstrate the use of function template.

21. [Templates and Generic Programming] Write a program to demonstrate the use of class template
22. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
23. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.

Note: At least 15 experiments are required to be performed.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C**
0 0 2 1

Course Objectives
The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes
At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

ELECTRONIC DEVICES AND CIRCUITS - II

Subject Code: BECE2-409 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To aware the students about Basic Electronic Circuits.
2. To update the Knowledge about small signal & large signal amplifier.
3. To analyze various types of circuits to generate signals.
4. Selection and specification of electronic components for industrial applications.
5. To understand working of switching circuits.

Course Outcomes:

1. After the completion of the course, the students could have learnt about the basic Electronic Circuits, their operational characteristics and their applications.
2. To generate ability to understand various amplifiers including push pull and complementary symmetry.
3. Design different types of feedback amplifiers and oscillator circuits.
4. To understand and analyze a stable multivibrators.

Unit-I (12 Hrs.)

Single Stage Amplifiers: Classification of Amplifiers - Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Multistage Amplifiers: Frequency response – Single stage amplifiers, multistage amplifiers. Couplings – Various coupling methods for multistage amplifiers.

Unit-II (12 Hrs.)

Transformer coupled audio amplifier: construction, working, efficiency & distortion analysis: Classifications: class-A, Class-B, class-AB and Class-C amplifiers, efficiency.

Push-Pull Amplifiers – operation of Class-B push-pull amplifier, crossover distortion, transistor phase inverter, complementary symmetry amplifier.

UNIT-III (12 Hrs.)

Feedback Amplifiers – Feedback concept, advantages and disadvantages of negative and positive feedback. Analysis of R_i, R_o, A_i, A_v with and without feedback

Oscillators: Classification of Oscillators, frequency and frequency stability of oscillatory circuits, Hartley Oscillator, Colpitts Oscillators, Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator.

Unit-IV (12 Hrs.)

A Stable Multivibrators: A stable Collector coupled and emitter coupled multivibrator, complementary Transistor A stable multivibrator.

Switching Characteristics of Devices: Diode and transistor as electronic switch.

Recommended Books:

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw- Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', Pearson Education.

4. Sedra, S. Adel and Smith, C. Kenneth, 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

ANALOG COMMUNICATION SYSTEMS

Subject Code: BECE2-410 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. To understand various wave propagation concepts.
2. To provide the students about the concepts of analog modulation techniques
3. To provide the detailed knowledge about AM transmission and AM reception
4. To impart the knowledge about FM transmission and FM reception.

Course Outcomes:
1. An ability to learn analog communication system and modulation techniques
2. An ability to understand design of useful circuits required in analog communication system.
3. An ability to explore working of transmitter and receiver circuits used in communication.
4. To analyze the performance of AM/FM transmission and reception.

Unit-I (12 Hrs.)

Analog Modulation Techniques: Introduction, Theory of Amplitude Modulation: AM Power Calculations, AM Modulation with a Complex wave, Theory of Frequency Modulation (FM): Spectra of FM Signals, Narrow Band and Wide Band FM, Theory of Phase Modulation, Comparison of AM and FM, Comparison of PM and FM, Concepts of VSB/ISB/SSB, Pre-emphasis and De-emphasis.

SSB Transmission/SSB Reception: Advantages of SSB transmission, Generation of SSB: Independent Side-Band Systems (ISB), Vestigial Side-Band Modulation (VSB). SSB Product Demodulator, Balanced Modulator as SSB Demodulator, ISB/Suppressed Carrier receiver, Applications of FM with Band ranges.

Unit-II (12 Hrs.)

AM Transmission/AM Reception: Introduction, Generation of Amplitude Modulation, Basic Principles of AM Generation: Square law Diode Modulation, Suppressed Carrier AM Generation, Ring Modulator, Balanced Modulator. Tuned Radio Frequency (TRF) Receiver, Basic Elements of AM Super-heterodyne receiver: RF Amplifiers Characteristics-Sensitivity, Selectivity, Image Frequency Rejection, Mixers, Tracking and Alignment, Local Oscillator, IF Amplifier, AM Detectors: Envelope or Diode Detector, AGC, AM Receiver using Transistors Communication Receiver, Applications of AM with different Band ranges

Unit-III (12 Hrs.)

FM Transmission/FM Reception: Generation of FM by Direct Methods. Indirect Generation of FM: The Armstrong Method, FM Stereo Transmission.FM Receiver Direct Methods of Frequency Demodulation: Slope Detector, Travis Detector Foster Seeley or Phase Discriminator, Indirect methods of FM Demodulation: FM Detector using PLL and Stereo FM Multiplex Reception.

Unit-IV (12 Hrs.)

Wave Propagation: Free space equation, Reflection from earth's surface, Surface and Space wave propagation, Range of space wave propagation, Effective earth's radius, Duct propagation, Troposphere propagation. Structure of ionosphere, propagation of radio waves

through ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field.

Recommended Books:

1. George Kennedy, 'Electronic Communication System', McGraw Hill.
2. Gary M. Miller and Jeffery S. Beasley, 'Modern Electronic Communications', PHI.
3. Simon Haykin, 'Communication Systems', \Wiley.
4. Wayne Tomasi, 'Electronics Communication systems', Pearson Publishers.
5. Proakis, 'Communication Systems', McGraw Hill.

DIGITAL ELECTRONICS

Subject Code: BECE2- 411 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about basics of digital electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Course Outcomes:

1. Students will simplify a digital design problem as part of the systematic approach to solve a problem.
2. To analyze and understand various sequential circuits & various Digital Logic families.
3. To design Analog to Digital and Digital to Analog converters and finite state machines.

Unit-I (12 Hrs.)

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

Unit-II (12 Hrs.)

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

Unit-III (12 Hrs.)

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

Unit-IV (12 Hrs.)

A/D and D/A Converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs. **Finite State Machines**: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

Recommended Book:

1. R.P. Jain, 'Modern Digital Electronics', Tata McGraw Hill.
2. Malvino & Leach, 'Digital Principles and Applications', McGraw Hill.
3. Taub & Schilling, 'Digital Integrated Electronics', Tata McGraw Hill.

ELECTROMAGNETIC FIELD THEORY

Subject Code: BECE2-412 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
2. Study of physical concept and all the important fundamental parameters of transmission lines and waveguides.

Course Outcomes:

1. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
2. An ability to understand the concepts of magnetic field and magnetic field intensity.
3. Analyze Maxwell’s equation in different forms (differential and integral) and apply them to diverse engineering problems.
4. To understand transmission lines and smith chart.

Unit-I (12 Hrs.)

Introduction: Fundamental of vector algebra, Scalar & vector fields, Introduction and transformation on different coordinate systems: (rectangular, cylindrical and spherical co-ordinate system). Introduction to line, surface and volume integrals, definition of gradient, divergent and curl of a vector and their physical significance.

Unit-II (12 Hrs.)

Electrostatics: Principal of Coulomb's law, definition of electric field intensity from point charges, field due to continuous distribution of charges on an infinite and finite line, Electric Field due to an infinite uniformly charged sheet. Gauss law and its applications, Electric flux density, potential fields due to electric dipole, Laplace and Poison equations.

Magneto statics: Definition and explanation on Magnetic Field intensity due to a finite and infinite wire carrying current. Magnetic field intensity on rectangular loop carrying current, Amperes Circuital law and its applications, Biot-savart law, the Lorentz force equation for a moving charge, Magnetic Vector Potential.

Unit-III (12 Hrs.)

Time Varying EM Fields: Maxwell's equation in differential and integral vector form and their interpretations, continuity of currents, conduction and displacement current, boundary conditions, Helmholtz equations, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for

normal incidence and surface impedance. Energy Flow and Poynting theorem, interpretation of E×H, Simple application, complex pointing vector.

Unit-IV (12 Hrs.)

Transmission Lines: Transmission line model, parameters and properties of transmission line equations, reflections in transmission lines: voltage, current and impedance relations-open, short circuit and matched lines, Standing wave ratio: impedance matching, quarter and half wave lines, single stub and double stub matching: circle diagram –Smith chart.

Recommended Books:

1. Matthew N.O. Sadiku, 'Elements of Engineering Electromagnetics', Oxford University Press.
2. William Hayt, 'Engineering Electromagnetics', Tata McGraw-Hill.
3. N. Narayana Rao, ‘'Elements of Engineering Electromagnetics', Pearson Education.
4. R.F. Jordan, 'Electromagnetic Waves & Radio System', Prentice Hall India.
5. Bhag Singh Guru and Hüseyin R. Hiziroglu, 'Electromagnetic Field Theory Fundamentals, Cambridge University Press.

NEURAL NETWORKS AND FUZZY LOGIC

Subject Code: BECE2-456 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

The students should be made to:

1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn about the concepts of Fuzzification and De-Fuzzification.
4. Describe various optimization techniques.

Course Outcomes:

Students will be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic and Fuzzy rules.
4. Learn and understand various optimization techniques.

UNIT-I (12 Hrs.)

Neural Networks: History, Overview of Biological Neuro-System, Terminology of Artificial Neural Network, Comparison of BNN and ANN, Mathematical Models of Neuron, ANN Architecture, Topology, Fundamental Learning Laws, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning.

UNIT-II (12Hrs)

Perceptron Architecture: Single layer perceptron, Perceptron Learning Rules, Multi-layer perceptron, Back Propagation Algorithm, Associative Memories, Hopfield Networks, Competitive Learning, Self-organizing Maps, ART Networks, Applications of Artificial Neural Networks.

UNIT-III (12 Hrs.)

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Linguistic Variables, Membership Function, Fuzzification, De-Fuzzification to Crisp Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation

Operations, Fuzzy rule generation (IF-THEN), Applications of Fuzzy Logic.

UNIT-IV (12 Hrs.)

Neuro-Fuzzy System: Introduction and Architecture of Neuro-Fuzzy Networks.

Introduction to different Optimization Techniques: Genetic Algorithm, Particle Swarm Optimization, Biogeography Based Optimization, Bacterial Forging Optimization, Detailed study of Genetic Algorithm, GA in problem solving, Implementation of GA.

Recommended Books:

1. N. Yegnanarayana, 'Artificial Neural Network', PHI.
2. LaureneFausett, 'Fundamental of Neural Networks', Pearson.
3. Simon Haykin, 'Neural Networks', Pearson.
4. S. Rajasekaran and GA Vijayalakshmi, 'Neural Networks, Fuzzy Logic and Genetic Algorithms', PHI.
5. Timothy J. Ross, 'Fuzzy Logic with Engineering', John Wiley.
6. S.N. Sivanandam, 'Introduction to Fuzzy Logic using MATLAB', Springer.
7. Ahmad M. Ibrahim, 'Introduction to Applied Fuzzy Electronics', PHI.

DATA STRUCTURES AND ALGORITHMS

Subject Code: BECE2-457 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand basic data structures and algorithms.
2. To use object oriented programming to implement data structures.
3. To introduce linear, non-linear data structures and their applications.
4. To understand the different methods of organizing large amount of data.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Select basic data structures and algorithms for autonomous realization of simple programs or program parts.
2. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.
3. Demonstrate advantages and disadvantages of specific algorithms and data structures.
4. To evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

Unit-I (12 Hrs.)

Introduction: Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

Development of Algorithms: Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.

Unit-II (12 Hrs.)

Linked Lists: Singly linked lists, linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction.

Trees: Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees(AVL), B-trees, B+ -trees.

Unit-III (12 Hrs.)

Graphs: Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and biconnected components, graph matching.

Unit-IV (12 Hrs.)

Sorting and Searching Techniques: Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Recommended Books:

1. J.P. Tremblay and P.G. Sorenson, 'An Introduction to Data Structures with Applications', Tata McGraw Hill.
2. S. Sahni, 'Data Structures, Algorithms ad Applications in C++', WCB/McGraw Hill.
3. Aho, Ullman and Hopcroft, ' Data Structures and Algorithms', Addison-Wesley.
4. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, 'Data Structures using C', Pearson Education.
5. Richard F. Gilberg, Behrouz A. Forouzan, 'Data Structures – A Pseudocode Approach with C', Thomson Brooks / COLE.

RADAR AND SONAR ENGINEERING

Subject Code: BECE2-458 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand theoretical principals underlying RADAR.
2. To understand the modern navigation system and general propagation phenomena.
3. Learn the fundamentals of physical acoustics and SONAR.

Course Outcomes:

1. Develop basic understanding of various types of RADARs and its applications.
2. Develop the ability to understand and design basic RADAR and SONAR systems.
3. Use of physical acoustics, electromagnetic, wireless communication and mathematics to understand fundamentals of RADAR and SONAR.

Unit-I (12 Hrs.)

Introduction to Radar: Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

Radar Equation: Simple form of Radar Equation, Prediction of Range performance, Minimum Detectable signal, Receiver noise, Signal to Noise ratio, Transmitter Power, Pulse repetition frequency &range ambiguities, System losses, Propagation effects.

Unit-II (12 Hrs.)

Continuous Wave (CW) &Frequency Modulated Radar: The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

MTI & Pulse Doppler RADAR: Introduction, Delay Line Cancellers, Multiple or staggered, Pulse repetition frequencies, Range-Gated Doppler Filters, Digital Signal Processing, Other

MTI delay line, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler Radar, MTI from a moving platform.

Tracking RADAR: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range.

Unit-III (12 Hrs.)

Types of SONAR Systems: active and passive, sonar equations, propagation characteristics of the medium, transmission loss and spreading effects, beam forming and steering, detection threshold, square law detector, cross-correlation detector.

Unit-IV (12 Hrs.)

Modern SONAR systems: signal and noise models, temporal sampling and quantization-spatial sampling and beam forming, band shifting, filtering and smoothing, decision processing, block diagram of active and passive sonars.

Correlation Receivers and Matched Filters: Advanced Sonar Signal Processing functions, adaptive beam forming, synthetic aperture arrays, automated decision-making.

Recommended Books:

1. Byron's Edde, 'Radar Principles technologies', Pearson.
2. Merrill I. Skolnik, 'Introduction to Radar Systems', Tata McGraw Hill.
3. K.K. Sharma, 'Fundamentals of Radar and Sonar Engineering', S.K. Kataria & Sons.

WEB TECHNOLOGIES

Subject Code: BECE2-459 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To learn the concepts of www including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user friendly web pages.
3. To define the Cascading Style Sheets(CSS) with its types and use them to provide the styles to the web pages at various levels.
4. To use the JavaScript to develop the dynamic web pages.

Course Outcomes:

After completion of the course students will be able to:

1. Describe the concepts of WWW including browser and HTTP protocol.
2. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
3. Use server side scripting with PHP to generate the web pages dynamically using the database
   connectivity.
4. Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Unit-I (12 Hrs.)

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

Unit-II (12 Hrs.)

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

Unit-III (12 Hrs.)

Style Sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

Unit-IV(12Hrs.)

JavaScript: Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web.

Recommended Books:

1. Ralph Moseley and M.T. Savaliya, 'Developing Web Applications', Wiley-India.
2. Joel Sklar, 'Web Design', Cengage Learning.
3. Harwani, 'Developing Web Applications in PHP and AJAX', McGraw Hill.
4. P.J. Deitel & H.M. Deitel, 'Internet and World Wide Web How to program', Pearson.

ELECTRONICS DEVICES AND CIRCUITS LAB - II

Subject Code: BECE2-413 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To understand the characteristics of various semiconductor devices
2. To understand various sources of oscillations
3. Able to understand, identification and selection of various amplifiers.
4. To make the students aware about the various multivibrator circuits.

Course Outcomes:

1. An ability to understand different types of electronics devices and circuits
2. An ability to design and conduct experiments, as well as to analyse and interpret output.

EXPERIMENTS

1. To study frequency response of a tuned amplifier.
2. To demonstrate and study a two stage RC coupled amplifier.
3. To demonstrate and study a Transformer coupled amplifier.
4. To observe the response of RC phase shift oscillator and determine frequency of oscillation.
5. To observe the response of Hartley oscillator and determine frequency of oscillation.
6. To observe the response of Colpitt's oscillator and determine frequency of oscillation.
7. To observe the response of Wien Bridge oscillator and determine frequency of oscillation
8. To demonstrate working of a JFET and study its V-I characteristics.
9. To experimentally study working of JFET as an amplifier.
10. To understand and plot working of Astable Multivibrator.
11. To understand and plot working of Monostable Multivibrator.

Note: At least 08 experiments are required to be performed.

ANALOG COMMUNICAION SYSTEM LAB

Subject Code: BECE2-414 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To familiarize with modulation & demodulation techniques and study their waveforms on oscilloscope.
2. To impart working knowledge of Voltage Controlled Oscillator.
3. To familiarize students with the functions of oscillators, filters, amplifiers, LC networks, modulators, limiters, mixers, and detectors in AM, FM, PM, SSB, and PLL circuits.

Course Outcomes:

1. An ability to perform transmission of signals from transmitter to receiver using various analog
   modulation and demodulation techniques.
2. Study of transmission and reception process.

EXPERIMENTS

1. To study Amplitude Modulation using a transistor and determine depth of modulation.
2. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
3. Frequency Modulation using Voltage Controlled Oscillator.
4. Generation of DSB-SC signal using Balanced Modulator.
5. Generation of Single Side Band (SSB) signal.
6. Study of Phase Lock Loop (PLL) and detection of FM Signal using PLL.
7. Measurement of Noise Figure using a noise generator.
8. Study functioning of Super heterodyne AM Receiver.
9. Familiarization of PLL, measurement of lock/captures range, frequency demodulation, and frequency multiplier using PLL.
10. Measurement of Sensitivity, Selectivity and Fidelity of radio receivers.

Note: At least 08 experiments are required to be performed.

DIGITAL ELECTRONICS LAB

Subject Code: BECE2-415 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

1. To give students a practical knowledge about all types of digital circuits.
2. To give students a working knowledge to connect digital circuits and verify their truth tables.
3. To give students a knowledge about integrated circuits of different combinational and sequential circuits.

Course Outcomes:

1. An ability to test and verify working and truth tables of combinational and sequential circuits.
2. Working knowledge of different converters.
3. To perform multiplexer and demultiplexer.

EXPERIMENTS

1. To Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and their Realization of OR, AND, NOT and XOR functions using universal gates.
2. To Realize of Half Adder using Logic gates.
3. To Realize of Full Adder using Logic gates.
4. To Realize of Half Subtractor using Logic gates
5. To Realize of Full Subtractor using Logic gates
6. To Design 4-Bit Binary-to-Gray Code Converter.
7. To Design 4-Bit Gray-to-Binary Code Converter.
8. To study and design 4-Bit magnitude comparator using logic gates.
9. To study and design multiplexer Truth-table and their verification.
10. Realization of Half adder and Full adder using MUX.
11. To study and design Demultiplexer Truth table and their verification
12. Realization of Half subtractor and Full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers, viz. SIPO, SISO, PIPO, PISO.

Note: At least ten experiments are required to be performed.

SOFT SKILLS-II

Subject Code: **BHUM0-F92** **L T P C**
0 0 2 1

Course Objectives

The course aims to address various challenges of communication as well as behavioural skills faced by individual at work place and organisations. Also, it aims to enhance the employability of the students.

Course Outcomes

At the end of the course the student will be able to understand the importance of goal setting. They will also be able to handle stress in their lives and future in a better way.

UNIT-1

DEVELOPING POSITIVE ATTITUDE- Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.
IMPROVING PERCEPTION- Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

CAREER PLANNING-Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

ART OF READING-Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

STRESS MANAGEMENT - Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

LINEAR INTEGRATED CIRCUITS

Subject Code: BECE2-516 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the basic building blocks of linear integrated circuits.
2. To learn the linear and non-linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To learn the theory of ADC and DAC.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes:

Upon Completion of the course, the students will be able to:

1. Design linear and nonlinear applications of op – amps.
2. Design applications using analog multiplier and PLL.
3. Design ADC and DAC using op – amps.
4. Generate waveforms using op – amp circuits.
5. Analyse special function ICs.

Unit–I (10 Hrs.)

Introduction to Op–Amp: Operational Amplifier, Block diagram, analysis and its schematic symbol, interpretation of IC 741 datasheet and characteristics, practical op–amp, all important electrical parameters and their values, Op-amp applications in open loop configuration.

Concept of Feedback, Op–Amp with Negative Feedback: Introduction and Block diagram representation of feedback configurations, Voltage Series feedback amplifier, Voltage Shunt feedback and derivation of important electrical parameters.

Unit-II (14 Hrs.)

Introduction to Operational Amplifiers and Characteristics: Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations.

The Practical op-amp: Introduction, input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, transient response, interpretation of TL082 datasheet.

Unit-III (14 Hrs.)

Amplifiers and Oscillators: Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, isolation amplifiers, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO.

Active Filters: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, notch filter: all pass filters, self-tuned filters.

Unit-IV (10 Hrs.)

Advanced applications: Applications as Frequency Divider, PLL, AGC, AVC using op-AMP and analog multipliers, Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, ADC TL0820 & DAC- 7821.

Recommended Books:

1. Ramakant A. Gayakward, 'Op–Amps & Linear Integrated Circuits', Pearson Education.
2. William D. Stanley, 'Operational Amplifiers with Linear Integrated Circuits', Merrill Publishing Company.
3. Millman & Grabal, 'Micro Electronics', Tata McGraw Hill.

MICROPROCESSOR AND INTERFACING

Subject Code: BECE2-517 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To understand the basic architecture of 8 and 16-bit microprocessor.
2. To understand interfacing of microprocessor with memory and peripheral chips involving system design.
3. To understand the techniques for faster execution of instructions and improve the performance of microprocessor.
4. To understand the concepts of multi core processor.

Course Outcomes:

1. The students will able to write program to run on 8085 microprocessor based systems.
2. Design system using memory chips and peripheral chips.
3. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.

UNIT-I (10 Hrs.)

Introduction: Introduction to microprocessor, Intel 8085 microprocessor architecture and pin diagram, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Bus timings, T state, machine cycle, timing diagram, Memories- RAM, DDR/SDR, ROM, EROM, EPROM, EEPROM, Flash Memory, Cache Memory.

UNIT-II (14 Hrs.)

Programming with 8085: Addressing modes, Detail study of 8085 instruction set. I/O and Memory mapping, Interfacing I/O Devices, Interrupts, stack and subroutines, Counter and Time

Delays, Code conversion, BCD Arithmetic and 16-bit data operations, Programming techniques with additional instructions, Program Debugging.

UNIT-III (14 Hrs.)

Interfacing with 8085: Architecture, interfacing and programming of 8155/8156 (programmable I/O port timer), 8251(universal synchronous, asynchronous receiver transmitter), 8253/ 8254 (programmable interval timer), 8255 (programmable peripheral interface), 8279 (keyboard display controller), and 8257 (direct memory access controller).

UNIT IV (10 Hrs.)

Other Microprocessor and interfacing: 8086 -Block diagram, Architecture, pipelining, flag register, register bank operation, memory segmentation, addressing modes. Introduction to 80186, 80286, 80386, 80486 and Pentium and their comparison, Comparative study of 8-bit microprocessors: Intel 8085, Motorola 6800, Zilog Z-80.

Recommended Books:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications with the 8085' Penram International Pub.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware', McGraw Hill Co.
3. Barry B. Brey, 'The Intel Microprocessors, Architecture Programming and Interfacing, PHI Publications.
4. B. Ram, Dhanpat Ra, 'Fundamentals of Microprocessor and Microcontrollers'.

DIGITAL COMMUNICATION SYSTEMS

Subject Code: BECE2-518 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about basics of Communication system and various digital modulation and demodulation techniques.
2. To learn design of useful circuits required in communication system.
3. To provide knowledge about various transmitter and receiver circuits used in communication.
4. To provide students with tools for communication signal analysis.

Course Outcomes:

1. To understand the various blocks/stages in a digital communication system.
2. Analyze the performance of a baseband and pass band digital communication system.
3. Perform the time and frequency domain analysis of the signals in a digital communication system.
4. Analyze the performance of various multiplexing techniques.

Unit-I (10 Hrs.)

Introduction: Block Diagram of Digital Communication System, Advantages of Digital communication system over Analog communication systems, Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Bandpass Signal, Aliasing Problem, Uniform and Non-uniform quantization. Signal to Quantization ratio of Quantized Signal.

Unit-II (12 Hrs.)

Baseband Transmission: Line Coding & its properties. Various types of PCM waveforms. Attributes of PCM waveforms, M-ary Pulse Modulation waveforms, Differential pulse code modulation, Multiplexing PCM signals, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, Adaptive DPCM, Comparison of PCM and DM.

Unit-III (10 Hrs.)

Baseband Detection: rror performance degradation in communication systems, E_b/N_O parameter, Matched filter and its derivation, Inter-Symbol Interference (ISI), Nyquist criterion for zero ISI & raised cosine spectrum, Correlation detector decision threshold and error probability for binary unipolar (on-off) signaling.

Unit-IV (16 Hrs.)

Band-pass Modulation and Demodulation: Types of digital modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques.

A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non-Coherent reception of ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Error probability for QPSK.

Multiplexing Techniques: Time division multiplexing, Frequency division multiplexing, code division multiplexing, Introduction to upcoming techniques of transmission.

Recommended Books:

1. Simon Haykin, 'Communication Systems', Wiley Publication.
2. Bernard Sklar, 'Digital Communication-Fundamentals and Applications', Pearson Education India.
3. Miller Gary M., 'Modern Electronic Communication', Prentice Hall.
4. John Proakis, 'Digital Communications', Tata McGraw Hill.
5. Wayne Tomsi, 'Electronic Communication Systems, Fundamentals Through Advanced', Pearson Education.

LINEAR INTEGRATED CIRCUITS LAB

Subject Code: BECE2-519 **L T P C** **Duration: 21 Hrs.**
0 0 2 1

Course Objectives:

1. To study the applications of op-amp as summing, scaling, averaging, instrumentation amplifiers, saw-tooth generator, zero-crossing detector and Schmitt trigger.
2. To study design of delay circuit using 555 timer and design a series regulator.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design oscillators and amplifiers using operational amplifiers.
2. Design filters using Op-amp and perform experiment on frequency response.
3. Analyze the working of voltage control oscillator.
4. Design DC power supply using ICs.

EXPERIMENTS

1. To study differential amplifier configurations.

2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. To study frequency response of an Op Amp
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Application of Op Amp as Log and Antilog amplifier. Design Low pass, High pass and Band pass 1st order butterworth active filters using Op Amp.
9. Design Phase shift oscillator using Op-Amp.
10. Design Wein Bridge oscillator using Op-Amp.
11. Application of Op Amp as Sawtooth wave generator.
12. Application of Op Amp as Zero Crossing detector and window detector.
13. Application of Op Amp as Schmitt Trigger.
14. Design a delay circuit using 555 timer.
15. Design of a function generator
16. Design of a Voltage Controlled Oscillator

Note: At least 12 experiments are required to be performed.

MICROPROCESSOR LAB.

Subject Code: BECE2-520 **L T P C** **Duration: 21 Hrs.**
0 0 2 1

Course Objectives:
The student should be made to:
1. Introduce assembling language Programming concepts and features.
2. Write assembling language Programming for arithmetic and logical operations in 8085.
3. Differentiate Serial and Parallel Interface.
4. Interface different I/Os with Microprocessors.

Course Outcomes:
At the end of the course, the student should be able to:
1. Write assembling language Programmes for fixed and Floating Point and Arithmetic
2. Interface different I/Os with processor.
3. Generate waveforms using Microprocessors.
4. Execute Programs in 8085.

EXPERIMENTS

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8086.
9. Write a program to find maximum and minimum from series using 8086.

10. Write a program to control the operation of stepper motor using 8085/8086 microprocessors and 8255 PPI.
11. Write a program to control speed of DC motor using 8085/8086 microprocessors and 8255 PPI.

Note: At least 08 experiments are required to be performed.

DIGITAL COMMUNICATION LAB

Subject Code: BECE2-521 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
1.To know the principles of sampling & quantization.
2.To study the various waveform coding schemes.
3.To learn the various baseband transmission schemes.
4.To understand the various Band pass signaling schemes.
5.To know the fundamentals of channel coding.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Design PCM systems.
2. Design and implement base band transmission schemes.
3. Design and implement band pass signaling schemes.
4. Analyze the spectral characteristics of band pass signaling schemes and their noise performance.

EXPERIMENTS

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation: error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

Note: At least 08 experiments are required to be performed.

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C**
0 0 2 1

Course Objectives
The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organisations.

Course Outcomes

At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, John M., et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007**.

DATA COMMUNICATION NETWORKS

Subject Code: BECE2-560 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

The students should be made to:

1. Understand the division of network functionalities into layers.
2. Be familiar with the components required to build different types of networks.
3. Be exposed to the required functionality at each layer.
4. Learn the flow control and congestion control algorithms.

Course Outcomes:

At the end of the course, the students should be able to:

1. Identify the components required to build different types of networks.
2. Choose the required functionality at each layer for given application.

3. Identify solution for each functionality at each layer.
4. Trace the flow of information from one node to another node in the network.

Unit-I (12 Hrs.)

Introduction to Data Communication: Goals and Applications of Networks, Wireless Network, Interfaces and services. Reference Models: The OSI reference model, TCP/IP reference model.

Physical Layer: Data and Signals, Digital and Analog transmission, Transmission Media, Wireless transmission, Switching.

Unit-II (14 Hrs.)

Data Link Layer: Data link layer design issues, Services provided to Network layers, Framing, Error control, Flow control, Error detection and correction, Elementary data link protocols, an unrestricted Simplex protocol, A Simplex Stop-and-Wait protocol, Simplex Protocol for a noisy channel, Sliding Window protocols, A protocol using go-back-N, A protocol using selective repeat, Example data link protocol-HDLC, PPP.

Unit-III (12 Hrs.)

Medium Access Sublayer: Channel Allocations, Random Access, ALOHA, Carrier Sense Multiple Access Protocols, Collision free Protocols, Limited contention protocols, Controlled Access, Channelization, Wired LANs: Ethernet, Wireless LANs.

Unit-IV (10 Hrs.)

Network Layer: Network Layer Design issue, Logical Addressing, Address Mapping, Error Reporting and Multicasting, Delivery Forwarding and Routing.

Transport Layer: Process to Process Delivery: UDP, TCP and SCTP.

Application Layer: Design issues of the layer, Domain Name systems, File Transfer, http, web documents, Virtual Terminals.

Recommended Books:

1. J. Frauzon, 'Computer Communication and Networks', Tata McGraw Hill.
2. W. Stallings, 'Data and Computer Communication', PHI.
3. S. Keshav, 'An Engineering Approach on Computer Networking', Addison Welsey.
4. Wayne Tomasi, 'Introduction to Data Communications and Networking', Pearson.
5. A.S. Tanenbaum, 'Computer Networks', PHI.

HUMAN RESOURCE MANAGEMENT

Subject Code: BECE2-561 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives: Understand and apply the policies and practices of the primary areas of human resource management, including staffing, training, Integration, management and compensation**.**

Course Outcomes:

1. Apply effective written and oral communication skills to business situations.
2. Analyze the global business environment.
3. Analyze the local business environment.
4. Use critical thinking skills in business situations.
5. Apply an ethical understanding and perspective to business situations.

Unit-I (12 Hrs.)

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement: Need for Human Resource Planning: Process of Human Resource Planning: Methods of Recruitment: Psychological tests and interviewing: Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970.

Unit-II (12 Hrs.)

Training & Development: Difference between training and Development: Principles of Training: Employee Development: Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job Analysis & Design: Job Analysis: Job Description & Job Description, Job Specification.

Job Satisfaction: Job satisfaction and its importance: Motivation, Factors affecting motivation, introduction to Motivation Theory: Workers ' Participation, Quality of work life.

The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961.

Unit-III (12 Hrs.)

Integration: Human Relations and Industrial Relations: Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry: Employee Employer Relationship Causes and Effects of Industrial disputes: Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective

Bargaining: Role of trade unions in maintaining cordial Industrial Relations.

Unit-I (12 Hrs.)

Maintenance: Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948: Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Recommended Books:

1. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
2. Lowin B. Flippo, 'Principles of Personnel Management', McGraw Hill.
3. R.C. Saxena, 'Labour Problems and Social Welfare', K. Math & Co.
4. A. Minappa and M.S. Saiyada, 'Personnel Management', Tata McGraw Hill.
5. C.B. Mamoria, 'Personnel Management', Himalaya Publishing House, Bombay.
6. T.N. Bhagotiwal, 'Economics of Labour and Industrial Relations', Sahitya Bhawan Agra.

DIGITAL SYSTEM DESIGN

Subject Code: BECE2-562 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
2. To introduce the concept of memories and programmable logic devices.
3. To illustrate the concept of synchronous and asynchronous sequential circuits.

Course Outcomes:

Students will be able to:

1. Design and implement Combinational circuits.
2. Design and implement synchronous and asynchronous sequential circuits.
3. Multi-input system controller design.
4. Write simple HDL codes for the circuits.

UNIT-I (12 Hrs.)

Introduction to Digital Design Concepts: Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals.

Clocked Sequential Finite State Machines: State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers.

UNIT-II (12 Hrs.)

Multi-input System Controllers Design: System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling, state assignment concepts, flip-flop level implementation using VEM's.

Sequential Design using LSI & MSI circuits: Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs).

UNIT-III (12 Hrs.)

Asynchronous Sequential Finite State Machines: Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design.

UNIT-IV (12 Hrs.)

VHDL: Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioural, dataflow and structural models.

Recommended Books:

1. William I. Fletcher, 'An Engineering Approach to Digital Design', PHI.
2. M. Morris Mano, 'Digital Design', Pearson Education.
3. Z. Navabi 'VHDL-Analysis and Modeling of Digital Systems', McGraw Hill.
4. Kevin Skahill, 'VHDL for Programmable Logic', Pearson Education.
5. Jr. Charles H. Roth, 'Fundamentals of Logic Design', Jaico Publishers.
6. John Wakerly, 'Digital Design, Principles and Practices', Pearson Education.

BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

Subject Code: BECE2-563 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
This course introduces general biological concepts:
1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Use bioinstrumentation, required in cellular or molecular biology investigations
2. Apply the concepts of engineering in different streams of biomedical field.
3. To explore and understand different biomedical instruments used in practice.
4. Understands different bio signals / potentials

UNIT-I (10 Hrs.)

Biomedical Signals: Origins of Bioelectric Signals, Human body, Heart and Circulatory System, Electrodes, Transducers, ECG, EMG.

UNIT-II (14 Hrs.)

Recording & Monitoring Instruments: Recording Electrodes, Physiological Transducers, Biomedical Recorders, Biomedical Recorders, Heart rate measurement, Temperature measurement, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Biomedical Telemetry.

UNIT-III (12 Hrs.)

Imaging System: Working with X-Rays, CT scanner, NMR, NMR, Ultrasonic System, Ultrasonic System, Ultrasonic System.

UNIT-IV (12 Hrs.)

Therapeutic & Physiotherapy Equipment's: Cardiac Pacemakers, Cardiac defibrillator, SW Diathermy & MW Diathermy.

Patient Safety: Electric Shock Hazards, Test Instruments, Biomedical Equipment's, Biomedical Equipment's.

Recommended Books:
1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation by', Tata McGraw Hill.
2. Leslie Cromwell, 'Biomedical Instrumentation and Measurements', PHI.
3. T.K. Attuwood, 'Introduction to bioinformatics', Pearson Education.
4. Joseph J. Carr & John M Brown, 'Introduction to Biomedical Equipment Technology', Pearson Education.

MICRO-ELECTRONICS

Subject Code: BECE2-564 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
This course introduces general biological concepts:
1. It helps students to understand importance of Microelectronics.

2. To understand IC fabrication, crystal growth, epitaxy, oxidation, photolithography and etching.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Review different IC's and its fabrication steps.
2. Understand need for crystal growth and epitaxial techniques.
3. Different silicon oxidation processes.
4. Steps behind photolithography and etching technique.

UNIT-I (12 Hrs.)

Introduction: Advantages of IC's, General classification of IC's (Linear/Digital IC's, Monolithic/ Hybrid IC's), Basic IC fabrication steps.

UNIT-II (12 Hrs.)

Crystal Growth and Epitaxy: Starting material for formation of crystal, Horizontal Bridgeman Method, Czochralski growth, Distribution of dopants, Zone refining, Silicon Float Zone process, Si-Wafer preparation, Epitaxial growth, Techniques used for epitaxial, growth (LPE, VPE, MBE).

UNIT-III (12 Hrs.)

Silicon Oxidation: Thermal oxidation process (Kinetics of growth, Thin oxide growth), Effect of impurities on the oxidation rate, Preoxidation Cleaning, Various oxidation techniques, Masking properties of SiO2.

Photolithography and Etching: Pattern generation/Mask making, Contact and Proximity printing, Photoresist, Photolithography Process (Lift off technology, Fine line photolithography), Wet/Dry etching, Reactive Plasma etching techniques and applications

UNIT-IV (12 Hrs.)

Diffusion and Ion Implantation: Basic diffusion process (Diffusion equation, Diffusion profiles), Extrinsic diffusion, Lateral Diffusion, Ion Implantation Process (Ion distribution, Ion Stopping), Implant Damage and Annealing process (Furnace and RTA).

IC Packaging: Isolation Techniques, Testing of the Chip, Wire Bonding techniques, Flip Chip technique, Various Packaging methods and Materials.

Fabrication of Monolithic Components: Fabrication of Diodes, Resistors, capacitors and inductors, Fabrication of BJT and FET, Fabrication of MOS Devices, CMOS fabrication techniques (n-well and p-well process sequences), Introduction to MEMS.

Recommended Books:

1. Gray S. May and Simon M. Sze, 'Fundamental of Semiconductor Fabrication', John Wiley & Sons.
2. Sze, 'VLSI Technology', McGraw Hill Publisher.
3. Jacob and Millman, 'Microelectronics', McGraw Hill Publisher.

MICROWAVE AND ANTENNA THEORY

Subject Code: BECE2-623 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To inculcate understanding of the basics required for circuit representation of RF networks.
2. To deal with the issues in waveguides and different modes.
3. To provide knowledge on the different antenna parameters and antenna types.

4. To explore designing of antenna arrays.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Explain the active & passive microwave devices & components used in Microwave communication systems.
2. Analyze the various Microwave tubes.
3. To understand various antenna parameters and different kinds of antennas.
4. To analyze different antenna arrays.

Unit-I (10 Hrs.)

Waveguides: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, characteristic impedance, introduction to circular waveguides and planar transmission lines.

Unit-II (14 Hrs.)

Microwave Components: Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators, mixers & detectors, matched Load, phase shifter, wave meter, Ferrite devices: Isolators, circulators.

Microwave Tubes: Limitation of conventional tubes: Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO, crossed field amplifiers.

Unit-III (14 Hrs.)

Antenna Parameters: Radiation pattern, Gain, Directive gain, Directivity, effective aperture, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle.

Broadband Antennas: Helical antennas, frequency independent antennas, Log - periodic antennas. Aperture antennas, smart antennas. Long Wire antenna, folded dipole antenna, Yagi-Uda antenna, Slot antenna, Micro Strip or Patch antennas, Antenna measurements.

Unit-IV (10 Hrs.)

Antenna Arrays: Various forms of antenna arrays, arrays of point sources, non-isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing, Dolph-Tchebysceff arrays, continuous arrays, rectangular arrays.

Recommended Books:

1. Samuel Liao, 'Microwave Devices and Circuits', PHI.
2. M. Kulkarni, Umesh, 'Microwave Devices & Radar Engg.'.
3. A.K. Maini, 'Microwaves and Radar', Khanna Publishers.
4. Balanis A. Constantine, 'Antenna Theory, Analysis and Design', Wiley, New York.

MICROCONTROLLER AND EMBEDDED SYSTEM

Subject Code: BECE2-624 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

The students should be made to:

1. Study the Architecture of 8051 microcontrollers.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.

Course Outcomes:

At the end of the course, the students should be able to:

1. Design and implement 8051 microcontroller based systems.
2. Serial communication 0f 8051.
3. Interfacing with 8051.

Unit-I (12 Hrs.)

Introduction: 8051 microcontroller, comparison of microcontroller and microprocessors, Embedded Systems, 8051 Microcontroller: Architecture and Pin Diagram, Program Counter and RAM Spaces, Data types and Directives, Flag Bits and PSW Register, Register Banks and Stack, interrupt.

Unit-II (12 Hrs.)

Programming: Basic assembly language programming concepts Addressing Modes, Arithmetic, Logical instructions and Programming, I/O Port Programming, BCD and ASCII application programs, Single-bit instruction programming, Timers and Counter Programming, Jump and loop Instructions, Introduction of 8051 Programming in C.

Unit-III (12 Hrs.)

Serial communication of 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, serial communication programming, Programming of timer interrupts, Programming of External hardware interrupts, Interrupt priority.

Unit-IV (12 Hrs.)

Interfacing with 8051: LCD and Keyboard Interfacing, interfacing with external memory and 8051 data memory space, interfacing with 8255, Sensors Interfacing and Signal Conditioning, interfacing with Stepper Motor and Servo motors, DS12887 RTC Interfacing and its programming.

Recommended Books:

1. Mazidi Muhammad Ali, 'The 8051 Microcontroller and Embedded Systems', Pearson Publications.
2. Manish K Patel, 'The 8051 Microcontroller Based Embedded Systems', McGraw Hill Publications.
3. Scot MacKenzie, Raphael C.W Phan, 'The 8051 Microcontroller', Pearson Publications.
4. Kenneth J. Ayala, 'The 8051 Microcontroller', Thomson Publishers.

LINEAR CONTROL SYSTEM

Subject Code: BECE2-625 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the elements of control system and their modeling using various Techniques.
2. To introduce methods for analyzing the time response, the frequency response and the stability of systems
3. To introduce the state variable analysis method.
4. Design the compensation technique that can be used to stabilize control systems.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Perform time domain and frequency domain analysis of control systems required for stability analysis.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.

3. Express and solve system equations in state-variable form (state variable models).
4. Determine the (absolute) stability of a closed-loop control system
5. Apply root-locus technique to analyze and design control systems.

Unit-I (8 Hrs.)

Basic Concepts: Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems.

Unit-II (12 Hrs.)

Mathematical Models of Control System: Linear and non-linear systems, Transfer function, Mathematical modeling of electrical, mechanical and thermal systems, Analogies, Block diagrams and signal flow graphs.

Control Components: DC servomotor, AC servomotor, Potentiometers, Synchronous, Stepper-motor.

Unit-III (14 Hrs.)

Time and Frequency Domain Analysis: Transient and frequency response of first and second order systems, Correlation ship between time and frequency domain specifications, Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

Stability Analysis: Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

Unit-IV (14 Hrs.)

State Variable Analysis: Introduction, Concept of State, State variables & State models, State Space representation of linear continuous time systems. State models for linear continuous – time systems, State variables and linear discrete time systems, Solution of state equations, Concept of Controllability & Observability.

Recommended Books:

1. K. Ogata, 'Discrete time Control Systems', Prentice Hall International.
2. Nagrath and Gopal, 'Control System Engineering', New Age International.
3. Warwick, Kevin, 'An Introduction to Control Systems', World Scientific Publishing Co. Pvt. Ltd.
4. W.S. Levine, 'Control System Fundamentals', CRC Press.
5. Williams, Ivan J. Distefano, Joseph J. Stubberud, Allen R., 'Feedback and Control Systems', Schaum's Outlines.

MICROWAVE ENGINEERING LAB.

Subject Code: BECE2-626 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. Know about the behavior of microwave components.
2. Practice microwave measurement procedures.

Course Outcomes:

At the end of the course, the student should be able to:

1. Test& analyze various microwave components.
2. Analyze the radiation pattern of antenna.

EXPERIMENTS

1. Study of wave guide components.

2. To study the characteristics of reflex Klystron and determine its tuning range.
3. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space waves length and guide wavelength.
4. To measure VSWR of unknown load and determine its impedance using a smith chart.
5. To match impedance for maximum power transfer using slide screw tuner.
6. To measure VSWR, insertion losses and attenuation of a fixed and variable attenuator.
7. To measure coupling and directivity of direction couplers.
8. To measure insertion loss, isolation of a three port circulator.
9. To measure the Q of a resonant cavity.
10. To study the V-I characteristics of GUNN diode.
11. To study the radiation pattern of Horn Antenna.

Note: At least 08 experiments are required to be performed.

MICROCONTROLLER LAB.

Subject Code: BECE2-627 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:
The student should be made to:
1. Introduce microcontroller concepts and features.
2. Introduce the practical concepts to control speed of DC and stepper motor.

Course Outcomes:
At the end of the course, the student should be able to:
1. Write programs for 8051 micro controller kit.
2. Understand programs for speed control of DC motor.
3. Understanding to control the speed of stepper motor.

EXPERIMENTS

1. Study of 8051 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending
   order.
5. Write a program to show the use of INT0 and INT1.
6. Write a program of Flashing LED connected to port 1 of the Micro Controller
7. Write a program to generate a Ramp waveform using DAC with micro controller.
8. Write a program to interface the ADC.
9. Write a program to control a stepper motor in direction, speed and number of steps.
10. Write a program to control the speed of DC motor.
11. Interfacing of high power devices to Micro-controller port-lines, LED, relays and LCD display

Note: At least 08 experiments are required to be performed.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C**
0 0 2 1

Course Objectives

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organisation.

Course Outcomes

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

NANO SCIENCE AND NANO TECHNOLOGY

Subject Code: BECE2-665 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To create awareness about nanotechnology issues.
2. To impart knowledge about carbon age and nano tubes.
3. To create awareness about Quantum computing**.**
4. To study the various characterization techniques in nano-electronics

Course Outcomes:

Students shall be able to:

1. Understand the fundamentals and basics of nanotechnology.
2. Understand significance and potential opportunities to create better materials and products.
3. Describe different nano-scale devices.

UNIT I (12 Hrs.)

Basics and Scale of Nanotechnology: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress.

UNIT II (12 Hrs.)

The Carbon Age and Nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical vapor deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics: Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs.)

Nano-scale Devices: Introduction: Quantum Electron Devices: High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing: Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books:

1. C.P. Polle and F.J. Owens, 'Introduction to Nanotechnology' Willey India Pvt. Ltd.
2. Daniel Minoli, 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd.
3. Manasi Karkare, 'Nano Technology: Fundamentals and Applications', I.K. International Pvt. Ltd.
4. Lynn E. Foster, 'Nano Technology', Pearson India.

ADVANCED MICROPROCESSOR

Subject Code: BECE2-666 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

Microprocessors and Microcontrollers are widely used in modern society with applications ranging from automatic gadgets to medical applications. The purpose of this course is to:

1. Introduce students with the advanced technology in embedded systems.
2. The objective is to make students understand architecture and programming of embedded processors.
3. Students will able to interface various circuits with advanced processors.

Course Outcomes:

1. Students will have ability to deal with 16 bit microprocessors.
2. They will be familiar with latest microprocessor.
3. Students will have skills to interface any peripheral devices with different microprocessors.

Unit I (12 Hrs.)

Microprocessor 8086: Block diagram, Architecture & Pin diagram of 8086, pipelining process, flag register. Register details of 8086, operation, different addressing modes.

Unit II (12 Hrs.)

8086 Assembly Language Programming: 8086 flags, JUMP operations, STRING operations, CALL & RET operations, STACK operations, Instruction set of an 8086, 8086 hardware configuration, addressing memory & ports, 8086 Interrupts and interrupt responses, Interrupt system based on 8259 A**.**

Unit III (12 Hrs.)

Interfacing with 8086 Microprocessor: Concept of programmable devices, architecture and programming of programmable I/O port timer, programmable interval timer, programmable peripheral interface, its interfacing with 8086 microprocessor.

Unit IV (12 Hrs.)

Introduction to Advanced Microprocessors: Architectures of 80186-286-386-486, Pentium Processors, Dual core processors, Core to duo, I5 and I-7 Processors.

Recommended Books:

1. Douglas V. Hall, 'Microprocessor & Interfacing: Programming & Hardware', Tata McGraw Hill.
2. M.A. Mazidi, J.G. Mazidi, R.D. McKinlay, 'The 8051 Micro Controllers & Embedded Systems', Indian Reprint, Pearson Education.
3. Kenneth J, Ayala, '8051 Microcontroller: Architecture, Programming and Application', Delmar Learning.
4. Brey, 'Intel Micropocessors, The 8056/8055, 80186/80188, 8028, /80386, 80486, Pentium & Pentium Pro, Pentium II, III, IV: Architecture, Programming and Interfacing', PHI.
5. Myke Predko, 'Programming and Customizing the ARM7 Microcontroller', McGraw Hill.
6. John Morton, 'The PIC Microcontroller: Your Personal Introductory Course', Newnes an Imprint of Butterworth-Heinemann Ltd.

IMAGE AND SPEECH PROCESSING

Subject Code: BECE2-667 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The student should be made to:
1. Learn digital image fundamentals.
2. Be familiar with image compression and segmentation techniques.
3. To introduce speech production and related parameters of speech.
4. To show the computation and use of techniques used in image compression and enhancement.
5. To understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Discuss digital image and speech fundamentals.
2. Apply image enhancement and restoration techniques.
3. Model speech production system and describe the fundamentals of speech.
4. Extract and compare different speech parameters.

Unit-I (12 Hrs.)

Introduction to Image Processing: Historical background, visual perception, image formation, Elements of Storage, sampling & Quantization, Relationships between pixels-neighbors of pixel, connectivity labelling of connected components, Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging, application of image Processing.

Unit-II (12 Hrs.)

Image Enhancement: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo-morphic felling, generation of spatial marks, Colour image processing.

Unit-III (12 Hrs.)

Image Compression: Redundancy models, error free compression, Lossy compression, Image compression standards.

Image Segmentation: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation, use of motion in segmentation.

Unit-IV (12 Hrs.)

Speech Processing: Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis Speech Recognition-speech in the computer-human interface.

Recommended Books:
1. Rafact Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Society.
2. Keenneth R. Castleman, 'Digital Image Processing', Pearson Education Society.

3. A.K. Jain, 'Fundamental of Digital Image Processing', PHI.
4. Iain Murray, 'Speech and Audio Processing for multimedia PC's', Pearson Education Society.

OPTICAL FIBER COMMUNICATION

Subject Code: BECE2-668 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. To Facilitate the knowledge about optical fiber sources and transmission techniques.
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
3. To explore the trends of optical fiber measurement systems.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
2. Explain the various optical sources and optical detectors and their use in the optical communication system.
3. Analyze the digital transmission and its associated parameters on system performance

Unit-I (12 Hrs.)

Introduction to Optical Communication Systems: Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Optical Fibers: Optical fibers structures and their types, fiber characteristics: attenuation, scattering, absorption, fiber bend loss, dispersion, fiber couplers and connectors

Unit-II (12 Hrs.)

Led Light Source: Light emitting diode: recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

Unit-III (12 Hrs.)

Laser Light Source: Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

Unit-IV (12 Hrs.)

Avalanche and Pin Photodetectors: Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

Recommended Books:
1. John M Senior, 'Optical Fiber Communications', PHI.
2. Gerd Keiser, 'Optical Fiber Communications', TMH.

OPERATION RESEARCH

Subject Code: BECE2-669 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. To Facilitate the knowledge about decision making systems.
2. To Enrich the idea of different models.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Identify and develop role of operations in decision making system.
2. Understand the deterministic models.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the waiting line model and project line.
5. Understanding to the decision-making processes.

Unit-I (12 Hrs.)

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on operation research model building –Types & methods.

Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, problems.

Unit-II (12 Hrs.)

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, stepping stone method, MODI methods, degeneracy, assignment, travelling salesman, problems.

Advanced Topic of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

Unit-III (12 Hrs.)

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources levelling in project, problems.

Unit-IV (12 Hrs.)

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.

Decision Theory: Decision process, SIMON model, types of decision making environment - certainty, risk, uncertainty, decision making with utilities, problems.

Recommended Books:
1. TAHA, 'Operation Research', PHI, New Delhi.
2. Ackoff, Churchaman, Arnoff, 'Principle of Operations Research', Oxford IBH, Delhi.
3. Vohra, 'Quantitative Techniques', TMH.
4. H.M. Wagher, 'Principles of operation Research (with Applications to Managerial Decisions), Prentice Hall of India.
5. Philips, Revindran, Solgeberg, 'Operation Research', Wiley ISE.

WIRELESS COMMUNICATION SYSTEMS

Subject Code: BECE2-728 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
The student should be made to:
1. Know the characteristic of wireless channel.
2. Learn the various cellular architectures.
3. Understand the concepts behind various digital signaling schemes for fading channels.
4. Be familiar the various multipath mitigation techniques.
5. Understand the various multiple antenna systems.

Course Outcomes:
At the end of the course, the student should be able to:
1. Characterize wireless channels.
2. Design and implement various signaling schemes for fading channels.
3. Compare multipath mitigation techniques and analyze their performance.
4. Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance.

Unit-I (12 Hrs.)

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit-II (12 Hrs.)

Introduction To Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit-III (12 Hrs.)

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signalling, ISDN (Integrated Services Digital Networks), advanced intelligent networks.

Unit-IV (12 Hrs.)

Intelligent Cell Concept and Application: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

Recommended Books:
1. Theodore S. Rappaport, 'Wireless Communications', Pearson.

2. W.C.Y. Lee, 'Mobile Cellular Telecommunication', McGraw Hill.
3. Jochen Schiller, 'Mobile Communications', Pearson.

DIGITAL SIGNAL PROCESSING

Subject Code: BECE2-729 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To learn discrete Fourier transform and its properties.
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals.
3. To understand Finite word length effects.
4. To study the concept of Multirate and adaptive filters.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Apply DFT for the analysis of digital signals & systems.
2. Design IIR and FIR filters.
3. Characterize finite Word length effect on filters.

Unit-I (12 Hrs.)

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Concept of Frequency in Continuous Time and Discrete Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Applications of Signal Processing.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time systems, Correlation of Discrete Time Signals.

Unit-II (12 Hrs.)

The Z-transform and Its Application to the Analysis of LTI Systems: The z-Transform, Properties of z-Transforms, Inversion of z-Transform, One-sided z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Frequency Analysis of Signals and Systems: Frequency Analysis of Continuous –Time Signals, Frequency Analysis of Discrete Time Signals, Properties of Fourier Transform for Discrete Time Signals. Frequency Domain Characteristics of Linear Time-Invariant Systems, Linear Time-Invariant Systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

Unit-III (12 Hrs.)

The Discrete Fourier Transform its Properties and Applications: Frequency Domain Sampling: The discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods based on the DFT. Frequency Analysis of Signals Using the DFT.

Efficient computation of DFT: Fast Fourier Transforms: Efficient Computation of DFT: FFT Algorithms, Application of FFT Algorithms, A Linear Filtering Approach to Computation of DFT. Quantization Effect in the Computation of DFT.

Unit-IV (12 Hrs.)

Implementation of discrete time systems: Structures for the realization of Discrete Time Systems, Structures for FIR Systems, Structures for IIR Systems, Representation of Numbers, Quantization of Filter Coefficients, Round off Effect in Digital Filters.

Design of Digital Filters: General Considerations like causality etc., Design of FIR Filters, Design of IIR Filters from Analog Filters, Frequency Transformations, Design of Digital Filters Based on Linear Squares Method.

Sampling and Reconstruction of Signals: Sampling of Bandpass Signals, Analog-to-Digital Conversion, Digital-to-Analog Conversion.

Recommended Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Applications', Pearson Prentice Hall.
2. S.K. Mitra, 'Digital Signal Processing: A Computer Based Approach', TMH.
3. A.V. Oppenheim, R.W. Schafer and J.R. Buck, 'Discrete-time Signal Processing', Prentice Hall.
4. B. Widrow and S.D. Stearns, 'Adaptive Signal Processing', Prentice Hall.

DIGITAL SIGNAL PROCESSING LAB

Subject Code: BECE2-730 **L T P C** **Duration: 24 Hrs.**
0 0 2 1

Course Objectives:

The student should be made to:

1. To implement Linear and Circular Convolution.
2. To implement FIR and IIR filters.
3. To study the architecture of DSP processor.
4. To demonstrate Finite word length effect.

Course Outcomes:

Students will be able to:

1. Carry out simulation of DSP systems.
2. Demonstrate their abilities towards DSP processor based implementation of DSP systems.
3. Analyze Finite word length effect on DSP systems.
4. Demonstrate the applications of FFT to DSP.

EXERCISES

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. Write a program in MATLAB to generate standard sequences.
3. Write a program in MATLAB to compute power density spectrum of a sequence.
4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
5. Write a program in MATLAB to verify linear convolution.
6. Write a program in MATLAB to verify the circular convolution.
7. To develop program for finding magnitude and phase response of LTI system Described by system function H(z).
8. To develop program for finding response of the LTI system described by the difference equation.
9. To develop program for computing inverse Z-transform.
10. To develop program for computing DFT and IDFT.
11. To develop program for conversion of direct form realization to cascade form realization.
12. To develop program for cascade realization of IIR and FIR filters.

13. To develop program for designing FIR filter.
14. To develop program for designing IIR filter.
15. To write a MATLAB program for noise reduction using correlation and autocorrelation methods.
16. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response
    from the given transfer function of a discrete-time causal system.
17. Write a program in MATLAB to find frequency response of different types of analog filters.
18. Write a program in MATLAB to design FIR filter (LP/HP) through Window technique.
    a. Using rectangular window.
    b. Using triangular window.

Note: At least 12 experiments are required to be performed.

MINOR PROJECT

Subject Code: BECE2-730 **L T P C**
0 0 8 4

The students are required to undergo Minor Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

COGNITIVE RADIO

Subject Code: BECE2-770 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The student should be made to:
1. Know the basics of the software defined radios.
2. Learn the design of the wireless networks based on the cognitive radios.
3. Understand the concepts of wireless networks and next generation networks.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Describe the basics of the software defined radios.
2. Design the wireless networks based on the cognitive radios.
3. Explain the concepts behind the wireless networks and next generation networks.

Unit-I (12 Hrs.)

Spectrum Scarcity: history and background leading to cognitive radios, Software define radios (SDRs), basic architecture of SDR, power control in cognitive transceivers, Dynamic Spectrum Access, new opportunities, spectrum management.
Cognitive Radios: Scarcity problems, network protocols, standardization, security issues.

Unit-II (12 Hrs.)

Spectrum Sensing: ideal spectrum sensing, Spectrum sensing techniques: Transmission detection (Energy detection, cyclostationary detection, matched filter detection), feature based detection, interference detection, spectrum sensing in fading environment.

Unit-III (12Hrs)

Cooperative Sensing: Importance of cooperative sensing, advantages of spectrum sensing, need of co-operations, centralized cooperative sensing, distributed spectrum sensing. Fusion rules: hard fusion, soft fusion rules.

Unit-IV (12 Hrs.)

Spectrum Management: Spectrum handoff management, spectrum mobility, spectrum sensing in ad-hoc network, spectrum sharing.

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Recommended Books:

1. Bruce A. Fette, 'Cognitive Radio Technology', Elsevier Publication.
2. Ekram Hossain, Dusit Niyato, Zhu Han, 'Dynamic Spectrum Access and Management in Cognitive Radio Networks', Cambridge University Press.
3. Kwang-Cheng Chen, Ramjee Prasad, 'Cognitive Radio Networks', John Wiley & Sons Ltd.
4. Huseyin Arslan, 'Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems', Springer.
5. Linda Doyle, 'Essentials of Cognitive Radio', Cambridge University Press.

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Subject Code: BECE2-771 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the concept of database systems
2. To prepare the student to be in a position to use and design databases for different applications.

Course Outcomes:

1. Master the basic concepts and appreciate the applications of database systems.
2. Be familiar with a relational model.
3. Design principles for relational query language.

Unit-I (12 Hrs.)

Introduction to Database Systems: File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

Physical Data Organization:

File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

Unit-II (12 Hrs.)

Data Models: Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities,

Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

The Relational Model:

Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

Unit-III (12 Hrs.)

Relational Query Languages:

SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

Database Design:

Functional Dependencies, reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions.

Unit-IV (12 Hrs.)

Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, 2PL protocol.

Database Protection: Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital Signatures.

Recommended Books:

1. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', Pearson Education.
2. C.J. Date 'An Introduction to Database Systems', Pearson Education.
3. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press.
4. S. K. Singh, 'Database Systems Concepts, Design and Applications', Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', Tata McGraw Hill.
6. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, 'Database System Concepts', Tata McGraw Hill.

COMPUTER ARCHITECTURE AND ORGANIZATION

Subject Code: BECE2-772 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

Course Objectives:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To expose the students to the concept of pipelining.
5. To familiarize the students with hierarchical memory system including cache memories and virtual memory.

6. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcomes:

At the end of the course, the student should be able to:

1. Design arithmetic and logic unit.
2. Design and analysis of pipelined control units
3. Evaluate performance of memory systems.
4. Understand parallel processing architectures**.**

Unit-1 (12 Hrs.)

Basic Principles: Boolean algebra and Logic gates, Combinational logic blocks (Adders, Multiplexers, Encoders, de-coder), Sequential logic blocks (Latches, Flip-Flops, Registers, Counters)

General System Architecture: Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD): Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language: structured organization: CPU, caches, main memory, secondary memory units & I/O: Performance metrics: MIPS, MFLOPS.

Unit-II (12 Hrs.)

Instruction Set Architecture: Instruction set based classification of processors (RISC, CISC, and their comparison): addressing modes: register, immediate, direct, indirect, indexed: Operations in the instruction set: Arithmetic and Logical, Data Transfer, Control Flow: Instruction set formats (fixed, variable, hybrid): Language of the machine: 8086: simulation using MSAM.

Unit-III (12 Hrs.)

Basic non pipelined CPU Architecture: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage): microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining.

Memory Hierarchy & I/O Techniques: The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit): Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types): Cache memory (Associative & direct mapped cache organizations.

Unit-IV (12 Hrs.)

Introduction to Parallelism: Goals of parallelism (Exploitation of concurrency, throughput enhancement): Amdahl's law: Instruction level parallelism (pipelining, super scaling –basic features): Processor level parallelism (Multiprocessor systems overview).

Computer Organization [8086]: Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts: Memory Hierarchy.

Recommended Books:

1. David A. Patterson and John L. Hennessy, 'Computer Organization and Design', Morgan, Kauffmann, Elsevier Publisher.
2. John P. Hayes, 'Computer Architecture and Organization', TMH.

3. William Stallings, 'Operating Systems Internals and Design Principles', Prentice Hall Upper Saddle River, New Jersey.

SOFT COMPUTING

Subject Code: BECE2-773 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
The students should be:
1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Learn genetic programming.

Course Outcomes:
Upon completion of the course, the student should be able to:
1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic.
4. Apply genetic programming.

Unit-I (12 Hrs.)

Neural Networks: Fundamentals of Neural Networks – History- Architectures- Learning methods- XOR Problem-Delta rule- Derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM- energy function- problems-applications of associative memories- ART1- ART2- applications of adaptive networks.

UNIT-II (12 Hrs.)

Fuzzy Logic: Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems- Crisp logic – predicate logic – fuzzy logic- fuzzy based systems - Defuzzification methods – applications.

Unit-III (12 Hrs.)

Genetic Algorithms: Fundamentals of GA – creation of offspring – encoding – fitness function reproduction – crossover- insertion& deletion- mutation- bitwise operators – applications.

UNIT-IV (12 Hrs.)

Programming Using Mat Lab: Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directed search toolbox.

Recommended Books:
1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley Publications.
2. Yagna Narayanan, 'Artificial Neural Networks', PHI.
3. Bart Kosko, 'Neural Networks & Fuzzy Logic', Prentice Hall
4. Simon Haykin, 'Neural Networks', Prentice Hall.

VLSI DESIGN

Subject Code: BECE2-833 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. In this course, the MOS circuit realization of the various building blocks that is common to any digital VLSI circuit is studied.

2. Architectural choices and performance trade-offs involved in designing and realizing the circuits in CMOS technology are discussed.

Course Outcomes:

Upon completion of the course, students should:

1. Explain the basic CMOS circuits and the CMOS process technology.
2. Discuss the techniques of chip design using programmable devices.
3. Model the digital system using Hardware Description Language.

Unit-I (12 Hrs.)

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture declaration Introduction to behavioural, dataflow and structural models.

VHDL Statements: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

Unit-II (12 Hrs.)

Applications of VHDL: Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

Unit-III (12 Hrs.)

Review of MOS Devices: MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.

Basic Electrical Properties and Circuit Concepts: The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.

Unit-IV (12 Hrs.)

Circuit Characterization and Performance Estimation: Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Recommended Books:

1. Bhasker, 'A VHDL Primmer', Prentice Hall.
2. Weste and Eshrighian, 'Principle of CMOS VLSI Design', Pearson Education.
3. D.A. Pucknell and K. Eshraghian, ‘Basic VLSI Design’, Prentice Hall India, New Delhi.
4. Brown and Vranesic, 'Fundamentals of Digital Logic with VHDL Design', TMH.
5. S.M. Kang, Y. Lebiebici, 'CMOS Digital Integrated Circuits Analysis & Design', TMH.

VLSI DESIGN LAB.

Subject Code: BECE2-834 **L T P C** **Duration: 24 Hrs**

0 0 2 1

Course Objectives:

1. To learn Hardware Descriptive Language(Verilog/VHDL)
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain
3. To familiarize fusing of logical modules on FPGAs
4. To provide hands on design experience with professional design (EDA) platforms.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write HDL code for basic as well as advanced digital integrated circuits.
2. Import the logic modules into FPGA Boards.
3. Synthesize Place and Route the digital IPs.
4. Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

EXPERIMENTS

1. Design of basic Gates: AND, OR, NOT.
2. Design of universal gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Substractor, Full Substractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Design of 4 Bit Binary to BCD Converter using sequential statement
10. Design an 8 Bit parity generator (with for loop and Generic statements)
11. Design of 2,s Complementary for 8-bit Binary number using Generate statements

SEQUENTIAL DESIGN EXPERIMENTS

1. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs
2. Design of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
3. Design of Synchronous 8-bit Johnson Counter.
4. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3- state
5. output (IC 74299)
6. Design of 4 Bit Binary to BCD Converter using sequential statement.
7. Design counters (MOD 3, MOD 5, MOD 8, MOD 16)
8. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
9. Design 3-line to 8-line decoder with address latch

Note: At least 12 experiments are required to be performed.

MAJOR PROJECT

Subject Code: BECE2-874 **L T P C**
0 0 12 6

The students are required to undergo Major Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

CELLULAR AND MOBILE COMMUNICATION

Subject Code: BECE2-874 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the radio wave propagation and interference in mobile communications.
2. To understand the basic knowledge about the generations of mobile communication.
3. To study different architectures of mobile communication and its related parameters.
4. To impart the knowledge about applications of mobile communication.

Course Outcomes:

Student shall be able to:

1. Understand the cellular systems
2. Analyse the concept of switching systems and base station subsystem.

Unit–I (12 Hrs.)

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface – specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features. 3G Systems: UMTS & CDMA 2000 standards and specifications.

Unit –II (12 Hrs.)

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co–channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co–channel interference, real time co–channel interference, co–channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co–channel interference – different types.

Unit –III (12 Hrs.)

Cell Coverage for Signal &Traffic: General introduction, obtaining the mobile point to point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Unit –IV (12 Hrs.)

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non–fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls: hand off, types of handoff and their characteristics, dropped call rates &their evaluation.

Optional Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Books:

1. Kamilo Feher, 'Wireless and Digital Communications', PHI.
2. T.S. Rappaport, 'Wireless Communication, Principles & Practice'.
3. William, C.Y. Lee, 'Mobile Cellular Telecommunications', McGraw Hill.

WIRELESS SENSORS NETWORKS

Subject Code: BECE2-875 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. This course introduces advances in wireless, sensor networks.
2. Wireless Sensor Networks provide opportunities even outside their usual application domain of environmental monitoring.
3. To track all activities, and check for errors that might occur in the process of handling and distributing goods.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand the existing applications of wireless sensor actuator networks.
2. Understand the elements of distributed computing and network protocol design and will learn to apply these principles in the context of wireless sensor networks.
3. Identify the various hardware, software platforms that exist for sensor networks.

Unit-I (12 Hrs.)

Introduction to Wireless Sensor Networks: Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness Advantages of sensor networks, Sensor network applications.

Unit-II (12 Hrs.)

Topology Control: Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF), GEAR, Connectivity driven, SPAN, ASCENT.

Unit-III (12 Hrs.)

WSN Sensors: Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols &Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address & Name management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing.

Unit IV (12 Hrs.)

WSN Platforms & Tools: Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Recommended Books:

1. Holger Karl & Andreas Willig, 'Protocols & Architectures for Wireless Sensor Networks', John Wiley.
2. Feng Zhao & Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach'.
3. Waltenegus Dargie and Christian Poella Bauer, 'Fundamentals of Wireless Sensor Networks Theory and Practice', John Wiley and Sons.
4. Holger Karl and Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley and Sons.

INFORMATION THEORY AND CODING

Subject Code: BECE2-876 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To aware the students about the information theory.
2. To provide the basic concepts of channel capacity.
3. To impart knowledge about linear block codes.
4. To study convolution and BCH codes.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of entropy, mutual information and divergence.
2. Apply and analyze the principles of channel capacity.
3. Use various types of check metrics, linear and cyclic codes.
4. Understand working principle of convolution codes.

Unit-I (12 Hrs.)

Information Theory: Definition of Information, Entropy, Mutual Information, Properties of Mutual Information, Fundamental Inequality, I.T. Inequality, Divergence, Properties of Divergence, Divergence Inequality, Relationship between entropy and mutual information, Chain Rules for entropy, relative entropy and mutual information.

Unit-II (12 Hrs.)

Channel Capacity: Uniform Dispersive Channel, Uniform Focusing Channel, Strongly Symmetric Channel, Binary Symmetric Channel, Binary Erasure Channel. Channel Capacity of the all these channels, Channel Coding Theorem, Shannon-Hartley Theorem.

Data Compression: Kraft inequality, Huffman codes, Shannon-Fano coding, Arithmetic Coding.

UNIT-III (12 Hrs.)

Linear Block Codes: Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, Hamming Code.

Cyclic Codes: Description of Cyclic codes, Generator and parity check matrices of cyclic codes, error detection decoding of cyclic codes.

UNIT-IV (12 Hrs.)

Convolution Codes: Encoding of convolution codes, structural properties of Convolution codes, Distance Properties of convolution codes.

Recommended Books:

1. Arijit Saha, 'Information Theory, Coding & Cryptography', Pearson Education.
2. Ranjan Bose, 'Information Theory, Coding and Cryptography', Tata McGraw Hill.
3. Thomas M. Cover, Joy A. Thomas, 'Elements of Information Theory', Wiley India Pvt.
4. J. Mary Jones, 'Information and Coding Theory', Springer.

OPERATING SYSTEMS

Subject Code: BECE2-877 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:
1. General understanding of structure of modern computers
2. Purpose, structure and functions of operating systems
3. 3.Illustration of key Operating system aspects by example

Course Outcomes:
By the end of the course you should be able to:
1. Describe the general architecture of computers
2. Describe, contrast and compare differing structures for operating systems
3. Understand and analyze theory and implementation of: processes,
4. Resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

Unit-I (12 Hrs.)

Operating System Concepts an Introduction: What is an OS, Need of OS, Different views of an OS, Evolution of OS, Batch Processing, Multiprocessing, Multiprogramming, Time Sharing, Real Time Systems, Network OS, Parallel Processing, Distributed Processing.

Operating System Structures: OS services, System Calls, System Structures, Layered Architecture of an OS.

Introduction to process: Concept of process, Process states and their transitions, PCB, Process Scheduling, Operations on process: Process creation and termination, Threads: User level and kernel level threads.

Unit-II (12 Hrs.)

CPU Scheduling: Introduction, CPU scheduler, Scheduling criteria, Scheduling algorithms: FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

Process Synchronization: Co-operating process, Concurrency, Semaphores.

Deadlocks: Introduction, Deadlock characteristics, Recognition methods, Dealing with deadlocks, Deadlock prevention, avoidance, detection and deadlock recovery.

Unit-III (12 Hrs.)

Memory Management Basics: Introduction, Logical vs. physical address space, Program relocation & management techniques, Continuous storage allocation, Fixed partition contiguous storage allocation, Variable partition CSA, Non-contiguous storage allocation, paging, segmentation.

Virtual Memory: Introduction, Swapping, Demand paging, Pure demand paging FIFO, Optimal.

File System Interface & implementation: File concepts, File naming, File attributes, File access methods, Directory structure.

Unit-IV (12 Hrs.)

Device Mgmt & Storage Structure: I/O subsystems, I/O channels, Secondary storage, Disk structure, Disk scheduling, FIFO, Shortest seek time first SSTF scan, C-SCAN, Look &C-look Disk scheduling algo's.

Protection & Security Introduction: Introduction, Goals of protection, Access rights, Access matrix, Security & its goals, Authentication, Passwords, Encryption, Viruses, worms, Dealing with viruses.

Case Study: UNIX &WIN NT.

Recommended Books:

1. Peter Galvin, 'Operating systems Concepts', Addison Wessly.
2. Ekta Walia, 'Operating systems Concepts', Khanna Publisher.

SATELLITE COMMUNICATION

Subject Code: BECE2-878 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

Course Objectives:

1. To introduce various aspects in the design of systems for satellite communication.
2. Students will be able to understand link design for satellite communication.
3. To provide the knowledge of various multiple access techniques.

Course Outcomes:

Students will be:

1. Able to learn the dynamics of the satellite.
2. Able to understand the communication satellite design.
3. Able to understand how analog and digital technologies are used for satellite communication networks.
4. Able to learn the design of satellite links.
5. Able to study the design of Earth station and tracking of the satellites.

Unit-I (12 Hrs.)

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & ionosphere effects on link design, complete link design, interference effects on complete link design, earth station parameters.

Unit-II (14 Hrs.)

Satellite Analog & Digital Communication: Baseband analog(voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques: TDMA frame structure, burst structure, frame efficiency, super frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

Unit-III (10 Hrs.)

Laser & Satellite Communication: Link analysis, optical satellite link Transmitter & Receiver, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fiber CAT system.

Unit-IV (12 Hrs.)

Satellite Applications: Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Books:

1. Timothy Pratt, 'Satellite Communication', John Wiley & Sons.
2. D.C. Aggarwal, 'Satellite Communication', Khanna Publishers.

B. TECH. ELECTRONICS & INSTRUMENTATION ENGINEERING

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-301	Electronic Devices and Circuits - I	3	1	0	40	60	100	4
BECE3-302	Digital Electronics	3	1	0	40	60	100	4
BECE3-303	Electrical Measurements & Instruments	3	1	0	40	60	100	4
BECE3-304	Network Analysis & Synthesis	3	1	0	40	60	100	4
BECE3-305	Electronic Devices and Circuits - I Lab.	0	0	2	60	40	100	1
BECE3-306	Digital Electronics Lab.	0	0	2	60	40	100	1
BECE3-307	Electromagnetic Field Theory	3	1	0	40	60	100	4
BHUM0-F91	Soft Skills-I	0	0	2	60	40	100	1
BECE3-308	Training -I	0	0	4	60	40	100	2
Total		**15**	**5**	**10**	**440**	**460**	**900**	**25**

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-409	Linear Control System	3	1	0	40	60	100	4
BECE3-410	Transducers & Sensors	3	1	0	40	60	100	4
BECE3-411	Electrical and Electronics Instrumentation	3	1	0	40	60	100	4
BECE3-412	Microprocessors & Peripheral Devices	3	1	0	40	60	100	4
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BECE3-456	Antenna &Wave Propagation							
BECE3-457	Data Structures and Algorithms							
BECE3-458	Electronic Instrumentation							
BECE3-459	Reliability Engineering							
BECE3-413	Linear Control System Lab.	0	0	2	60	40	100	1
BECE3-414	Instrumentation Lab.	0	0	2	60	40	100	1
BECE3-415	Microprocessor Lab	0	0	2	60	40	100	1
BHUM0-F92	Soft Skills-II	0	0	2	60	40	100	1
Total		**15**	**4**	**8**	**440**	**460**	**900**	**23**

In House / Industrial Training of 6 Weeks during Summer vacations

SEMESTER 5th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-516	Pneumatic and Hydraulic Instrumentation	3	1	0	40	60	100	4
BECE3-517	Linear Integrated circuits	3	1	0	40	60	100	4
BECE3-518	Microcontroller and Embedded System	3	1	0	40	60	100	4
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BECE3-560	Advanced Microprocessor							
BECE3-561	Neural Networks and Fuzzy Logic							
BECE3-562	Digital Control System							
BECE3-563	Micro-Electronics							
Open Elective-I		3	0	0	40	60	100	3
BECE3-519	Instrumentation Lab. - II	0	0	2	60	40	100	1
BECE3-520	Microcontroller Lab.	0	0	2	60	40	100	1
BECE3-521	Linear Integrated circuits Lab.	0	0	2	60	40	100	1
BHUM0-F93	Soft Skills–III	0	0	2	60	40	100	1
BECE3-522	Training-II	0	0	0	60	40	100	2
Total		**15**	**3**	**8**	**500**	**500**	**1000**	**24**

SEMESTER 6th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-623	Analytical Instrumentation	3	1	0	40	60	100	4
BECE3-624	Optoelectronics Instrumentation	3	1	0	40	60	100	4
BECE3-625	Signal and Systems	3	1	0	40	60	100	4
Departmental Elective-III (Select any one)		3	0	0	40	60	100	3
BECE3-664	Nano-Science and Nano-Technology							
BECE3-665	Internet of Things							
BECE3-666	Information Theory and Coding							
BECE3-667	Optical Fiber Communication							
Open Elective-II		3	0	0	40	60	100	3
BECE3-626	Analytical Instrumentation Lab.	0	0	2	60	40	100	1
BECE3-627	Industrial Lab.	0	0	2	60	40	100	1
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Total		**15**	**3**	**6**	**380**	**420**	**800**	**21**

SEMESTER 7th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-728	Biomedical Instrumentation	3	1	0	40	60	100	4
BECE3-729	Process Control	3	1	0	40	60	100	4
Departmental Elective-IV (Select any one)		3	0	0	40	60	100	3
BECE3-768	VLSI Design							
BECE3-769	Power Plant Instrumentation							
BECE3-770	Basics of Social Science, Economics and Industrial Management							
BECE3-771	Digital Systems Design							
Open Elective-III		3	0	0	40	60	100	3
BECE3-730	Process Control Lab.	0	0	2	60	40	100	1
BECE3-731	Training-III	0	0	0	60	40	100	4
BECE3-732	Minor Project	0	0	0	60	40	100	4
Total		**12**	**2**	**2**	**340**	**360**	**700**	**23**

SEMESTER 8th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECE3-833	Virtual Instrumentation	3	1	0	40	60	100	4
Departmental Elective-V (Select any one)		3	0	0	40	60	100	3
BECE3-872	Programmable Logic Controller							
BECE3-873	Remote Sensing and Thermal Imaging							
BECE3-874	Advance Photonics							
BECE3-875	Data Acquisition and Processing							
BECE3-834	Virtual Instrumentation Lab.	0	0	2	60	40	100	1
BECE3-835	Major Project	0	0	0	60	40	100	6
Total	**Total 2 Theory & 2 Lab. Courses**	**6**	**1**	**2**	**200**	**200**	**400**	**14**

Total Credits: 25 + 25 + 25 + 23 + 24 + 21 + 23 + 14 = 180

ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code: BECE3-301 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
This course is meant to provide fundamental knowledge to ECE students for understanding of the basic semi-conductor devices and their behaviour under various conditions.

Course Outcomes:
Student after undergoing this course student will be able to:
1. Understand the concepts of PN junction diode and their applications
2. Understand BJT characteristics and determine their behavior under low and high frequencies.
3. Understanding of FETs and their characteristics
4. To understand low and high frequency models

UNIT-I (12 Hrs.)

Semiconductor Diodes: Semi-conductor materials and their characteristics, PN junction Diode - VI characteristics, qualitative and quantitative analysis of its behaviour, Diode resistance, Transition capacitance and Diffusion capacitance, clippers, clampers, rectifiers. Special purpose diodes - Zener diode, varactor diode, schottky diode.

UNIT-II (12 Hrs.)

Bipolar Junction Transistor: BJT – Transistor current components, BJT configurations – CE, CB, CC and their characteristics. Transistor Biasing –Operating point determination, fixed bias, emitter bias, voltage-divider bias. Bias stability – Stabilization against variation in Ico, V_{BE} and β, Bias compensation.

UNIT-III (12 Hrs.)

Field-Effect Transistor: The junction FET - construction, operation, characteristics, parameters, Biasing of JFET, Small signal analysis of JFET as an amplifier- common source and common drain amplifiers. Metal Oxide Semiconductor FET: MOSFET- construction, operation, characteristics, parameters, CMOS devices, CMOS inverter characteristics, metal semiconductor.

UNIT-IV (12 Hrs.)

Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters

Recommended Books

1. Millman, Jacob, Halkias Christos C. and Satyabratajit, 'Electronic Devices and Circuits', Tata McGraw- Hill, New Delhi.
2. Boylestad Nashelsky, 'Electronic Devices and Circuit Theory', Pearson Education.
3. Floyd, L. Thomas, 'Electronic Devices', 6th Edn., Pearson Education, **2002.**
4. Sedra, S. Adel and Smith, Kenneth C., 'Microelectronic Circuits', Oxford University Press, New York.
5. Streetman Ben J., Sanjay Banerjee, 'Solid State Electronic Devices', PHI.

DIGITAL ELECTRONICS

Subject Code: BECE3-302 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives

1. To provide knowledge about basics of Digital Electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Course Outcomes

1. An ability to understand all types of combinational & sequential digital circuits and their designing.
2. Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.
3. To understand various sequential circuits & various Digital Logic families
4. Understand Analog to Digital and Digital to Analog converters and finite state machines

UNIT I (12 Hrs.)

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

UNIT II (12 Hrs.)

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

UNIT III (12 Hrs.)

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

UNIT IV (12 Hrs.)

A/D and D/A Converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs.

Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

Recommended Books

1. R.P. Jain, 'Modern Digital Electronics', Tata McGraw Hill.
2. Malvino & Leach, 'Digital Principles and Applications', McGraw Hill.
3. Taub & Schilling, 'Digital Integrated Electronics', McGraw Hill.

ELECTRICAL MEASUREMENTS & INSTRUMENTS

Subject Code: BECE3-303 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:
1. To aware the students about the basics of Measurements and Instrumentation systems.
2. To impart knowledge about different instruments for electrical parameters.
3. To provide them basic concepts of different types of sensors and transducers.

Course Outcomes:
1. After the completion of course, students will be having skills to design, analyze and instruments.
2. Gain the skill knowledge of bridges and CRO operations.

UNIT I (12 Hrs.)

Introduction to measuring techniques, Necessity of measurements, block diagram of measurement system, Types of instruments, classification of standards, Fundamental Unit and Derived units. Instrument Characteristics; accuracy and precision, indications of precision, repeatability, Threshold, Sensitivity and span. Different types of errors in measurement, relative errors, limiting errors. Gross error, systematic errors, random error, Observational error, statistical analysis of data, arithmetic mean, deviation, average and standard deviation, probable error.

UNIT II (12 Hrs.)

Principle of operation and Constructional Features; D'Arsonval Galvanometer, Moving Coil PMMC & Moving Iron instrument (Repulsion and Attraction type), Electrodynamic instruments, Electrostatic instruments and Thermoelectric Instruments. Range Extension of Voltmeter and Ammeter (Without Mathematical Derivations).

UNIT III (12 Hrs.)

DC potentiometers; Basic potentiometer circuit, Compton type & multiple range potentiometer, constructional details & precision type potentiometers & their applications, AC potentiometer. Measurement of Power using two Wattmeter and three Wattmeter methods, Q meter.

UNIT IV (12 Hrs.)

Measurement of Resistance; Low, Medium and High using; Kelvin Double Bridge, Ammeter-Voltmeter method, substitution method, Wheat Stone Bridge, Loss of Charge and Megger. Measurement of Inductance and Capacitance using; Maxwell Inductance, Hay's, Anderson and Schering Bridges. Measurement of frequency by Wein bridge method.

Recommended Books:
1. Cooper Halfrick, 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990**.
2. A.K. Sawhney, 'Electronic Instrumentation & Measurement', 19th Edn., Dhanpat Rai & Sons., **2011**.
3. Jones & Chin., 'Electronic Instruments and Measurement', 2nd Edn., **2010**.
4. J. Toppin, 'Theory of Errors', 4th Edn., Wessely Publishing, **2009**.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: ECE3-304 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:
1. To aware the students about the basics of networks.
2. To provide them basic concepts of different types of network theorems & their applications.

3. To impart knowledge about different circuits, analyzing and synthesizing methods of circuits.

Course Outcomes:

1. After the completion of course, students will be having skills to design, analyze and synthesize the circuits.
2. Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.

UNIT-I (12 Hrs.)

Circuit Concepts: Circuit elements; Independent and dependent sources, source transformation theory, Mesh & Nodal Analysis: Loop currents and loop equations, node voltages and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum power Transfer, Tellegen's, Reciprocity.

UNIT-II (12 Hrs.)

Network Functions: Terminal pairs or ports, network functions for one-port and two-port networks, pole and zeros of network functions, restrictions on pole and zero locations for driving point functions and transfer functions, time domain behavior from pole-zero plots. Stability criteria of active networks.

UNIT-III (12 Hrs.)

Transient Response: Transient Response of RC, RLC, RL circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform. Network synthesis techniques for two terminal network, foster and cauer form of synthesis.

UNIT-IV (12 Hrs.)

Fundamental of filters, filter networks, equation of filter network, classification and characteristic impedance of low-pass, high-pass, band-pass & band-reject, constant K filters, m – derived. Network synthesis: Hurwitz Polynomial, positive real functions, synthesis of one port and two port networks, elementary idea of active networks and frequency response.

Recommended Books:

1. A. Sudhakar & S.P. Shyammohan, 'Network Analysis', 2nd Edn., TMH, **1994**.
2. Van Valkenburg, 'Introduction to Modern Network Synthesis', 1st Edn., PHI, **1960**.
3. Van Valkenburg, 'Network Analysis', 6th Edn., PHI, **1974**.
4. G.K. Mithal, 'Network Analysis', 5th Edn., Khanna Publication, **2008**.
5. D. Roy Choudhury, 'Networks and Systems', 2nd Edn., New Age Pub., **2009**.

ELECTRONIC DEVICES AND CIRCUITS LAB. - I

Subject Code: BECE3-305 **L T P C**
0 0 2 1

Course Objectives

1. To understand the Characteristics of various semiconductor devices and construction of different electronic circuits using the above devices.
2. To introduce variety of sources to obtain specifications of electronic devices & to impart knowledge about write technical reports related to basic electronic circuits using correct technical vocabulary.
3. Able to understand identification and selection of various electronic components.

Course Outcomes

1. An ability to understand all types of electronics devices and circuits
2. An ability to design and conduct experiments, as well as to analyze and interpret data

EXPERIMENTS

1. Study of Zener regulator as voltage regulator
2. Study of Half wave, full wave & Bridge rectifiers.

3. To plot the input and output characteristics of CE configuration.
4. To study the characteristics of a Class- A amplifier.
5. To study the characteristics of Class- B amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To plot a load line for a CE amplifier and show effect of input signal on Q-point.
9. To demonstrate use of a BJT in a CE amplifier circuit configuration and study its frequency response.
10. To demonstrate use of a BJT in a CC amplifier circuit configuration and study its frequency response.
11. To demonstrate use of a power BJT as an amplifier.

Note: At least 08 experiments are required to be performed.

DIGITAL ELECTRONICS LAB.

Subject Code: BECE3-306 **L T P C**
0 0 2 1

Course Objectives

1. To provide knowledge about basics of Digital Electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic Algebra to represent digital gates in the creation of solutions to design problems

Course Outcomes

1. An ability to understand all types of combinational & sequential digital circuits and their designing.
2. Students will restate and simplify a digital design problem as part of the systematic approach to solving a problem.

EXPERIMENTS

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates;
2. Realization of OR, AND, NOT and XOR functions using universal gates.
3. Realization Half Adder / Full Adder using Logic gates.
4. Realization Half Subtractor / Full Subtractor using Logic gates
5. Design 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter.
6. Design 4-Bit magnitude comparator using logic gates. Multiplexer: Truth-table verification and realization of Half adder and Full adder using MUX.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using DEMUX.
8. Flip Flops: Truth-table verification of RS, JK, D, JK Master Slave Flip Flops.
9. Design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
10. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.

Note: At least 08 experiments are required to be performed.

ELECTROMAGNETIC FIELD THEORY

Subject Code: ECE3-307 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course objectives:

1. To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
2. Study of physical concept and all the important fundamental parameters of transmission lines and waveguides.

Course Outcome:

1. After the completion of the course, the students will be familiar with the concepts of electromagnetic field theory and fundamental equations fields.
2. An ability to understand the concepts of magnetic field and magnetic field intensity.
3. An ability to understand Maxwell's equations in differential and integral forms.
4. To understand transmission lines and smith chart.

UNIT-I (12 Hrs.)

Introduction: Fundamental of vector algebra, Scalar & vector fields, Introduction and transformation on different coordinate systems: (rectangular, cylindrical and spherical co-ordinate system). Introduction to line, surface and volume integrals, definition of gradient, divergent and curl of a vector and their physical significance.

UNIT-II (12 Hrs.)

Electrostatics: Principal of Coulomb's law, definition of electric field intensity from point charges, field due to continuous distribution of charges on an infinite and finite line, Electric Field due to an infinite uniformly charged sheet. Gauss law and its applications, Electric flux density, potential fields due to electric dipole, Laplace and Poison equations.

Magnetostatics: Definition and explanation on Magnetic Field intensity due to a finite and infinite wire carrying current. Magnetic field intensity on rectangular loop carrying current, Amperes Circuital law and its applications, Biot-savart law, the Lorentz force equation for a moving charge, Magnetic Vector Potential.

UNIT-III (12 Hrs.)

Time Varying EM Fields: Maxwell's equation in differential and integral vector form and their interpretations, continuity of currents, conduction and displacement current, boundary conditions, Helmholtz equations, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal incidence and surface impedance. Energy Flow and Poynting theorem, interpretation of E×H, Simple application, complex pointing vector.

UNIT-IV (12 Hrs.)

Transmission Lines: Transmission line model, parameters and properties of transmission line equations, reflections in transmission lines; voltage, current and impedance relations-open, short circuit and matched lines, Standing wave ratio; impedance matching, quarter and half wave lines, single stub and double stub matching; circle diagram –Smithchart.

Recommended Books

1. Matthew N.O. Sadiku, 'Elements of Engineering Electromagnetics', Oxford University Press.
2. William Hayt, 'Engineering Electromagnetics', Tata McGraw Hill.

3. N. NarayanaRao, 'Elements of Engineering Electromagnetics', Pearson Education.
4. R.F. Jorden, 'Electromagnetic Waves & Radio System', Prentice Hall India.
5. J.D. Kraus, 'Electromagnetics', McGraw Hill.
6. Bhag Singh Guru and Hüseyin R. Hiziroglu, 'Electromagnetic Field Theory Fundamentals', Cambridge University Press.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C**
0 0 2 1

Course Objectives
The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes
At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Course, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

LINEAR CONTROL SYSTEM

Subject Code: BECE3-409 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:

1. To obtained transfer functions for electrical circuits, translational/rotational mechanical systems and electromechanical systems.
2. To learn basic goals of control systems in terms of transient/steady state time response behaviour.
3. To update the knowledge about control components.

Course Outcomes:

1. After the completion of the course, the students could have skills about the basics to model the control systems.
2. An ability to analyze the stability of designed systems

UNIT I (12 Hrs.)

Introduction to control systems; open loop and closed Loop systems-, Electrical to Mechanical and Mechanical to Electrical analogy. Block diagram reduction, Signal flow diagram & Meson`s gain formula

Time response analysis: Analysis of Test signals; step. Impulse, & ramp. Analysis of Zero, first & second order systems. Steady state errors, design of second order systems. Stability of control system, Routh Hurwitz's stability criterion, static and dynamic errors coefficients, errors criteria.

UNIT II (12 Hrs.)

Introduction of Root Locus method; Root Locus plots, Rules for constructing root loci, stability analysis of systems using Root locus, concept of dominant, closed loop pole pair, Root contour plots, effect of addition of zeros & poles on root loci

UNIT III (12 Hrs.)

Introduction of frequency response, bode plots, log magnitude versus phase plots, stability margins on the Bode plot, stability analysis of systems using Bode plots, polar plots, Nyquist stability criterion, relative stability.

UNIT IV (12 Hrs.)

Concept of state, state space representation of systems, conversion of state variable models to transfer functions, conversion of transfer functions to state variable models, solution of state equations. controllability & observability.

Recommended Books

1. Kuo, 'Automatic Control System', Princeton Univ. Press. Edition, **2010.**
2. D'Azzo and Houpis, 'Feedback Control System', McGraw Hill Pub. International Edition, **2010.**
3. Oagata, 'Modern Control Engineering', Prentice Hall Pub. Reprint, **2009.**
4. Nagrath & Gopal, 'Control Systems Engineering', New Age International Pub., **2011.**

TRANSDUCERS & SENSORS

Subject Code: BECE3-410 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:
The main aim of this course is to understand the role of sensors and transducers for different communication systems. In this different transducers for Temperature, pressure, Liquid level measurement will be discussed in detail.

Course Outcomes:
For different process control industries sensors and transducers play a vital role. For DCS, SCADA or PLC operation basic idea about measurement will be boosted in the students.

UNIT-I (12 Hrs.)

Introduction to transducers and their classifications.

Pressure transducers: Manometers, Elastic transducers, High Pressure transducers, Mcloed Gauge, Pirani-gauge, Ionization gauge, Knudsen Gauge, pressure smart transmitters.

Temperature Transducers: Resistive transducers (Platinum Resistance Thermometer), Thermistor, Thermoelectric sensors, Solid-state Sensors & Pyrometers.

UNIT-II (12 Hrs.)

Flow Transducers: Classification of flow meter, Volume flow Sensors (orifice, Nozzle, Venture, Pitot type) Turbine type, Rotometers, Anemometers, Ultrasonic, Mass flow meters, Positive displacement type flow-meter, Open channel flow measurement, E.M. Flow-meter.

Level Transducers: Thermal effect type, Electric methods (Resistive method, Conductance probe method, Inductive level gauging and capacitive method), Ultrasonic method.

UNIT-III (12 Hrs.)

Force Transducers: Load Cell, Hydraulic Load Cell Torque Transducers: Absorption type, transmission Type, Stress Type, Deflection type.

Acoustics sensors: ceramic microphones, capacitor microphones, electric microphones, magnetic microphone, Humidity sensors: Hair hygrometer, electrode hygrometer, moisture sensors.

UNIT-IV (12 Hrs.)

Introduction to sensors. **Nano & Bio Sensors**: Structure of Protein, role of protein in nanotechnology, using protein in nanodevices, antibodies in sensing, antibody in nano particle conjugates, enzymes in sensing, enzyme nanoparticle hybrid sensors, Motor proteins in sensing, transmembrane sensors, Nan sensors based on Nucleotides and DNA; Structure of DNA, DNA decoders and microarrays; DNA protein conjugate based sensors, Bioelectronic sensors, biomagnetic sensors.

Recommended Books

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai & Sons.
2. Douglas M. Considine, 'Process/Industrial Instruments & Controls Handbook', 6th Edn., McGraw Hill.
3. H.S. Kalsi, 'Electronic Instrumentation', TMH.
4. J.B. Gupta, 'Electrical, Electronics Measurement & Instrumentation', S.K. Kataria & Sons.
5. Kouroush Kalantar – Zadeh, Benjamin Fry, 'Nanotechnology enabled Sensors', Springer Verlag, New York, **2007**, ISBN-13: 978038732473.
6. D.V.S. Murthy, 'Transducers and Instrumentation', PHI, **2004**.

ELECTRICAL & ELECTRONICS INSTRUMENTATION

Subject Code: BECE3-411 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:
The subject aims to enrich the students about different analog and digital instruments of electrical and electronics domain. To understand various measurements with different instruments.

Course Outcomes:
Subject will provide skills about handling different instruments. They will be able to measurement various unknown signals.

UNIT I (12 Hrs.)

Oscilloscope: Basic principle & construction, CRT, sweep modes, applications in measurement of voltage, freq. (Lissajous pattern), Dual Trace Oscilloscope, sweep modes, active, passive probes, delay line, analog storage oscilloscope, principle of secondary emission, Digital Storage Oscilloscope, sampling rate, sampling oscilloscope, application of the CRO in instrumentation and measurement, sampling oscilloscope. Comparison between analog and digital oscilloscope,

UNIT II (12 Hrs.)

Wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, applications of wave analyzer, Distortion analyzer, spectrum analyzer. **Digital Voltmeter**: Types of DVM; Ramp, Integrating, Successive approximation and Atomization in DVM. **Digital Frequency Meter**: Basic circuit, Frequency Measurement Circuit, High Frequency Measurement.

UNIT III (12 Hrs.)

Recorders: Strip Chart Recorders, X-Y Recorders, Ultraviolet Recorders, Magnetic Tape Recorders. **Display Devices**: Digital display methods, Seven Segment LED display, Dot Matrix display and LCD Display.
Nuclear Instrumentation: Geiger Muller Tube, Ionization Chamber, Scintillation Counter.

UNIT IV (12 Hrs.)

Basic Concept of measurement system, Transducer and its classifications, basic requirements of Transducer/Sensors. Displacement Transducers: LVDT, RVDT and Piezo Electric. Resistance Thermometer, Thermistors, Thermocouples and Strain Gauge Transducer: Basic principle of operation of Resistance strain gauge.

Recommended Books:

1. A.K. Sawhney, 'Electrical & Electronic Measurement and Instrumentation', 4th Edn., Dhanpat Rai & Sons, **2012**.
2. Douglas M. Considine, 'Process/Industrial Instruments & Controls Handbook', 4th Edn., McGraw Hill, **2009**.
3. H.S. Kalsi, 'Electronic Instrumentation', 3rd Edn., TMH, **2010**.
4. J.B. Gupta, 'Electrical, Electronics Measurement & Instrumentation', 3rd Edn., S.K. Kataria & Sons, **2011**.

MICROPROCESSORS & PERIPHERAL DEVICES

Subject Code: BECE3-412 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives:
This course aims to provide detailed description of 8-bit microcontrollers, its architecture, programming, and interfacing. This course also briefly introduce the Next focus is to get student familiarize with architecture and programming of microcontrollers. Besides that, embedded systems are introduced.

Course Outcomes:
1. The students will acquire teaching skills about embedded life
2. They will be able to control various hardware devices with software.
3. Students will learn interfacing skills for different devices

UNIT-I (12 Hrs.)

Introduction:
Introduction to microprocessor, Intel 8085 microprocessor architecture and its operations, various functions, Data flow to/from memory, from/to microprocessor unit, multiplexing and de-multiplexing of address data bus. Comparative study of 8-bit microprocessors: 8085, Motorola 6800, Zilog Z-80.

UNIT-II (12 Hrs.)

Programming with 8085
Addressing modes, Bus timings, T state, machine cycle, timing diagram, Detail study of 8085 instruction set. Memory mapping. Interrupt: necessity, types and structure, stack and subroutines, Programming techniques: looping, counting. Efficient programming in view of memory and speed.

UNIT-III (12 Hrs.)

Interfacing with 8085
Concept of programmable devices, architecture and programming of 8155/8156 (programmable I/O port timer), 8254/8253 (programmable interval timer), 8255 (programmable peripheral interface), its interfacing with 8085 microprocessors. 8279 (keyboard display controller), 8237 (direct memory access controller), 8251(universal synchronous, asynchronous receiver transmitter) with 8085 microprocessor

UNIT-IV (12 Hrs.)

8086 Microprocessor
Block diagram, Architecture & Pin diagram of 8086, pipelining process, flag register. Register details of 8086, operation, different addressing modes.

Recommended Books
1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Applications with the 8085', 5th Edn., Penram International Pub., **2009**.
2. D.V. Hall, 'Microprocessor and Interfacing Programming and Hardware', 3rd Edn., McGraw Hill Co, **2012**.
3. Intel Data Books.

ANTENNA & WAVE PROPAGATION

Subject Code: BECE3-456 **L T P C** **Duration: 34 Hrs.**
3 0 0 3

Course Objectives

1. To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
2. Study of physical concept of radiation patterns and all the important Fundamental Parameters of antennas with antenna Arrays in the antenna terminology

Course Outcome

1. An ability and development of skill of students to design highly effective communication system.
2. After completion of the course, students will be aware with the various performance parameters of the antenna system design and antenna arrays.
3. Understand various types of antennas such as micro strip and Yagi-uda antennas.
4. To understand Ground wave propagation.

UNIT-I (12 Hrs.)

ANTENNA BASICS: Directional properties of antennas, Radiation patterns, antenna gain and aperture, antenna terminal impedance, self and mutual impedance, front to back ratio, antenna beam width and bandwidth, antenna efficiency, antenna beam area, polarization, antenna temperature and Reciprocity properties of antennas.

UNIT-II (12 Hrs.)

ANTENNA ARRAYS: Classification of arrays, linear arrays of two point sources, linear arrays of n-point sources, pattern multiplication, array factor, linear arrays of equal amplitude and spacing (Broadside and end fire arrays) of n-point sources, directivity and beam width, non-uniform arrays excitation using Binomial series.

UNIT-III (12 Hrs.)

SPECIAL ANTENNAS: VLF and LF antennas (Hertz and Marconi antennas), effects of antenna height and effect of ground on performance of antenna, Rhombic antennas, Loop antennas, receiving antenna and radio direction finders. Folded dipole antennas, Yagi-uda antenna, horn antennas, microwave dish, helical antennas, frequency independent antennas, micro strip antennas, fractal antennas.

UNIT-IV (12 Hrs.)

GROUND WAVE PROPAGATION: Characteristics for ground wave propagation, reflection at the surface of a finitely conducting plane and on earth, Attenuation Calculation of field strength at a distance.

IONOSPHERE PROPAGATION: The ionosphere, formation of the various layers, their effective characteristics, reflection and refraction of waves by ionosphere, virtual height, maximum frequency, skip distance, regular and irregular variation of ionosphere, Fading and Diversity reception, ordinary and extraordinary waves.

SPACE WAVE PROPAGATION: Space wave, range and effect of earth, Troposphere waves-reflection, refraction, duct propagation, Troposphere scatter propagation link

Recommended Book

1. J.D. Kraus, 'Antennas', McGraw Hill.
2. C.A. Balanis 'Antennas Theory and Design', Willey.
3. K.D. Prasad, 'Antenna & Wave Propagation', Satya Parkashan, New Delhi.

DATA STRUCTURES AND ALGORITHMS

Subject Code: BECE3-457 **L T P C** **Duration: 34 Hrs.**
3 0 0 3

Course Objectives

1. To use object oriented programming to implement data structures.
2. To introduce linear, non-linear data structures and their applications.

Course Outcomes

Upon completion of the course, students will be able to:

1. Explain the concepts of algorithms, trees and graphs.
2. Write simple applications of data structures.
3. Discuss the different methods of organizing large amount of data**.**

UNIT-I (12 Hrs.)

INTRODUCTION: Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

DEVELOPMENT OF ALGORITHMS: Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.

UNIT-II (12 Hrs.)

LINKED LISTS: Singly linked lists, linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction.

TREES: Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees (AVL), B-trees, B+ -trees.

UNIT-III (12 Hrs.)

GRAPHS: Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and bi-connected components, graph matching.

UNIT-IV (12 Hrs.)

SORTING AND SEARCHING TECHNIQUES: Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Recommended Books

1. J.P. Tremblay and P.G. Sorenson, ‘An Introduction to Data Structures with Applications’, Tata McGraw Hill.
2. S. Sahni, ‘Data Structures, Algorithms ad Applications in C++’, WCB/McGraw Hill.
3. Aho, Ullman and Hopcroft, ‘Data Structures and Algorithms’.
4. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, ‘Data Structures using C’, Pearson Education.

ELECTRONIC INSTRUMENTATION

Subject Code: BECE3-458 **L T P C** **Duration: 34 Hrs.**
3 0 0 3

Course Objectives

1. To provide knowledge about different types of measuring, waveform generation, and analysis electronics instruments.
2. Exposure to various methods of data transmission and transduction.
3. Elaborate discussion about recorder & display devices.

Course Outcomes

1. Able to understand operation of different instruments and able to describe different terminology related to measurements.
2. A recognition and understanding of various analog measuring instruments.
3. Measurement of Resistance and understanding of CRO.

UNIT–I (12 Hrs.)

Units, Dimensions and Standards: SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

General Theory of Analog Instruments: Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/ weight ratio, pointers and scales

UNIT –II (12 Hrs.)

Analog Measuring Instruments: Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/applications.

UNIT – III (12 Hrs.)

Measurement of Resistances: Low, Medium & High Resistance their measurement.

Bridges: Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

UNIT-IV (12 Hrs.)

Cathodes Ray Oscilloscopes: Principles and working of CRO, CRO– probes, Measurement of voltage, frequency and phase angle with CRO.

Recommended Books

1. A.K. Sawhney, 'Electrical & electronic Measurement and Instrumentation', Dhanpat Rai & Sons.
2. J.B. Gupta, 'A Course in Electrical and Electronics Measurement & Instrumentation', S.K. Kataria & Sons.

RELIABILITY ENGINEERING

Subject Code: BECE3-459 **L T P C** **Duration: 34 Hrs.**
3 0 0 3

Course Objectives

1. To provide students with a comprehensive understanding on various aspects of reliability engineering
2. To enable students to understand reliability considerations in designing machine components, elements and systems
3. To ensure sound maintenance of machines and systems and bring about reliability improvement
4. To perform reliability engineering analysis and its management throughout the product life cycle.

Course Outcomes

After successful completion of this course the students will be able to:

1. Demonstrate understanding of basic reliability measures such as failure rate, availability, MTTR, etc.
2. Compute and evaluate reliability for redundant, series, and parallel systems
3. Develop fault trees and apply various reliability models to identify and analysis possible faults in machine systems and assess their impact on overall system reliability & maintainability.
4. Use reliability improvement techniques and undertake product testing.

UNIT-I (12 Hrs.)

Introduction: Definition for Reliability, Static and Dynamic Reliability Need for reliability Engineering, success and failure models, Causes of failures, catastrophic failures and degradation failures Characteristic types of failures, useful life of components, Exponential case of chance failure, Reliability Measures; MTBF, MTTR, hazard rate, probability distribution function, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Raleigh, Weibull, Gamma distribution, marks, Chains, failures data analysis.

UNIT-II (12 Hrs.)

Series Parallel Systems: Reliability Block Diagrams, series systems, parallel systems, K-out of-M systems, open and short circuits failures, standby systems.

Reliability Analysis of Non-Series Parallel System: Boolean algebra Method, Outset approach, delta star method, logical signal relation method, Bay's Theorem Method.

Reliability Prediction: objective of reliability prediction, classification, and information sources for failure rate data, prediction methodologies, general requirements, Role and limitations of Reliability prediction.

UNIT-III (12 Hrs.)

Reliability Allocation: subsystems reliability improvement, allocation for new units, criticality.

Maintainability and Availability: forms of maintenance, measures of Maintainability and availability, maintainability function, availability function, two-unit parallel system with repair, Markov Model for two unit systems, preventive maintenance, provisioning of spares.

UNIT-IV (12 Hrs.)

Reliability Testing: kinds of testing, component reliability measurements, parametric methods, confidence limits, accelerated testing, equipment acceptance testing, standard life testing plans, accelerated life testing, system safety analysis-FMECA, risk priority number and its allocation.

Economics of Reliability Engineering: Reliability cost, Life Cycle Costing, effect of reliability on cost, reliability achievement cost models, reliability Utility cost models, Replacement policies.

Recommended Books

1. K.K. Agarwal, 'Reliability Engineering', Kluwer Academic Press, USA, **1993.**

2. E. Balagurusamy, 'Reliability Engineering', Tata McGraw Hill, 4th Reprint, **2003.**
3. L.S. Srinath, 'Reliability Engineering', East West Press Pvt. Ltd, 3rd Edn., **1991.**
4. Brijendra Singh, 'Quality Control and Reliability Analysis', Khanna Publishers, **1998.**
5. E.E. Lewis, 'Introduction to Reliability Engineering', John Wiley and Sons, **1987.**

CONTROL SYSTEM LAB.

Subject Code: BECE3-413 **L T P C**
0 0 2 1

Course Objectives:

1. To understand the basics of MATLAB software.
2. To introduce variety of control system strategies.
3. To comment about the stability of designed systems.

Course Outcomes:

1. To acquire skills to understand all types of control components
2. An ability to analyze the stability of control systems

EXPERIMENTS

1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox
2. Determination of step response for first order & second order system with unity feedback and their display on CRO. Calculation and verification of time constant, peak overshoot, setting time etc. from the response.
3. To locate ploe zero locations of a control system.
4. Determination of Root Locus of a control system
5. Determination of Bode plot of a control system.
6. Determination of Nyquist Plot of a control system
7. Evaluation of steady state error, setting time, percentage peak overshoot, gain margin, phase margin, with addition of lead compensator & by compensator in forward path transfer function for unity feedback control system.
8. Determination of control system specifications for variations of system parameters in practical position control system.
9. Design of a second order linear time invariant control system and study of system response with unit step input.
10. To study the characteristics of potentiometers and to use 2- potentiometers as an error detector in a control system.
11. To study the synchro Transmitter-Receiver set and to use it as an error detector
12. To study the Speed – Torque characteristics of an AC Servo Motor and to explore its applications.
13. To study the Speed – Torque characteristics of a DC Servo Motor and explore its applications.
14. To study various electro-mechanical transducers i.e. resistive, capacitive and inductive transducers
15. To study a LVDT (AC-AC, DC-DC) as a transducer and its processing circuits
16. To obtain the transfer function of a D.C. motor – D.C. Generator set using Transfer Function Trainer.

INSTRUMENTATION LAB.

Subject Code: BECE3-414 **L T P C**
0 0 2 1

Course Objectives:

1. To understand the working principal and construction of the measuring instruments and recorders.
2. To measuring various electrical parameters using meters and transducers.
3. To calibrate the measuring devices such as meters and transducers.

Course Outcomes:

1. After the completion of the course, the students could have skills about the basic measurement circuits, their operational characteristics and their applications.
2. An ability to use the techniques and skills to CRO.

EXPERIMENTS

1. Study of principle of operation of various types of electromechanical measuring instruments.
2. To measure high value of DC current and voltage using shunt and Multiplier.
3. To measurement of low resistance using wheat stone bridge.
4. To measure active and reactive power in 3-phase balanced load by one wattmeter method.
5. To measure the active power in 3-phase balanced and unbalanced load by two wattmeter method and observe the effect of power factor variation on wattmeter reading.
6. To study and calibrate Energy Meter.
7. Measurement of resistance using Kelvin's Bridge.
8. Measurement of self-inductance using Anderson's Bridge.
9. Measurement of capacitance using Schering Bridge.
10. Plotting of Hysteresis loop for a magnetic material using flux meter.
11. Measurement of frequency using Wein's Bridge.
12. To study the connections and use of Current and Potential transformers and to find out ratio error.
13. Determination of frequency and phase angle using CRO.
14. Measurement of unknown voltage using potentiometer.

MICROPROCESSOR LAB.

Subject Code: BECE3-415 **L T P C**
0 0 2 1

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8086.
9. Write a program to find maximum and minimum from series using 8086.
10. Write a program to control the operation of stepper motor using 8085/8086 microprocessors and 8255 PPI.
11. Write a program to control speed of DC motor using 8085/8086 microprocessors and 8255 PPI

SOFT SKILLS-II

Subject Code: **BHUM0-F92** **L T P C**
0 0 2 1

Course Objectives
The course aims to address various challenges of communication as well as behavioural skills faced by individual at work place and organisations. Also, it aims to enhance the employability of the students.
Course Outcomes
At the end of the course the student will be able to understand the importance of goal setting. They will also be able to handle stress in their lives and future in a better way.

UNIT-1

DEVELOPING POSITIVE ATTITUDE- Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.
IMPROVING PERCEPTION- Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

CAREER PLANNING-Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

ART OF READING-Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

STRESS MANAGEMENT - Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

PNEUMATIC AND HYDRAULIC INSTRUMENTATION

Subject Code: BECE3-516 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives: The student should be able to,
1. Understand the pneumatic and hydraulic systems.
2. Be familiar with the hydraulic actuators and control valves.
3. To get the knowledge about timing and sequence diagrams.
4. Learn about the hydraulic and pneumatic controllers.

Course Outcomes:
At the end of the course, the student should be able to:
1. Identify the components required to build different types of pneumatic and hydraulic systems

2. Understand the concept of various control valves and hydraulic actuators
3. Identify solution for Pneumatic temperature, pressure transmitters & PLC.
4. Learn the working principle of Pneumatic Sensors and controllers.

UNIT I (12 Hrs.)

Introduction: Basic requirement for Pneumatic System, Servicing compressed air: Air compressors, air treatment stages, pressure regulation. Introduction to hydraulic system, comparison of pneumatic and hydraulic system.

UNIT II (12 Hrs.)

Pneumatic & hydraulic Actuators, cylinders Spring, spring less, spring with positioner piston & motor actuators, electro pneumatic actuators, cylinder lubrication, cylinder with sensors, hydraulic actuators, control valves, types of control valves, basic pneumatic circuits.

UNIT III (12 Hrs.)

Timing & Sequence Diagram: Cylinder sequencing hydraulic & pneumatic Accessories pneumatic telemetry systems: Pneumatic temperature & pressure transmitters their working & applications, electrical control in pneumatic circuit. Introduction to PLC, architecture of PLC, Programming of PLC.

UNIT IV (12 Hrs.)

Pneumatic & Hydraulic Controllers (P, PI, PID), P & ID Diagrams, Converters: I/P, P/I, Pneumatic Relay, Pneumatic Sensors Flapper nozzle assembly. Maintenance and troubleshooting of pneumatic and hydraulic systems. Introduction to Mechatronics and its approach.

Recommended Books

1. C.D. Johnson, 'Process Control Instrumentation Technology', PHI.
2. Krishan Kant, 'Computer Based Industrial Control', PHI.
3. Andrew Parr, 'Pneumatic & Hydraulic', PHI.
4. D. Considine, 'Process Industrial Instruments & Control Handbook', McGraw Hill.
5. B.G. Liptak, 'Instrument Engineers Handbook', CRC Press.

LINEAR INTEGRATED CIRCUITS

Subject Code: BECE3-517 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. Students will be able to understand basic concepts of OP-AMPs characteristics and their specifications.
2. Op-AMP applications to signal conditioning for amplifiers, filters and oscillators.
3. Op-AMP applications for comparators and data conversions will be studied.

Course Outcomes:

1. Students will be able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.
2. Students will acquire the ability to design and test practical circuits for amplifiers.
3. Students will be able to analyze the operation of active filters.

UNIT-I (12 Hrs.)

Introduction to Op–Amp: Operational Amplifier, Block diagram, analysis and its schematic symbol, interpretation of IC 741 datasheet and characteristics, practical op–amp, all important electrical parameters and their values, Op-amp applications in open loop configuration.

Concept of Feedback, Op–Amp with Negative Feedback: Introduction and Block diagram representation of feedback configurations, Voltage Series feedback amplifier, Voltage Shunt feedback and derivation of important electrical parameters

UNIT-II (12 Hrs.)

Introduction to Operational Amplifiers and Characteristics: Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations.

The Practical op-amp: Introduction, input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, transient response, interpretation of TL082 datasheet.

UNIT-III (12 Hrs.)

Amplifiers and Oscillators Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, isolation amplifiers, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO.

Active Filters: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, notch filter; all pass filters, self-tuned filters.

UNIT-IV (12 Hrs.)

Advanced Applications: Applications as Frequency Divider, PLL, AGC, AVC using op-AMP and analog multipliers, Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, ADC TL0820 & DAC-7821.

Recommended Books

1. Ramakant A. Gayakward, ‘Op–Amps & Linear Integrated Circuits’, Pearson Education.
2. William D. Stanley ‘Operational Amplifiers with Linear Integrated Circuits’, 4th Edn.
3. Millman & Grabal, ‘Micro Electronics’, Tata McGraw Hill.
4. ‘Op Amps & Linear Integrated Circuits by Coughlin’, Prentice Hall.

MICROCONTROLLER AND EMBEDDED SYSTEM

Course Code: BECE3-518 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. The student should be made to:
2. Study the Architecture of 8051 microcontroller.
3. Learn the design aspects of I/O and Memory Interfacing circuits.
4. Study about communication and bus interfacing.

Course Outcomes:

1. At the end of the course, the student should be able to:
2. Design and implement 8051 microcontroller based systems.
3. Serial communication 0f 8051.

4. Interfacing with 8051

UNIT I (12 Hrs.)

Introduction: 8051 microcontroller, comparison of microcontroller and microprocessors, Embedded Systems, 8051 Microcontroller: Architecture and Pin Diagram, Program Counter and RAM Spaces, Data types and Directives, Flag Bits and PSW Register, Register Banks and Stack, interrupt,

UNIT II (12 Hrs.)

Programming: Basic assembly language programming concepts Addressing Modes, Arithmetic, Logical instructions and Programming, I/O Port Programming, BCD and ASCII application programs, Single-bit instruction programming, Timers and Counter Programming, Jump and loop Instructions, Introduction of 8051 Programming in C.

UNIT III (12 Hrs.)

Serial Communication of 8051: Basics of Communication, Overview of RS-232, UART, USB, 8051 connections to RS-232, serial communication programming, Programming of timer interrupts, Programming of External hardware interrupts, Interrupt priority.

UNIT IV (12 Hrs.)

Interfacing with 8051: LCD and Keyboard Interfacing, interfacing with external memory and 8051 data memory space, interfacing with 8255, Sensors Interfacing and Signal Conditioning, interfacing with Stepper Motor and Servo motors, DS12887 RTC Interfacing and its programming.

Recommended Books:

1. Mazidi Muhammad Ali, 'The 8051 Microcontroller and Embedded Systems', Pearson Publications.
2. Manish K. Patel, 'The 8051 Microcontroller Based Embedded Systems', McGraw Hill Publications.
3. Scot MacKenzie, Raphael C.W Phan, 'The 8051 Microcontroller', Pearson Publications.
4. Kenneth J. Ayala, 'The 8051 Microcontroller', Thomson Publishers.

ADVANCED MICROPROCESSOR

Course Code: BECE3-560 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives

1. The purpose of this course is to introduce students with the advanced technology in embedded systems.
2. The objective is to make students understand architecture and programming of embedded processors.
3. Students will be able to learn and apply assembly language programming
4. Students will able to interface various circuits with advanced processors.

Course Outcomes

1. Students will have ability to deal with 16 bit microprocessors
2. They will be familiar with latest microprocessor and assembly language programming
3. Students will have skills to interface any peripheral devices with different microprocessors.
4. Students will have an introduction about more advanced processors like core to duo, I-5 & I-7.

Unit I

Microprocessor 8086: Block diagram, Architecture & Pin diagram of 8086, pipelining process, flag register. Register details of 8086, operation, different addressing modes.

Unit II

8086 Assembly Language Programming: 8086 flags, JUMP operations, STRING operations, CALL & RET operations, STACK operations, Instruction set of an 8086, 8086 hardware configuration, addressing memory & ports, 8086 Interrupts and interrupt responses, Interrupt system based on 8259 A**.**

Unit III

Interfacing with 8086 Microprocessor: Concept of programmable devices, architecture and programming of programmable I/O port timer, programmable interval timer, programmable peripheral interface, its interfacing with 8086 microprocessor.

Unit IV

Introduction to Advanced Microprocessors: Architectures of 80186-286-386-486, Pentium Processors, Dual core processors, Core to duo, I-5 and I-7 Processors.

Recommended Books:

1. Douglas V. Hall, 'Microprocessor & Interfacing: Programming & Hardware', Tata McGraw Hill.
2. M.A. Mazidi, J.G. Mazidi, R.D. Mc Kinlay 'The 8051 Micro Controllers & Embedded Systems', Pearson Education.
3. Kenneth J, Ayala, '8051 Microcontroller: Architecture, Programming and Application', Delmar Course.
4. Brey, 'Intel Micropocessors, The 8056/8055, 80186/80188, 8028, /80386, 80486, Pentium & PentiumPro, Pentium II, III, IV: Architecture, Programming and Interfacing', PHI.
5. Myke Predko, 'Programming and Customizing the ARM7 Microcontroller', McGraw-Hill.
6. John Morton, 'The PIC Microcontroller: Your Personal Introductory Course', Newnes (an imprint of Butterworth-Heinemann Ltd.).

NEURAL NETWORKS AND FUZZY LOGIC

Subject Code: BECE3-561 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

The student should be made to:

1. Learn the various soft computing frame works
2. Be familiar with design of various neural networks
3. Learn about the concepts of Fuzzification and De-Fuzzification.
4. Describe various optimization techniques.

Course Outcomes:

Upon completion of the course, the student should be able to:

1. Apply various soft computing frame works.
2. Design of various neural networks.
3. Use fuzzy logic and Fuzzy rules.
4. Learn and understand various optimization techniques.

UNIT I

Neural Networks: History, Overview of Biological Neuro-System, Terminology of Artificial Neural Network, Comparison of BNN and ANN, Mathematical Models of Neuron, ANN Architecture, Topology, Fundamental Course Laws, Course Paradigms-Supervised, Unsupervised and reinforcement Course.

UNIT II

Perceptron Architecture, Single layer perceptron, Perceptron Course Rules, Multi-layer perceptron, Back Propagation Algorithm, Associative Memories, Hopfield Networks, Competitive Course, Self-organizing Maps, ART Networks, Applications of Artificial Neural Networks.

UNIT III

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Linguistic Variables, Membership Function, Fuzzification, De-Fuzzification to Crisp Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations, Fuzzy rule generation (IF-THEN), Applications of Fuzzy Logic.

UNIT IV

Neuro-Fuzzy System: Introduction and Architecture of Neuro-Fuzzy Networks.

Introduction to different Optimization Techniques: Genetic Algorithm, Particle Swarm Optimization, Biogeography Based Optimization, Bacterial Forging Optimization, Detailed study of Genetic Algorithm, GA in problem solving, Implementation of GA.

Recommended Books

1. N. Yegnanarayana, 'Artificial Neural Network', PHI.
2. Laurene Fausett, 'Fundamental of Neural Networks', Pearson.
3. Simon Haykin, 'Neural Networks', Pearson.
4. S. Rajasekaran and G.A. Vijayalakshmi, 'Neural Networks, Fuzzy Logic and Genetic Algorithms', PHI.
5. Timothy J. Ross, 'Fuzzy Logic with Engineering', John Wiley.
6. S.N. Sivanandam, 'Introduction to Fuzzy Logic using MATLAB', Springer.
7. Ahmad M. Ibrahim, 'Introduction to Applied Fuzzy Electronics', PHI.

DIGITAL CONTROL SYSTEM

Course Code: BECE3-562 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

Course Objectives:

1. To identify the different control system terminologies.
2. To describe the operation of digital control devices systems.
3. To study the different control systems using state variable methods.
4. To study stability analysis and analysis using state variable methods.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of stability, transfer function and terminologies of control systems.
2. Apply and analyze the principles of state feedback and state regulator.
3. Use various types of State Variable Methods for Digital Control Systems.

UNIT I

Introduction: Control system terminology, control theory history and trends, computer-based control. An overview of classical approach to analog controller design. Basic digital control scheme. Principles of signal conversion, Basic discrete time signals, Time domain models for discrete-time systems. Transfer function models, Stability on the Z-plane and jury stability criterion. Sampling as impulse modulation, Sampled spectra and aliasing. Filtering, choice of sampling rate, Principles of discretisation. Routh stability criterion on the r-plane.

UNIT II

Models of Digital Control Devices and Systems, Z-domain description of sampled continuous-time plants and systems with dead-time, Digital Controller design using direct synthesis procedures. Stability improvement by state feedback, Necessary and sufficient conditions for arbitrary pole-placement. State regulator design, Design of state observer. Compensator design by separation principle. Servo design. State feedback with integral control., Deadbeat control by state feedback and deadbeat observers.

UNIT III

Control System Analysis using State Variable Methods for Digital Control Systems: State variable representation, Conversion of state variable models to transfer function and of transfer function to canonical state variable models, Eigen values and Eigen vectors, Solution of state difference equations, controllability and Observability, Multi variable system.

UNIT IV

Lyapunov Stability Analysis: Basic concepts, Stability definitions and theorems, Lyapunov functions for linear and nonlinear systems, A model reference adaptive system. Parameter optimization and optimal control, Quadratic performance index, control configurations, State regulator design through the Lyapunov equation, Optimal state regulator through the Matrix Riccati-equation for digital control systems.

Recommended Books

1. B.C. Kuo,‘ Digital Control Systems’, Prentice Hall of India.
2. Sushil Das Gupta, ‘Automatic Control Systems’, Khanna Publishers.
3. M. Gopal, ‘Digital Control & State Variable Methods’, TMH.
4. M. Gopal, ‘Control System Principles & Design’, TMH.
5. K. Ogata, ‘Discrete-Time Control Systems’, Prentice Hall India.

MICROELECTRONICS

Course Code: BECE3-563 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

The student should be made to:

1. Know the characteristic of Integrated Circuits
2. Learn the basics of diffusion and photolithography.
3. Understand the concepts behind etching and annealing techniques.
4. Be familiar the various types of IC packages and assembly techniques

Course Outcomes:

At the end of the course, the student should be able to:

1. Characterize Integrated Circuits
2. Understand and Implementation of oxidation, diffusion and photolithography
3. Describe photo resist, annealing and etching techniques in IC fabrication.
4. Compare several of IC packages and assembly techniques

UNIT I

Introduction to Integrated Circuits and advantages, classification of integration, size and complexity of IC’s, Crystal Growth of Silicon: Electronic-Grade Silicon, Czochralski Crystal growth, Liquid Encapsulated Czochralski growth, Zone-refining and float zone growth, Bridgman growth of GaAs. Wafer preparation, Slicing and polishing, Epitaxy, VPE, MBE, MOCVD.

UNIT II

Oxidation, characterization of oxide films, diffusion, Diffusion, Fick's diffusion equation in one dimension, ion implantation, Rapid Thermal Annealing, Photolithography, E-beam lithography, optical lithography, and X-Ray lithography.

UNIT III

Photo resists: positive and negative photo resists, mask generation, wet and dry etching, Plasma and Rapid Thermal-Processing: Reactive Ion Etching technique, RTP for annealing, CVD and LPCVD techniques for deposition of poly silicon, silicon nitride and silicon dioxide, Metallization and patterning.

UNIT IV

VLSI process integration, process flows for CMOS and bipolar IC processes, Assembly techniques and Packaging of I.C's**,** packages Types, Packages using surface-mount-technology (SMT), Yield, reliability.

Recommended Books

1. S.M. Sze, 'VLSI Technology', Tata McGraw Hill.
2. Campbell, Stephen A., 'The Science and Engineering of Microelectronic Fabrication', Oxford Uni. Press.
3. S.K. Ghandhi, 'VLSI Fabrication Principles', John Wiley & Sons.

INSTRUMENTATION LAB.-II

Subject Code: BECE3-519 **L T P C**
0 0 2 1

Course Objectives:

1. To understand the working principal and construction of the measuring instruments and recorders.
2. To measuring various electrical parameters using meters and transducers.
3. To study the characteristics of potentiometers, synchro set, dc and a.c. servo-systems.

Course Outcomes:

1. After the completion of the course, the students could have skills about the basic measurements of transducers, meters and servo systems.
2. An ability to use the techniques and skills to operate various meters, motors and transducers.

EXPERIMENTS

1. To determine output characteristic of a LVDT and determine its sensitivity.
2. Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of small project using signal conditioning circuit.
3. Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.
4. To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.
5. To study transmitter- receiver characteristics of a synchro set to use the set as control component.
6. To study the operation of a d-c positional servo system and to investigate the effect of damping and supply voltage on its response.
7. To study the operation of an a.c. position servo-system and to obtain effects of supply voltage and system parameter on its transient response.

8. To study a stepper motor and control its direction speed and number of steps with the help of a microprocessor.
9. Design & Performance of Instrumentation amplifiers and Active filters.
10. To study the performance of Strain Gauge & pressure transducers.

Note: Perform any 08 experiments from the above list of experiments.

MICROCONTROLLER LAB.

Subject Code: BECE3-520 **L T P C**
0 0 2 1

Course Objectives:

The student should be made to:

1. Introduce microcontroller concepts and features.
2. Implement assembly language programming for various applications
3. Introduce the practical concepts to control speed of DC and stepper motor.

Course Outcomes:

At the end of the course, the student should be able to:

1. Write programs for 8051 micro controller kit.
2. Understand programs for speed control of DC motor.
3. Understanding to control the speed of stepper motor.

EXPERIMENTS

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
5. Write a program to show the use of INT0 and INT1.
6. Write a program of Flashing LED connected to port 1 of the Micro Controller
7. Write a program to generate a Ramp waveform using DAC with micro controller.
8. Write a program to interface the ADC.
9. Write a program to control a stepper motor in direction, speed and number of steps.
10. Write a program to control the speed of DC motor.
11. Interfacing of high power devices to Micro-controller port-lines, LED, relays and
12. LCD display.

Note: Perform any 08 experiments from the above list of experiments.

LINEAR INTEGRATED CIRCUITS LAB.

Subject Code: BECE3-521 **L T P C**
0 0 2 1

Course Objectives

1. To study the applications of op-amp as summing, scaling, averaging, instrumentation amplifiers, saw-tooth generator, zero-crossing detector and Schmitt trigger.
2. To study design of delay circuit using 555 timer and design a series regulator.

Course Outcomes

At the end of the course, the student should be able to:

1. Design oscillators and amplifiers using operational amplifiers.
2. Design filters using Op-amp and perform experiment on frequency response.
3. Analyze the working of voltage control oscillator.
4. Design DC power supply using ICs.

EXPERIMENTS

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. To study frequency response of an Op Amp
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Application of Op Amp as Log and Antilog amplifier. Design Low pass, High pass and Band pass 1st order butterworth active filters using Op Amp.
9. Design Phase shift oscillator using Op-Amp.
10. Design Wein Bridge oscillator using Op-Amp.
11. Application of Op Amp as Sawtooth wave generator.
12. Application of Op Amp as Zero Crossing detector and window detector.
13. Application of Op Amp as Schmitt Trigger.
14. Design a delay circuit using 555 timer.
15. Design of a function generator
16. Design of a Voltage Controlled Oscillator

Note: At least 12 experiments are required to be performed.

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C**
0 0 2 1

Course Objectives

The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organisations.

Course Outcomes

At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration- Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, John M., et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007**.

ANALYTICAL INSTRUMENTATION

Subject Code: BECE3-623 **L T P C** **Duration: 48 Hrs..**
3 1 0 4

Course Objectives:

The student should be made to:

1. Understand the electromagnetic radiation and spectrum.
2. Be familiar with the components of spectrometry and photometry.
3. Be exposed to the Nuclear magnetic resonance spectrometry and mass spectrometry.
4. Learn the various characterization techniques.

Course Outcomes:

At the end of the course, the student should be able to:

1. Identify the components required to understand electromagnetic radiation and spectrum
2. Understand the theoretical concepts of flame photometry, emission spectrometry and atomic absorption spectrometer.
3. Describe the principle and basic components of NMR and mass spectrometry.
4. Learn the various characterization techniques like SEM, TEM etc.

UNIT I (12 Hrs.)

Introduction to electromagnetic Radiation & spectrum and interaction of radiation with matter. Laws relating to Absorption of Radiation; Beer Lamberts law, Ultraviolet (UV) and Visible absorption instruments components. UV and Visible instruments: spectro photo-meters: single and dual beam. Infra-Red (IR) spectrophotometers: basic components, types, Fourier transform techniques.

UNIT II (12 Hrs.)

Emission spectrometry: Theoretical concepts, instrumentation: source unit, electrodes. Direct reading multichannel spectrometers. Flame photometry: principle, constructional details, fuel gases, atomizer, burner, optical and recording systems. Atomic absorption spectrometers: theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems.

UNIT III (12 Hrs.)

Nuclear magnetic resonance (NMR) spectrometry: principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details, spin decoupler, Fourier transform NMR spectroscopy. Electron spin resonance (ESR) spectrometry: principle and constructional details. Basic principle of chromatography – Gas & Liquid column chromatograph.

Mass spectrometry: basic components, types (magnetic deflection type, time of flight, double focusing, quadrupole, gas chromatograph mass spectrometer (GCMS) system,

UNIT IV (12 Hrs.)

Characterization Techniques: Construction, principle and working of Scanning Electron Microscope (SEM), Scanning Tunneling Microscope (STM), Atomic Force Microscope (AFM), Transmission Electron Microscope (TEM) and X-Ray Diffractometer (XRD).

Recommended Books

1. R.S. Khandpur, 'Handbook of Analytical Instrumentation', Tata McGraw-Hill.
2. Willard, Merrit and Dean, 'Instrumental Methods of Analysis', CBC Publishers.
3. E.W. Ewing, 'Instrumental Methods of Chemical Analysis', McGraw Hill.
4. Bharat Bhushan, 'Handbook of Nanotechnology', Springer.
5. P.J. Goodhew and F.J. Humphreys, 'Electron Microscopy and Analysis', Taylor & Francis.
6. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, 'Basic Science and Emerging Technologies', Overseas Press.

OPTO ELECTRONICS INSTRUMENTATION

Subject Code: BECE3-624 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To inculcate understanding of the basics required for optical components.
2. To deal with the issues of the light transmission through a fiber.
3. To instill knowledge on optical fiber measurements.
4. To deal with fiber optic sensors and other fiber optical application

Course Outcomes:

Upon completion of the course, students will be able to:

1. Explain the nature of light, black body radiation and optical components.
2. Describe the modes of fibers and losses in optical fiber.
3. Analyze the various parameters required for the measurement of optical fiber.
4. Illustrate various fiber optic sensors.

UNIT I (12 Hrs.)

Nature of light, wave nature of light, light sources black body radiation, units of light. Optical components; Prisms, Filters, Monochromators, Diffraction Gratings, Holographic Gratings. Light Sources; Discharge lamps, Nernst lamp, Incandescence lamp, Globar, Led and Laser. Light Detectors: Photovoltaic, photo detector, photo diode array & APD.

UNIT II (12 Hrs.)

Principle of light transmission through a Fiber. Classification of optical fibers; Single Mode and Multi-Mode Fibres, Step Index and Graded Index Fibres. Losses in Optical Fibers; Absorption, Scattering and Dispersion. Optical Windows for Fiber Optic Transmission system.

UNIT III (12 Hrs.)

Optical Fiber Measurements: N.A. measurement, working of OTDR, microprocessor based OTDR, applications of OTDR, dispersion measurements, Bit Error Rate (BER) measurement, attenuation measurement using OTDR, cut off wavelength measurement, micro bending loss measurement. Splicing of fibers.

UNIT IV (12 Hrs.)

Fiber Optic Sensors, intensity modulated sensors, microben strain intensity modulated sensor, liquid level types hybrid sensor, internal effect intensity modulated sensor, phase sensor, diffraction grating sensors, sensors using single mode fiber, inter ferometric temperature sensor, distributed fiber optic sensors.

Optical Fiber Applications in the field of Communication, LAN and Medical diagnostic.

Recommended Books:

1. Optical Fibers & Fiber Optic Communication systems by Subir Kumar Sarkar, S. Chand & Co.
2. Opto electronics: Fiber Optics and Lasers by Morris Tischler, A Lab Text Manual, McGraw Hill.
3. Fiber Optics Handbook for Engineers & Scientist (Optical & Electro-optical Engineering Series), by Frederick C. Allard, McGraw Hill.
4. Optical Fiber Communications, Principles & Practice by John M. Senior, Prentice Hall of India.
5. Optical Fiber Communications by Gerd Keiser, McGraw-Hill International.
6. Optical Fiber Communications, Principles & Practice by John M. Senior, Pearson Publishers.

SIGNAL AND SYSTEMS

Subject Code: BECE3-625 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To be able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
3. To impart them knowledge of various types of noises.

Course Outcomes:

1. An ability to analyze various types of signals in communication system.
2. Developing skills to understand random signals.
3. To understand various types of noises.
4. Understand signal transmission through linear networks.

UNIT-I (12 Hrs.)

Systems and Signal Analysis: Detailed Classification of Signals and Systems, Fourier Series and its properties, Fourier transform and its properties along with applications, Discrete Time Fourier Series (DTFS) and Discrete Time Fourier Transform (DTFT).

Correlation and Spectral Density: Definition of Correlation and Spectral Density, Analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

UNIT-II (12 Hrs.)

Random Signal Theory: Introduction to Probability Theory, Definition of Probability of Random Events. Joint and Conditional Probability, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Examples of PDF, Transformation of Random Variables. Random Processes, Stationary and Ergodicity.

UNIT-III (12 Hrs.)

Introduction to Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure. Experimental determination of Noise Figure, Pulse Response and Digital Noise and its elimination.

UNIT-IV (12 Hrs.)

Signal Transmission Through Linear Networks: Convolution Theorem and its graphical interpretation. The Sampling Theorem, Low Pass and Band Pass Networks, Matched Filter, Enveloped detector.

Recommended Books

1. B.P. Lathi, 'Digital and Analog Communication Systems', Oxford University Press.
2. Ravi Kumar, 'Signals and Systems', PHI Course.
3. Simon Haykin, 'Signals and Systems', Wiley.
4. D. Ganesh Rao and Satish Tunga, 'Signals and Systems', Pearson.

NANO SCIENCE AND NANO-TECHNOLOGY

Subject Code: BECE3-664 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To create awareness about nanotechnology issues.
2. To impart knowledge about carbon age and nano tubes.
3. To create awareness about Quantum computing**.**
4. To study the various characterization techniques in nano-electronics

Course Outcomes:

Students shall be able to

1. Understand the fundamentals and basics of nanotechnology.
2. Understand significance and potential opportunities to create better materials and products.
3. Describe different nano-scale devices.

UNIT I (12 Hrs.)

Basics and Scale of Nanotechnology: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress.

UNIT II (12 Hrs.)

The Carbon Age and Nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical vapor deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics: Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs.)

Nano-scale Devices: Introduction: Quantum Electron Devices; High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing; Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books

1. C.P. Polle and F.J. Owens, 'Introduction to Nanotechnology', Willey India Pvt. Ltd.
2. Daniel Minoli, 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd.
3. Manasi Karkare, 'Nano Technology: Fundamentals and Applications', I.K. International Pvt. Ltd.
4. Lynn E. Foster, 'Nano Technology', Pearson India.

INTERNET OF THINGS

Subject Code: BECE3-665 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives

1. To aware the students about the internet and networking basis.
2. To provide the basic concepts of internet of things (IoT) platforms.
3. To impart knowledge about IoT architecture and application development.
4. To study case studies and advance IoT applications.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of OSI model, data transfer and network topologies.
2. Apply and analyze the principles wired and wireless networking equipment.
3. Use various types of IoT architectures and web of things
4. Understand the home and commercial applications of IoT.

UNIT-I (10 Hrs.)

Internet/Web and Networking Basics: OSI Model, Data transfer referred with OSI Model, IP Addressing, Point to Point Data transfer, Point to Multi Point Data transfer & Network Topologies, Sub-netting, Network Topologies referred with Web, Introduction to Web Servers, Introduction to Cloud Computing

UNIT-II (12 Hrs.)

IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards. Network Fundamentals: Overview and working principle of Wired Networking equipment's – Router, Switches, Overview and working principle of

Wireless Networking equipment's – Access Points, Hubs etc. Linux Network Configuration Concepts: Networking configurations in Linux Accessing Hardware & Device Files interactions.

UNIT-III (12 Hrs.)

IoT Architecture: History of IoT, M2M – Machine to Machine, Web of Things, IoT protocols Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis the Architecture the Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN, Security aspects in IoT

IoT Application Development: Application Protocols: MQTT, REST/HTTP, CoAP, MySQL 13 36 /85

UNIT-IV (14 Hrs.)

Back-end Application Designing: Apache for handling HTTP Requests, PHP & MySQL for data processing, MongoDB Object Type Database, HTML, CSS &jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development, Application Development for mobile Platforms: Overview of Android / IOS App Development tools.

Case Study & Advanced IoT Applications: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Recommended Books

1. Zach Shelby, Carsten Bormann, 'The Wireless Embedded Internet', Wiley.
2. Ovidiu Vermesan, Peter Friess, 'Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems', River Publishers.
3. Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, 'Interconnecting Smart Objects with IP: The Next Internet'.
4. Lu Yan, Yan Zhang, Laurence T. Yang, HuanshengNing, 'The Internet of Things: From RFID to the Next-Generation Pervasive Networked'.
5. Vijay Madisetti, Arshdeep Bahga, 'Internet of Things (A Hands-On-Approach).

INFORMATION THEORY AND CODING

Subject Code: BECE3-666 **L T P C** **Duration: 37 Hrs.**

3 0 0 3

Course Objectives:

1. To aware the students about the information theory.
2. To provide the basic concepts of channel capacity.
3. To impart knowledge about linear block codes.
4. To study convolution and BCH codes.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of entropy, mutual information and divergence.
2. Apply and analyze the principles of channel capacity.
3. Use various types of check metrics, linear and cyclic codes.
4. Understand working principle of BCH and convolution codes.

Unit-I (12 Hrs.)

Information Theory: Definition of Information, Entropy, Mutual Information, Properties of Mutual Information, Fundamental Inequality, I.T. Inequality, Divergence, Properties of Divergence, Divergence

Inequality, Relationship between entropy and mutual information, Chain Rules for entropy, relative entropy and mutual information.

Unit-II (12 Hrs.)

Channel Capacity: Uniform Dispersive Channel, Uniform Focusing Channel, Strongly Symmetric Channel, Binary Symmetric Channel, Binary Erasure Channel. Channel Capacity of the all these channels, Channel Coding Theorem, Shannon-Hartley Theorem.

Data Compression: Kraft inequality, Huffman codes, Shannon-Fano coding, Arithmetic Coding.

Unit-III (12 Hrs.)

Linear Block Codes: Systematic linear codes and optimum decoding for the binary symmetric channel; Generator and Parity Check matrices, Syndrome decoding on symmetric channels; Hamming codes; Weight enumerators and the MacWilliams identities; Perfect codes. Cyclic Codes, BCH codes

Unit-IV (12 Hrs.)

Decoding of BCH Codes: Berlekamp's decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. A fast Berlekamp - Massey algorithm.

Convolution codes: Viterbi decoding algorithm, Turbo Codes, Concatenated Codes.

Recommended Books

1. Arijit Saha, 'Information Theory, Coding & Cryptography', Pearson Education.
2. Ranjan Bose, 'Information Theory, Coding and Cryptography', Tata McGraw Hill.
3. Thomas M. Cover, Joy A. Thomas, 'Elements of Information Theory', Wiley India Pvt.
4. J. Mary Jones, 'Information and Coding Theory', Springer.

OPTICAL FIBER COMMUNICATION

Subject Code: BECE3-667 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To Facilitate the knowledge about optical fiber sources and transmission techniques
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
3. To explore the trends of optical fiber measurement systems.

Course Outcomes:

1. Upon completion of the course, students will be able to:
2. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
3. Explain the various optical sources and optical detectors and their use in the optical communication system.
4. Analyze the digital transmission and its associated parameters on system performance

UNIT-I (12 Hrs.)

Introduction to Optical Communication Systems: Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays, Advantages of optical fiber communication.

Optical Fibers: Optical fibers structures and their types, fiber characteristics: attenuation, scattering, absorption, fiber bend loss, dispersion, fiber couplers and connectors

UNIT-II (12 Hrs.)

LED Light Source: Light emitting diode: recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

UNIT-III (12 Hrs.)

LASER Light Source: Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

UNIT-IV (12 Hrs.)

Avalanche and PIN Photo Detectors: Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

Recommended Books

1. John M Senior, 'Optical Fiber Communications', PHI.
2. Tata McGraw Hill, Gerd Keiser, 'Optical Fiber Communications'.
3. John Gowar, 'Optical Communication Systems', PHI.
4. Selvarajan, Kar, Srinivas, 'Optical fiber Communication', Tata McGraw Hill.

ANALYTICAL INSTRUMENTATION LAB.

Subject Code: BECE3-626 **L T P C**
0 0 2 1

Course objectives:

1. To introduce the students about the theoretical concepts associated with pH measurement.
2. To be able to think critically & to apply problem solving & reasoning strategies to the analysis of various gases.
3. To impart them knowledge of fluoride and moisture contents.

Course Outcomes:

1. Developing skills to measure pH using pH meter.
2. To understand viscosity and strength of solutions.
3. Understand the concept of fluoride and moisture contents

EXPERIMENTS

1. pH measurement of a given sample on microprocessor based pH meter.
2. To estimate the concentration of given sample in a given solution (PPM) on flame photometer.
3. To measure the viscosity of given solution.
4. To measure the strength of oxygen dissolved (PPM) in a given solution.
5. To analyse a given gas using gas analyser.
6. To determine fluoride content in a given sample using fluoride meter.
7. To determine moisture content in a given sample using Karl Fischer Titrator.

Note: At least 07 experiments are required to perform.

INDUSTRIAL LAB.

Subject Code: BECE3-627 **L T P C**
0 0 2 1

Course Objectives:
The student should be made to:
1. To introduce Programmable logic controllers concepts and features.
2. To introduce the practical concepts of Distributed control system and SCADA.
3. To introduce the functioning of relays and sensors

Course Outcomes:
At the end of the course, the student should be able to:
1. Write basic programs using ladder programming
2. Analyze the application of Distributed control systems.
3. Understand Functioning of different relays and sensors

EXPERIMENTS

1. To understand Programmable logic controllers
2. To implement basic programmes using Ladder programming
3. To implement basic logics using statement lists
4. To overview about SCADA.
5. To acquire knowledge about Distributed control system.
6. Temperature controller using Distributed control system.
7. Pneumatics controller using Distributed control system
8. Level control using Distributed control system.
9. Functioning of different relays and sensors
10. To understand different diagrams representation in Industry.

Note: At least 08 experiments are required to perform.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C**
0 0 2 1

Course Objectives
The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organisation.

Course Outcomes
At the end of the course, the student will be able to:
1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation

skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

BIOMEDICAL INSTRUMENTATION

Subject Code: BECE3-728 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To identify the various biomedical instruments and their characteristics.
2. To learn about the Therapeutic equipment and central nervous system.
3. To study the different ultrasound and medical imaging systems.
4. To study safety parameters of biomedical instruments.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand concepts of biomedical instruments and bioelectric signals.
2. Apply and analyze the principles of Therapeutic equipment and central nervous system.
3. Describe the various types of biomedical imaging systems.
4. Understand sources of noise and safety parameters of biomedical equipment.

UNIT I (12 Hrs.)

Introduction to Biomedical Instrumentation: Sources of bio medical potentials. Different bioelectric signals like ECG, EMG & EEG. Bio potential electrodes: basic electrode theory, nearest equation, electrical conductivity of electrode jellies & creams, skin contact impedance & its measurement. Electrodes for ECG, EEE & EMG. Cardiovascular system: physiology of heart & cardio vascular system, ECG lead configuration, ECG recorders, Vector cardiograph, Phonocardiograph, measurement of cardiac output, blood flow & blood pressure.

UNIT II (12 Hrs.)

Central Nervous System: Anatomy of nervous system, neuronal communication, neuronal receptors. The sematic nervous system & spinal reflexes. Neuronal firing measurements, EEG measurements, Recorder for EEG & EMG. Therapeutic equipment: cardiac pacemakers, cardiac de fibrillators, nerve & muscle stimulators, Diathermy: shortwave, UV & ultrasonic.

UNIT III (12 Hrs.)

Medical Imaging System: Instrumentation for Diagnostics-Ray: properties, X-ray units, X-ray machines & generation process, special imaging techniques for X-rays. Ultrasonic Imaging System: Physics of ultrasound, basic modes of transmission, ultrasonic display modes: A scan, B scan & M scan with applications. Biological effects of ultrasound.

UNIT IV (12 Hrs..)

Electrical Safety: General consideration for biomedical recorder amplifiers, sources of noise in zero level recording circuits, physiological effects of electrical currents, electric shock hazards, leakage currents, methods of accident prevention. Test instruments for checking safety parameters of biomedical equipment.

Recommended Books

1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation', Tata McGraw Hill.
2. L. Cromwell, F. Weibell, E.A. Pfciffer, 'Biomedical Instrumentation & Measurements', PHI.
3. Carr & Brown, 'Introduction to Biomedical Equipment', McGraw Hill.
4. J.G. Webster, 'Medical Instrumentation', 3rd Edn., John Wiley.

PROCESS CONTROL

Course Code: BECE3-729 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To identify the various process variables and mathematical modeling.
2. To learn about the controlling modes of process control.
3. To study the different types of actuators.
4. To study various advanced control schemes.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand need and application of mathematical modeling.
2. Realize and analyze the control modes.
3. Describe the various types of actuators used in process control.
4. Understand the different advanced control schemes.

UNIT I (12 Hrs.)

Introduction: Incentives of process control, Synthesis of control system. Classification and definition of process variables.

Mathematical Modelling: Need and application of mathematical modelling, Lumped and distributed parameters, Analogies, Thermal, Electrical and chemical systems, Modelling of CSTR, modelling of heat exchanger, Interacting and non-interacting type of systems, Dead time elements, Developing continuous time and discrete time models from process data.

UNIT II (12 Hrs.)

Control Modes: Definition, Characteristics and comparison of on-off, Proportional (P), Integral (I), Differential (D), PI, PD, PID, Dynamic behavior of feedback controlled processes for different control modes, Control system quality, IAE, ISE, IATE criterion, tuning of controllers Ziegler-Nichols, Cohen-Coon methods, Controller troubleshooting.

Realization of Control Modes: Realization of different control modes like P, I, D, In Electric, Pneumatic, Hydraulic controllers.

UNIT III (12 Hrs.)

Actuators: Hydraulic, Pneumatic actuators, Solenoid, E-P converters, Control valves, Types, Functions, Quick opening, Linear and equal percentage valve, Ball valves, Butterfly valves, Globe valves, Pinch valves, Valve application and selection, Cavitation and flashing, Dampers and variable speed Drives.

UNIT IV (12 Hrs.)

Advanced Controls: Introduction to advanced control schemes like Cascade, Feed forward, Ratio, Selective, Override, Split range and Auctioneering control, Plant wide control.

Recommended Books

1. C.D. Johnson, 'Process Control Instrumentation Technology', PHI.
2. Krishan Kant, 'Computer based Industrial Control', PHI.
3. Andrew Parr, 'Pneumatic & Hydraulic', PHI.
4. D. Considine, 'Process Industrial Instruments & Control Handbook', McGraw Hill.
5. B.G. liptak, 'Instrument Engineers Handbook', CRC Press.

VLSI DESIGN

Subject Code: BECE3-768 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. In this course, the MOS circuit realization of the various building blocks that is common to any digital VLSI circuit is studied.
2. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.

Course Outcomes:

Upon completion of the course, students should

1. Explain the basic CMOS circuits and the CMOS process technology.
2. Discuss the techniques of chip design using programmable devices.
3. Model the digital system using Hardware Description Language.

UNIT-I (12 Hrs.)

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, and Logical operators. Types of delays, Entity and Architecture Declaration Introduction to behavioral, dataflow and structural models

VHDL Statements: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

UNIT-II (12 Hrs.)

Applications of VHDL: Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

UNIT-III (12 Hrs.)

Review of MOS Devices: MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS.

Basic Electrical Properties and Circuit Concepts: The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Driving large Capacitive loads, Propagation delays and effect of wiring capacitance.

UNIT-IV (12 Hrs.)

Circuit Characterization and Performance Estimation: Estimation of R, C, L, Switching Characteristics-delay models. Power dissipation. Scaling of MOS circuits. Effect of device scaling on circuit performance.

Recommended Books

1. Bhasker, 'A. VHDL Primmer', Prentice Hall.
2. Weste and Eshrighian, 'Principle of CMOS VLSI Design', Pearson Education.
3. D.A. Pucknell and K. Eshraghian, 'Basic VLSI Design', Prentice Hall India, New Delhi.
4. Brown and Vranesic, 'Fundamentals of Digital Logic with VHDL Design', Tata McGraw Hill.
5. S.M. Kang, Y. Lebiebici, 'CMOS Digital Integrated Circuits Analysis & Design', Tata McGraw Hill.

POWER PLANT INSTRUMENTATION

Subject Code: BECE3-769 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To identify the various process of thermal power plant.
2. To learn about the boiler and turbine instrumentation.
3. To study the automation strategy of thermal power plant.
4. To study hydroelectric power generation and regulation.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand comparison between thermal, hydro, nuclear power plant.
2. Analyze the different parameters of boiler and turbines.
3. Describe the PLC, DCS, SCADA strategies of industrial automation.
4. Understand the different hydraulic and nuclear power generators.

UNIT I (12 Hrs.)

Thermal Power Plant: Unit overview, types of boilers, turbine generators, condensers, variable speed pumps and fans, material handling system. Comparison of thermal, hydro, nuclear power plant, boiler safety standards, boiler inspection procedures.

UNIT II (12 Hrs.)

Boiler & Turbine instrumentation: Control and optimization, combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, Oxygen/CO/CO2 furnace

draft, electrical megawatt controls, boiler interlocks, sequence event recorder, supervisory control, data acquisition systems, burner management systems and controllers.

Turbine Instrumentation: Speed calculation, valve actuation, auto-start-up, thermal stress control, condition monitoring and power distribution instrumentation.

UNIT III (12 Hrs.)

Automation strategy of thermal power plant (PLC, DCS, SCADA) and open system application, block schematic, control equipment, boiler automation, diagnostic functions and protection, digital electro hydraulic governor, man-machine interface, software system, graphic display of automated power plant application functions, variable pressure control.

UNIT IV (12 Hrs.)

Hydroelectric power generation, regulation and monitoring of voltage and frequency, pollution and effluent monitoring and control. Nuclear power generation and control station.

Recommended Books

1. Payne and Thompson, 'Efficient Boiler Operation Source Book', The Fairmont Press.
2. Popovic & Bhatkar, 'Distributed Computer Control for Industrial Automation', Marcel Dekker.
3. Dickinson and Cheremisinoff, 'Solar Energy Technology', Vol. I, II, Marcel Dekker, CRC Press.
4. Krishna Kant, 'Computer Based Industrial Control', PHI.
5. Energy Management Handbook by W.C.Turner, John willey & Sons .
6. Energy Technology Handbook by D.M.Considine, Tata McGraw Hill.
7. B.G. Liptak, 'Process Control', CRC Press.

BASICS OF SOCIAL SCIENCE, ECONOMICS AND INDUSTRIAL MANAGEMENT

Subject Code: BECE3-770 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To study the several aspects of social change
2. To learn about nature and scope of economics.
3. To study about the difference of management and administration.
4. To study marketing management and total quality management.

Course Outcomes:

At the end of the course the student shall be able to:

1. Understand the processes of social change.
2. Analyze the different parameters of industrial economics.
3. Describe the entrepreneurial qualities, skills, role of government, financing agencies
4. Understand the marketing management and total quality management

Unit I (12 Hrs.)

Meaning of social change, nature of social change, theories of social change. The direction of social change, the causes of social change, the process of social change. Factors of social change - the technological factors, the cultural factors, the effect of technology on major social institutions, social need of status system, social relations in industry.

Unit II (12 Hrs.)

Nature and Scope of Economics: Special significance of economics to engineers. Meaning of Industrial Economic, production function and its type; least cost combination, law of variable

proportion, law of return increasing, constant and diminishing. Fixed and variable costs in short run and long run, opportunity costs, relation between AC and MC, U shaped short run AC curve. Price and output determination under monopoly in short run and long run. Price discrimination, price determination under discriminating monopoly. Comparison between monopoly and perfect competition.

Unit III (12 Hrs.)

Meaning of Management: Characteristics of management, management versus administration, management-art, science and profession, Fayol's principles of management. Personal management - meaning and functions, manpower – process of manpower planning, recruitment and selection – selection procedure. Training – Objectives and types of training, various methods of training. Labour legislation in India – main provisions of industrial dispute & act 1947. Industrial ownership: types, single partnership, JSC, cooperative, public sector, private sector, merits & demerits. Entrepreneurial qualities, skills, role of government, financing agencies.

Unit IV (12 Hrs.)

Marketing Management: Definition and meaning, scope of marketing management, marketing research meaning, objectives. Purchasing management – meaning and objectives, purchase procedure, inventory control techniques. Financial management- Introduction, objectives of financial decision, source of finance. Quality management: Concepts and applications of Kaizen, quality circle, ISO 9000series, just-in-time, quality planning and total quality management, elements of TQM, quality circles.

Recommended Books

1. K.P. Sundharam and E.N. Sundharam, 'Economic Analysis', Sultan Chand & Sons.
2. M.L. Jhingam, 'Micro Economic Theory', Konark Publishers Pvt. Ltd.
3. M.L. Seth, Lakshami Narain Aggarwal, 'Principles of Economics', Educ. Pub. Agra.
4. D.R. Sachdeva and Vidya Bhusan, 'An Introduction to Sociology', Kitab Mahal Pub.
5. R.D. Aggarwal, 'Organization and Management', Tata McGraw Hill.
6. N.C. Shukla, 'Business Organization and Management', Sultan Chand & Sons.

DIGITAL SYSTEM DESIGN

Subject Code: BECE3-771 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
2. To introduce the concept of memories and programmable logic devices.
3. To illustrate the concept of synchronous and asynchronous sequential circuits

Course Outcomes:

Students will be able to:

1. Design and implement Combinational circuits.
2. Design and implement synchronous and asynchronous sequential circuits.
3. Write simple HDL codes for the circuits.

UNIT-I (12 Hrs.)

Introduction to Digital Design Concepts: Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals.

Clocked Sequential Finite State Machines: State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers.

UNIT-II (12 Hrs.)

Multi-input System Controllers Design: System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling.

Sequential Design using LSI & MSI circuits: Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs).

UNIT-III (12 Hrs.)

Asynchronous Sequential Finite State Machines: Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design.

UNIT-IV (12 Hrs.)

VHDL: Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioural, dataflow and structural models.

Recommended Books

1. William I. Fletcher, 'An Engineering Approach to Digital Design', PHI.
2. M. Morris Mano, 'Digital Design', Pearson Education.
3. Z. Navabi, 'VHDL Analysis and Modeling of Digital Systems', McGraw Hill.
4. Kevin Skahill, 'VHDL for Programmable Logic', Pearson Education.
5. Jr. Charles H. Roth, 'Fundamentals of Logic Design', Jaico Publishers.
6. John Wakerly, 'Digital Design, Principles and Practices', Pearson Education.

PROCESS CONTROL LAB.

Subject code: BECE3-730 **L T P C**
0 0 2 1

Course Objectives:

To get practical knowledge of process control based systems, programmable logic controller, Fuzzy Controller, and software based PLC operation.

Course Outcomes:

1. To familiarize with PID control & its tuning procedures.
2. To experiment various functions of a Fuzzy Controller.
3. To practice various process control based pressure and level control system.

EXPERIMENTS

1. To study the control valve, shuttle valve and logic valve on pneumatic trainer.
2. To study PID control & its tuning procedures on a furnace.
3. To study the functioning of a Fuzzy Controller.
4. To study the operation of programmable logic controller.
5. To study the effect of cascade control in temp and flow system.
6. To study the effect of forward control in temp and flow system.
7. To study the process control based pressure control system.

8. To study the process control operation in level control.
9. To study distribution process control in temp process and level system.
10. To study the supervisory control in process control.
11. To study of a Software-based PLC operation.

Note: At least 10 experiments are required to be performed.

MINOR PROJECT

Subject code: BECE3-732 **L T P C**
0 0 4 4

The students are required to undergo Minor Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice, report writing. Students can use different hardware and software in order to analyse and verify the results.

VIRTUAL INSTRUMENTATION

Subject Code: BECE3-833 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. To study the basic concept of virtual instrumentation.
2. To learn various programing methods of virtual instrumentation.
3. To know the characteristics of data acquisition system.
4. To understand various application of virtual instrumentation.

Course Outcomes:
Upon completion of the course, students will be able to
1. Explore historical perspective and architecture of virtual instrumentation
2. Understand programing methods and analysis tools of virtual instrumentation.
3. Analyze the field of data acquisition system.
4. Learn about various applications of virtual instrumentation.

UNIT I (12 Hrs.)

Introduction to Virtual Instrumentation: Definition of virtual instrumentation, need & advantage of virtual instrumentation, historical perspective of virtual instrumentation. Block diagram & architecture of V.I., data flow techniques, graphical programming in data flow & comparison of conventional programming.

UNIT II (12 Hrs.)

Programming Methods: VIS & sub VIS, loops& charts, arrays, cluster, graphs, sequence & structure, formula modes, local and global variables, string& file inputs. Analysis tools: Fourier transforms, power spectrum, correlation methods, windowing &filtering.

UNIT III (12 Hrs.)

Data Acquisition Systems: ADC, DAO, DIO, ccounters & timers, PC hardware structures, timing, interrupts, DMA, software& hardware installations. Current loops, RS 232/RS 485, GPIB,system basics,

interface basics, USB, PCMIA,VXI,SCXI,PXI etc., networking basics for office & industrial application VISA & VI , image acquisition & processing , motion control.

UNIT IV (12 Hrs.)

Application of Virtual Instrumentation: Application in process control, Laboratory equipments: Oscilloscope, digital multi meter, Pentium computer, lab view software. Study of data acquisition & control using lab view. Virtual instrumentation for an innovative thermal conductivity apparatus to measure the thermal conductivity.

Recommended Books

1. Gary Johnson, 'Labview Graphical Programming', 2nd Edn., McGraw Hill, New York.
2. Lisa K. Wells & Jeffrey Travis, 'Labview for Everyone', Prentice Hall, New Jersey.

PROGRAMMABLE LOGIC CONTROLLER

Subject Code: BECE3-872 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To outline the formal procedures for the analysis of PLC
2. To introduce the commands and functions of PLC
3. To illustrate the concept of advance functions.

Course Outcomes:

Students will be able to:

1. Understand the need for automation in process industries
2. Learn about the various technologies used in process automation.
3. Learn programming of PLC.

UNIT I (10 Hrs.)

Introduction to PLC: Evolution Advantages/Disadvantages: system description, internal operation of CPU and I/C modules, installation &testing.

Programs & Software: General programming procedures, registers and Addresses, Relation of Digital Gate Logic to contact logic.

UNIT II (14 Hrs.)

Basic PC Functions: Programming, On-Off inputs to produce on – off outputs: Timers, Counters: Auxiliary Commands &functions.

UNIT III (12 Hrs.)

Intermediate Functions: Arithmetic functions, Number Comparison functions, The skip & master control relay functions.

Functions involving individual register bits: Utilizing digital bits, the sequences functions, Matrix functions.

UNIT IV (12 Hrs.)

Advanced Functions: Controlling a robot with a PC; Analog PC operator, Immediate update, select continuously, ascending sort, transmit print, FIFO, LIFO & Loop Control.

Recommended Books:

1. C.D. Johnson, 'Process Control Instrumentation Technology', PHI.
2. Krishan Kant, 'Computer Based Industrial Control', PHI.
3. Andrew Parr, 'Pneumatic & Hydraulic', PHI.
4. D. Considine, 'Process Industrial Instruments & Control Handbook', McGraw Hill.

5. B.G. Liptak, 'Instrument Engineers Handbook', CRC Press.

REMOTE SENSING AND THERMAL IMAGING

Subject Code: BECE3-873 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:
1. To outline the formal procedures for the basics and history of remote sensing
2. To introduce the concept of Microwave Remote Sensing.
3. To illustrate the concept of Thermal Imaging system.
4. To study Meteorological satellite characteristics and their orbits

Course Outcomes:
Students will be able to:
1. Describe the principles and history of remote sensing.
2. Illustrate platforms and remote sensing sensors.
3. Learn electromagnetic spectrum, and atmospheric transmission for thermal imaging system.
4. Understand applications, future trends and research in remote sensing.

UNIT I (12 Hrs.)

Basics of Remote Sensing: Principles of Remote sensing, History of Remote sensing, Remote sensing in India, Electromagnetic Radiation and Electromagnetic Spectrum, EMR quantities: Nomenclature and Units Thermal Emission of Radiation, Radiation Principles (Plank's Law, Stephen Boltzmann law), Interaction of EMR with the Earth Surface (Wien's displacement law, Kirchhoff's Law) Spectral signature, Reflectance characteristics of Earths cover types, Remote sensing systems.

UNIT II (12 Hrs.)

Platforms and sensors: Platforms, Remote sensing sensors, resolutions Across track and along the track scanning, Optical sensors, Thermal scanners Microwave sensing radar satellite missions. Land sat series, SPOT series, IRS satellite series, IKNOS.

Microwave Remote Sensing: Airborne and Space borne radar systems basic instrumentation. System parameters: Wave length, Polarization, Resolutions, Radar geometry. Target parameters - Back scattering, Point target, Volume scattering, Penetration, Reflection, Bragg resonance, Cross swath variation. Speckie radiometric calibration, Radar Grametry, Introduction, Mosaicing Stereoscope.

UNIT III (12 Hrs.)

Thermal Imaging system: Thermal Imaging System: Introduction - IR region of the Electromagnetic spectrum, Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature. Thermal conductivity. Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity. IR - radiometers, Airborne and Satellite TTR scanner system Characteristics of IR images: Scanner distortion, image irregularities, Film density and recorded & Temperature ranges. Effects of weather on images; Clouds, Surface winds and Penetration of smoke plumes. Interpretation of thermal imagery.

UNIT IV (12 Hrs.)

Meteorological Satellites: Meteorological satellite characteristics and their orbits, TIROS, NIMBUS, NOAA, TIROS, SEASAT, GOES, METEOSAT, INSAT**.** Measurement of Earth and Atmospheric energy and Radiation budget parameters from satellites. Applications of remote sensing: Geology, Forestry, Land use, Soils etc. Future trends and Research.

Recommended Books

1. W. Travelt , 'Imaging Radar for Resource Survey: Remote Sensing Applications', Chapman & Hall.
2. P.H. Swain and S.M. Davis, 'Remote Sensing: The Quantitative Approach', McGraw Hill.
3. Floyd, F. Sabins, 'Remote Sensing Principles and Interpretation', Jr. Freeman and Co. San Franscisco.
4. 'Applied Remote Sensing C.P.L.O.', Longman Scientific and Technical Publishers.
5. E.C. Barrett & L.F Curtis, 'Introduction to Environmental Remote Sensing', Chapman and Hall, London.
6. George Joseph, 'Fundamentals of Remote Sensing', Universities Press.

ADVANCE PHOTONICS

Subject Code: BECE3-874 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives:

1. To understand the various photonics concepts.
2. To introduce the concept of wave optics.
3. To illustrate the concept how propagation of light in confined geometries is done.

Course Outcomes:

Students will be able to:

1. Understand various photonics concepts.
2. Understanding of wave optics.
3. Propagation of light through various geometries.

UNIT I (12 Hrs.)

Introduction to Photonics – Nature of Light – Wave and light terminology, Maxwell equation, light spectra and sources, absorption and emission, black body radiation. Geometric Optics – Light as a ray, law of reflection including plane mirrors, law of refraction including optical fiber applications, prisms and thin lenses including Lens maker's equation, Lens problems and optical instruments using the thin lens equation.

UNIT II (12 Hrs.)

Wave Optics – wave descriptive terminology, wave superposition (interference) including double – slit interference, diffraction and diffraction gratings, interference applications, e.g. Michelson, Mach Zender and Fabry Perot interferometers, Thin film interference and Fiber Bragg Gratings. Diffraction Effects including: airy disk, near far field effects. Polarization principles including scattering, reflection and birefringence.

UNIT III (12 Hrs.)

Propagation of light in confined geometries, planar waveguides, Optical fibers and their design, Linear and Nonlinear wave propagation in Fibers, Optical Solitons, Directional couplers, Fiber Bragg gratings, Fiber-optic communication systems. Generation of light in semiconductors, Electroluniscence, p-n junction and hetrostructure LEDs, their properties and modulation, Semi-conductor lasers (p-n junction diode, MQW and DFB lasers) and their modulation, Semiconductor Amplifiers.

UNIT IV (12 Hrs.)

Photo-chemical effects, CDROMS, Magneto Optic memories, Persistent spectral hole burning and data storage. Photo detectors – thermal and quantum devices, Noise in light detectors. Coherent and squeezed

states of light, Quantum no demolition measurement, correlated photons, Entanglement and applications to quantum information processing, Coherent control of physical processes.

Recommended Books

1. T.P. Pearsall, 'Photonics Essentials: An Introduction with Experiments', McGraw Hill.
2. F.G. Smit and T.A. King, 'Optics and Photonics: An introduction', John Wiley & Sons.
3. B. Balkrishna Laud, 'Lasers and Non-Linear Optics', Halsted Press.
4. F.A. Jenkins and H.E. White, 'Fundamentals of Optics', McGraw Hill.
5. R.S. Quimby, 'Photonics and Lasers-An Introduction', Wiley-Interscience.
6. E.A. Baha, Saleh and M.C. Teich, 'Fundamental of Photonics', John Wiley and Sons.

DATA ACQUISITION AND PROCESSING

Subject Code: BECE3-875 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Course Objectives

1. To impart knowledge about the measuring instruments and the methods of measurement
2. To understand different ADCs and DACs.
3. To study and practice calibration and testing of different instrumentation systems.

Course Outcomes

At the end of the course the student shall be able to:

1. Do error budget analysis associated with DACS and ADCS.
2. Analyse and use the functions of various instrumentation systems.

UNIT-I (12 Hrs.)

Introduction: Objective of a DAS, single channel DAS, Multi-channel DAS, Components used in DAS– Converter Characteristics-Resolution-Non-linearity, settling time, Monotonicity.
Digital to analog converters (DACS): Principles and design of – Parallel R– 2R, weighted resistor, inverted ladder, D/A decoding – Codes other than ordinary binary.

UNIT-II (12 Hrs.)

Analog to Digital Converters (ADCS): Classification of A/D converters. Parallel feedback – Successive approximation – Ramp comparison – Dual slope integration – Voltage to frequency – Voltage to Time – Logarithmic types of ADCS.
non-linear data converters (NDC): Basic NDC configurations – Some common NDACS and NADCS – Programmable non-linear ADCS – NADC using optimal sized ROM – High speed hybrid NADC – PLS based NADC – Switched capacitor NDCS.

UNIT-III (12 Hrs.)

Data Converter Applications: DAC applications – Digitally programmable V/I source – Arbitrary waveform generators – Digitally programmable gain amplifiers – Analog multipliers/ dividers – Analog delay lines.
ADC APPLICATIONS: Data Acquisition systems – Digital signal processing systems – PCM voice communication systems – Test and measurement instruments – Electronic weighing machines.

UNIT-IV (12 Hrs.)

Monolithic Data Converters: Typical study of monolithic DACS and ADCS. Interfacing of DACS and ADCS to a microprocessor.
Error budget of DACS and ADCS: Error sources, error reduction and noise reduction techniques in DAS. Error budget analysis of DAS, case study of a DAC and an ADC.

Recommended Books

1. Dinesh K. Anvekar, B.S. Sonde, 'Electronic Data Converters Fundamentals and Applications', Tata McGraw Hill.
2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill.
3. Hermann Schmid, 'Electronic Analog/ Digital Conversions', Tata McGraw Hill.
4. E.R. Hanateck, 'User's Handbook of D/A and A'.

VIRTUAL INSTRUMENTATION LAB.

Subject Code: BECE3-834 **L T P C**
0 0 2 1

Course Objectives:
To get practical knowledge in programming techniques, data acquisition and interfacing techniques of virtual instrumentation and to use VI for different applications.

Course Outcomes:
1. To familiarize with the VI software and learn programming in VI.
2. To experiment various functions available in LabVIEW.
3. To practice various Instrument Interfacing and data acquisition methods.
4. To check various analysis tools and develop programs for Process control applications.

EXPERIMENTS

1. Verification of Arithmetic Operations.
2. Verification of Half Adder and Full adder.
3. Program to find Addition of First n natural numbers using for and while loop.
4. Implementation of Array functions.
5. Program for implementing seven segment displays.
6. Program to perform Traffic light control.
7. Calculation of BMI using cluster.
8. Program to control Temperature by using RTD and DAQ.
9. Program to control Temperature by using Thermocouple and DAQ
10. Program to control Temperature by using Thermistor and DAQ
11. Program for controlling the Flow of water using DAQ.
12. Program for controlling the Level of water using DAQ.
13. Program for Pressure control using DAQ.
14. Program for controlling the speed of a DC motor using PID tool box.

Note: At least 10 experiments are required to be performed.

MAJOR PROJECT

Subject Code: BECE3-835 **L T P C**
0 0 12 6

The students are required to undergo Major Project work and it will be evaluated by the external examiner and one internal examiner appointed by the institute/university. External examiner will be from panel of examiners. Assessment of project will be based on Quality of work, Seminar, viva-voice,

report writing. Students can use different hardware and software in order to analyse and verify the results.

5th Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BITE2-520	System Analysis and Design	3	1	0	40	60	100	4
BITE2-521	Programming in Java	3	1	0	40	60	100	4
BITE2-522	Computer Networks-II	3	1	0	40	60	100	4
Departmental Electives-I (Choose any one)		3	1	0	40	60	100	4
BITE2-556	Cyber Laws & IPR							
BITE2-557	Compute4r Graphics							
BITE2-558	Linus & Shell Programming							
BITE2-523	Programming in Java Lab.	0	0	2	60	40	100	1
BITE2-524	Computer Networks-II Lab.	0	0	2	60	40	100	1
BHUM0-F93	Soft Skills-III	0	0	2	60	40	100	1
Open Elective-I (Choose any one)		3	0	0	40	60	100	3
BITE2-525	Training-II#	0	0	4	60	40	100	2
Total		**15**	**4**	**10**	**440**	**460**	**900**	**24**

6th Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BITE2-626	Network Programming	3	1	0	40	60	100	4
BITE2-627	Software Engineering	3	1	0	40	60	100	4
Departmental Electives-II (Choose any one)		3	1	0	40	60	100	4
BITE2-659	Mobile App Development							
BITE2-660	Cryptography & Network Security							
BITE2-661	Web Technologies							
Departmental Electives-III (Choose any one)		3	1	0	40	60	100	4
BITE2-662	Cloud Computing							
BITE2-663	Enterprise Resource Planning							
BITE2-664	Parallel & Distributed							
BITE2-628	Network Programming Lab.	0	0	2	60	40	100	1
BITE2-629	Software Engineering Lab.	0	0	2	60	40	100	1
Open Elective-II (Choose any one)		3	0	0	40	60	100	3
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Total		**15**	**4**	**6**	**380**	**420**	**800**	**22**

SYSTEM ANALYSIS AND DESIGN

Subject Code: **BITE2-520** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

The course has been designed to provide a solid foundation of systems principles and an understanding of how business function, while heightening students to the issues analysts face daily.

UNIT-I

1. Introduction: System definition and concepts: Characteristics and types of automated systems, Manual and Real-life Business sub-systems: Production, Marketing, Personal, Material, Finance Systems models types of models: Systems environment and boundaries, Real- time and distributed systems, Basic principles of successful systems

2. Systems Analyst: Role and need of systems analyst, Qualifications and responsibilities, Systems Analyst as an agent of change.

3. System Development Cycle: Introduction to systems development life cycle (SDLC): Various phases of development: Analysis, Design, Development, Implementation, Maintenance Systems documentation considerations: Principles of systems documentation, Types of documentation and their importance, Enforcing documentation discipline in an organization.

UNIT-II

4. System Planning: Data and fact gathering techniques: Interviews, Group communication, Presentations, Site visits. Feasibility study and its importance Types of feasibility reports, System Selection plan and proposal Prototyping Cost-Benefit and analysis: Tools and techniques

5. Systems Design and Modeling:

Process modeling, Logical and physical design, Design representation, Systems flowcharts and structured charts, Data flow diagrams, Common diagramming conventions and guidelines using DFD and ERD diagrams. Data Modeling and systems analysis, Designing the internals: Program and Process design, Designing Distributed Systems.

UNIT-III

6. Input and Output: Classification of forms: Input/output forms design, User-interface design, Graphical interfaces.

7. Modular and Structured Design: Module specifications, Module coupling and cohesion, Top-down and bottom-up design.

8. System Implementation and Maintenance: Planning considerations, Conversion methods, producers and controls, System acceptance Criteria, System evaluation and performance, Testing and validation, Systems qualify Control and assurance, Maintenance activities and issues.

UNIT-IV

9. System Audit and Security: Computer system as an expensive resource: Data and Strong Media Procedures and norms for utilization of computer equipment, Audit of computer system usage, Audit trails, Types of threats to computer system and control measures: Threat to computer system and control measures, Disaster recovery and contingency planning.

10. Object Oriented Analysis and Design: Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic diagramming modeling: state diagram, Dynamic modeling: sequence. Case study of the following systems

(I) Inventory Control, (II) Railway Reservation System, (III) University Management System, (IV) Hospital management System.

Recommended Books

1. Elias M. Awad, 'System Analysis and Design'.
2. Perry Edwards, 'System Analysis and Design'.
3. Ames A. Senn, 'Analysis and Design of Information Systems'.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Define and describe the five phases of the system development life cycle.
2. State at least five expected benefits from systems projects.
3. Explain at least three ways in which information systems support business requirements.
4. Describe how systems analysts interact with users, management, and other information systems professionals.
5. Develop data flow diagrams and decision tables.
6. Perform a feasibility study.
7. Evaluate systems development alternatives.
8. Solve realistic systems analysis problems.
9. Determine methods for evaluating the effectiveness and efficiency of a system.
10. Work as an effective team member on assigned projects.

PROGRAMMING IN JAVA

Subject Code: **BITE2-521** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

This course will provide the knowledge of Java and prepare students to be in a position to write object oriented programs in Java.

UNIT-I

1. Overview of Java: Object oriented programming, two paradigms, abstraction, the three OOP principles, Java class libraries.

2. Date Types, Variables and Arrays:

Integers, floating-point types, characters, Boolean, Iterates, Variable, Data types and casting, automatic type promotion in expressions, arrays.

3. Operators and Control Statements:

Arithmetic operators, bit wise operators, relational operators, Boolean logical operators, the ? Operators, operator precedence, Java's selection statements, iteration statements, jump statements.

UNIT-II

4. Introduction to Classes:

Class fundamentals, declaring object reference variable, Introducing methods, method. Constructors, this keyword, garbage collection, the finalize.

5. Methods and Classes:

Overloading methods, using objects as parameters, recursion.

6. Inheritance:

Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract Classes, using final with inheritance, Package and Interfaces, Package access protection, importing packages.

UNIT-III

7. Exception Handling: Exception handling fundamentals, Exception types, Uncaught Exceptions Using try and catch, multiple catch clauses, nested try statements, throw, finally Java's built-in exceptions. Exceptions, creating your own exception sub classes, using

8. Multithreaded Programming:

The Java thread model, the main thread, creating thread, creating multiple threads, using is alive and join, Thread priorities, synchronization, inter thread communications, suspending resuming and stopping threads.

9. String Handling:

The string constructors, string length, special string operations, character extraction, string comparison, searching string, modifying string, data conversion, changing the case of characters, string buffer.

UNIT-IV

10. I/O and Applets:

I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files, Applet Fundamentals, Applet Architecture, The HTML Applet tag, Passing parameters to Applets.

11. Networking:

Networking basics, Java and the Net, TCP/IP Client Sockets URL, URL Connection, TCP/IP Server Sockets, Database connectivity.

Recommended Books

1. Herbert Schildt, 'The Complete Reference Java2', McGraw Hill.
2. Joyce Farrell, 'Java for Beginners', Cengage Learning.
3. Deitel and Deitel, 'Java: How to Program', 6th Edn., Pearson Education.
4. James Edward Keogh, Jim Keogh, 'J2EE: The Complete Reference', McGraw Hill.
5. Khalid A. Mughal, Torill Hamre, Rolf W. Rasmussen, 'Java Actually', Cengage Learning.
6. Shirish Chavan, 'Java for Beginners', 2nd Edn., Shroff Publishers.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Knowledge of the structure and model of the Java programming language, (knowledge)
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language, (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (Evaluation)

COMPUTER NETWORKS–II

Subject Code: **BITE2-522** **L T P C** **3 1 0 4** **Duration: 45 Hrs.**

Course Objectives

The objective of the course is to offer good understanding of the concepts of network security, wireless, Adhoc and various emerging network technologies. Course Contents:

UNIT-I

1. Network Security: Fundamentals of network security, Basics of IPv6, IPsec: overview of IPsec, IP and IPv6, Authentication header (AH), Encapsulating Security Payload (ESP).

2. Internet Key Exchange (IKE): History, Photuris, Simple Key-management for Internet protocols (SKIP), IKE phases, IKE encoding.

UNIT-II

3. Adhoc Networks: Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies.

UNIT-III

4. Wireless Communication Systems: Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA.

UNIT-IV

5. 3G Wireless Networks: Wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.

6. Wireless System Design: Introduction, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.

Recommended Books

1. Theodore S. Rappaport, 'Wireless Communication: Principles and Practices', 2nd Edn., Pearson Education.
2. Charlie Kaufman, Radio Perlman, Mike Speciner, 'Neywork Security', 2nd Edn., PHI.
3. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, 'Wireless and Mobile Networks: Concepts and Protocols', Wiley India.
4. Michael A. Gallo & William M. Hancock, 'Computer Communications and Networking Technologies', Cengage Learning / Thomson Brooks / Cole.
5. S. Keshav, 'An Engineering Approach to Computer Networking', Pearson Education. Mayank Dave, 'Computer Networks', Cengage Learning.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Able to define the Fundamentals of network security, Characteristics of IPv6 and their addressing format and schemes.
2. Acquire the Knowledge about various concepts of IPSec and able to explain about various concepts of Ad-hoc and Cellular Networks.
3. Acquire the Knowledge about wireless communication systems and their generations with different Technologies.
4. Able to explain about Third Generation Networks, their Technologies, wireless System Design and their various strategies

CYBER LAWS AND IPR

Subject Code: **BITE2-556** **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

The objective of the course is to offer good understanding of Cyber law and awareness of intellectual property rights.

1. Basics of Computer & Internet Technology: Internet, ISP & domain name; Network Security; Encryption Techniques and Algorithms; Digital Signatures.

2. Introduction to Cyber World: Introduction to Cyberspace and Cyber Law; Different Components of cyber Laws; Cyber Law and Netizens.

3. E-Commerce: Introduction to E-Commerce; Different E-Commerce Models; E-Commerce Trends and Prospects; E-Commerce and Taxation; Legal Aspects of E-Commerce.

4. Intellectual Property Rights: IPR Regime in the Digital Society; Copyright and Patents; International Treaties and Conventions; Business Software Patents; Domain Name Disputes and Resolution.

5. IT ACT 2000: Aims and Objectives; Overview of the Act; Jurisdiction; Role of Certifying Authority; Regulators under IT Act; Cyber Crimes-Offences and Contraventions; Grey Areas of IT.

6. Project Work: Candidates will be required to work on a project. At the end of the course students will make a presentation and submit the project report.

Recommended Books

1. Nandan Kamath, 'A Guide to Cyber Laws & IT Act 2000 with Rules & Notification'.
2. Keith Meril l& Deepti Chopra (IK Inter.), 'Cyber Cops, Cyber Criminals & Internet'.
3. Diane Row Land, 'Information Technology Law'.
4. Vakul Sharma, 'Handbook of Cyber Laws', McMillian.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. To describe how can stay safe from cybercrime.
2. To understand the features of Intellectual Property rights.
3. To understand about attacks and their properties.

COMPUTER GRAPHICS

Subject Code: **BITE2-557** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

Understanding the fundamental graphical operations and the implementation on computer, get a glimpse of recent advances in computer graphics, understanding user interface issues that make the computer easy for the novice to use.

UNIT-I

1. Introduction: Computer Graphics and its applications, Elements of a Graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input devices.

2. Basic Raster Graphics: Scan Conversion-Point plot technique, Line drawing, Circle generating and Ellipse generating algorithms.

UNIT-II

3. Two-dimensional Geometric Transformations: Basic Transformations-Translation, Rotation and Scaling, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing transformations.

4. Clipping: Window to viewport transformation, Clipping Operations- Point Clipping, Line Clipping, Polygon Clipping and Text Clipping.

UNIT-III

5. Filling Techniques: Scan line algorithms, Boundary-fill algorithm, Flood-fill algorithm, Edge fill and fence fill algorithms

6. Elementary 3D Graphics: Plane projections and its types, Vanishing points, Specification of a 3D view.

UNIT-IV

7. Visibility: Image and object precision, Hidden edge/surface removal or visible edge/surface determination techniques; z buffer algorithms, Depth sort algorithm, Scan line algorithm and Floating horizon technique.

8. Advance Topics: Introduction of Rendering, Raytracing, Antialiasing, Fractals, Gourard and Phong shading.

Recommended Books

1. Donald Hearn and M. Pauline Baker, 'Computer Graphics', 2nd Edn., PHI/Pearson Education.
2. Zhigandxiang, Roy Plastock, Schaum's Outlines, 'Computer Graphics', 2nd Edn., Tata McGraw Hill.
3. C. Foley, Van Dam, Feiner and Hughes, 'Computer Graphics Principles & Practice', 2nd Edn., Pearson Education.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. To provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations.
2. To make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations.
3. The computer graphics course prepares students for activities involving in design, development and testing of modeling, rendering, shading and animation.

LINUX AND SHELL PROGRAMMING

Subject Code: **BITE2-558** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

This Linux Bash Shell Programming training course is designed to give delegates practical experience in developing and writing LINUX shell scripts. Most of the built-in shell commands are introduced together with the main program control structures. This course is not suitable for C shell programmers.

UNIT–I

Linux introduction and file system - Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File System-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories. Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, creating and viewing files using cat, file comparisons – cmp&comm, View files, disk related commands, checking disk free spaces. Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down process, init and run levels.

UNIT–II

Essential linux commands Understanding shells, Processes in linux-process fundamentals, connecting processes with pipes, tee, redirecting input output, manual help, Background processing, managing multiple processes, changing process priority with nice, scheduling of processes at command, cron, batch commands, kill, ps, who, sleep, Printing commands, find, sort, touch, file, file related commands-ws, sat, cut, dd, etc. Mathematical commands- bc, expr, factor, units. Creating and editing files with vi, joe & vim editor

UNIT–III

System administration Common administrative tasks, identifying administrative files – configuration and log files, Role of system administrator, managing user accounts-adding &

deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su. Getting system information with name, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages with rpm command. Configure X-windows desktop-redhat-config-Xfree86, understanding XF86config file, starting & using X desktop. KDE & Gnome graphical interfaces, changing X settings.

UNIT–IV

Shell Programming- Basic of shell programming, Various types of shell available in Linux, comparisons between various shells, shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automate system tasks. Simple filter commands – pr, head, tail, cut, paste, sort, uniq, tr. Flter using regular expressions – grep, egrep, and sed. awk programming – report printing with awk.

Recommended Books

1. Sumitabha Das, 'UNIX – Concepts & Applications', 3rd Edn., Tata McGraw Hill.
2. Graham Glass & King Ables, 'Unix for Programmers and Users', 3rd Edn., Pearson Education India. (Low Prices Edition).
3. Cristopher Negus, 'Red Hat Linux 9 Bible', IDG Books India Ltd.

Course Outcomes

1. Upon successful completion of this course, the student will be able to:
2. Writing simple scripts to enhance basic command output
3. Using the various shell quoting mechanisms appropriately
4. Manipulating shell variables and user-defined variables in scripts
5. Implementing conditional execution facilities
6. Using the shell's built-in loop constructs where appropriate
7. Writing scripts to trap user interrupts
8. User defined Functions
9. Developing menu-driven shell scripts

PROGRAMMING IN JAVA LAB.

Subject Code: **BITE2-523** **L T P C**
3 1 0 4

1. Implementation of classes.
2. Implementation of inheritance.
3. Implementation of packages and interfaces.
4. Implementation of threads.
5. Using exception handling mechanisms.
6. Implementation of Applets.
7. Implementation of mouse events, and keyboard events.
8. Implementing basic file reading and writing methods.
9. Using basic networking features.
10. Connecting to Database using JDBC.

COMPUTER NETWORKS–II LAB.

Subject Code: **BITE2-524** **L T P C**
3 1 0 4

1. To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer.
2. To plan IPv6 address scheme for a local area network comprising of 'n' terminals.
3. To develop programs for implementing / simulating routing algorithms for Adhoc networks.
4. To install any one open source packet capture software like wireshark etc.
5. To configure Wireless Local Loop.
6. To plan Personal Area Network.
7. To configure WLAN.
8. To configure Adhoc networks.
9. To install and configure wireless access points.

SOFT SKILLS-III

Subject Code: BHUM0-F93 **L T P C** **Duration: 25 Hrs.**
0 0 2 1

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procrastination.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016**.
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, M. John, et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007.**

NETWORK PROGRAMMING

Subject Code: **BITE2-626** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To familiarize students with advanced concepts of networks, network programming in UNIX environment.

UNIT-I

1. OSI model, client server model, TCP/IP protocols, Introduction to Unix; Process, groups, job control and non-job control shells, reliable and unreliable signals, shell Programming.
2. 2.Inter process communication in Unix, pipes, half duplex and full duplex pipes, FIFOs, properties of pipes and FIFOs, POSIX message queues, system V message queues, semaphores, shared memory, mmap function and its use, RPC, authentication, timeout and retransmission, call semantics, XDR.

UNIT-II

3. Communication Protocol – Introduction, TCP, IP, XNS, SNA, NetBIOS, OSI protocols, comparisons.

UNIT-III

4. Introduction to Berkeley sockets, socket addressing, TCP and UDP socket functions, sockets and Unix signals, socket implementation, client and server examples for TCP and UDP and their behavior under abnormal conditions.

UNIT-IV

5. Socket options, IPv4, IPv6, TCP, I/O multiplexing, Unix I/O models, select and poll functions.
6. System V Transport Layer, interface – Introduction Transport End Point address, TLI.

Recommended Books

1. W.R. Stevens, B. Fenner & A.M. Rudoff, 'Unix Network Programming', Vol. I, 3rd Edn., Pearson Education.
2. W.R. Stevens, 'Unix Network Programming', Vol. II, 2nd Edn., Pearson Education.
3. Comer and Stevens, 'Internetworking with TCP/IP', Vol. -I, -II, -III, PHI.
4. Christian Benvenuti, 'Understanding Linux Network Internals', O'Reilly.
5. W.R. Stevens, 'Advanced Programming in Unix Environment', Pearson Education.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. To understand the use of client/server architecture, inter process communication and to explain the basic communication protocols.
2. To understand elementary socket system calls, advanced socket system calls and Java Socket API and to explain the basic concepts relating to TCP and UDP based sockets.
3. To understand File transfer protocol, remote login using pseudo terminal and RPC.

SOFTWARE ENGINEERING

Subject Code: **BITE2-627** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To enable the students to learn the principles and methodologies followed to develop a good software.

UNIT-I

1. Introduction: Evolution and impact of Software engineering, Software crisis, Principles of Software Engineering, Feasibility study Software Life Cycle Models: Waterfall, prototyping, Evolutionary, and Spiral models, Comparison of software models.

UNIT-II

2. Scheduling and Planning: Management Activities, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts. Requirement Analysis: Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

UNIT-III

3. Software Design: Basic principles of software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, Design specifications, Design metrics, Verification and validation, User Interface design.

Coding: Coding standards and Code review techniques, Coding styles, Coding metrics.

Software Testing: Fundamentals of testing, Types of software testing, White-box, and black-box testing, test case design techniques, mutation testing, Testing metrics.

UNIT-IV

4. Reliability: Software reliability metrics, reliability growth modeling. Software Quality Management: Risk Management, Quality management, ISO and SEI CMMI, Six Sigma, Computer aided software engineering, Software maintenance, Software Configuration Management, Component-based software developments.

Recommended Books

1. Pressman, 'Software Engineering: A Practitioner's Approach', 3rd Edn., TMH, **2004.**
2. Flecher and Hunt, 'Software Engineering and CASE: Bridging and Culture Gap', **2000**.
3. Shepperd, 'Software Engineering, Metrics', Vol.-1 (EN), McMillan, **1999**.
4. Robert S. Arnold, 'Software Re–engineering', IEEE Computer Society, **1994**.
5. Pankaj Jalote, 'An Integrated Approach to Software Engineering', 3rd Edn., Narosa Publishers, **2006**.
6. Ghezzi, Cario, 'Fundamentals of Software Engineering', 2nd Edn., PHI, **2002**.
7. Sommerville, Ian, 'Software Engineering', 7th Edn., Pearson Education, **2004**.
8. Watts Humphrey, 'Managing Software Process', 2nd Edn., Pearson Education, **2003**.
9. James F. Peters and Witold Pedrycz, 'Software Engineering – An Engineering Approach', 1st Edn., Wiley, **2010**.
10. Mouratidis and Giorgini, 'Integrating Security and Software Engineering Advances and Future', IGP.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. To study how software engineering principles, evolve and to analyze the various software models that can be followed to develop a software.
2. To understand the software analysis and design step of software development.
3. To study coding, testing and reliability of a software.
4. To highlight the various management activities and related terms of a software.

MOBILE APP DEVELOPMENT

Subject Code: **BITE2-659** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
This course teaches students how to build mobile apps for Android, iOS, and Windows 8, the trinity that is today's mobile operating platforms.

UNIT-I

1. **Characteristics of Mobile Applications:** Architecture and working of Android, iOS and Windows phone8 operating system. User-interface design for mobile applications and managing application data. Integrating cloud services, networking, OS and hardware into mobile-applications. Addressing enterprise requirements in mobile applications: performance, scalability, modifiability, availability and security.

UNIT-II

2. Introduction to Android Development Environment: What Is Android? Advantages and Future of Android, Frameworks, Tools and Android SDK. Installing Java, Android Studio, SDK Manager Components and updating its platforms, AVD Manager, Understanding Java SE and the Dalvik Virtual Machine. The Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML.
User Interface Widgets: Text controls, Button controls, Toggle buttons, Images. Notification and Toast: Parameters on Intents, Pending intents, Status bar notifications, Toast notifications. Menus & Dialogs: Localization, Options menu, Context menu; Alert dialog, Custom dialog, Dialog as Activity.
Lists: Using string arrays, Creating lists, Custom lists. Location and Maps: Google maps, Using GPS to find current location.

UNIT-III

3. Application Development in Android: App Components (Intents and Intent Filters, activities, services, Content Providers, App Widgets, Processes and Threads), App resources, App Manifest and User interface, Action Bar, Content Sharing, Multi-Platform Designs, Animation and graphics, computation, Media and Camera, Location and sensors, Connectivity, Text and Input, Data Storage, Administration and Web Apps.
Publishing Your App: Preparing for publishing, Signing and preparing the graphics, publishing to the Android Market.

UNIT-IV

4. Introducing SQLite: SQLite Open Helper and creating a database, Opening and closing a database Cursors and its types, Working with cursors Inserts, updates, and deletes.
Database Connectivity: SQLite Data Types, Content Values, Adding, Updating and Deleting Content, Content provider: introduction, Query providers.

Recommended Books

1. Jeffmcwherter, Scott Go Well, 'Professional Mobile Application Development', 1st Edn., Wiley, **2012**.
2. Belen Cruz, Zapata, 'Android Studio Application Development', 2nd Edn., Packt Publishing, **2016**.
3. Reto Meier, 'Professional Android 4 Application Development', Wrox Publication, **2012**.
4. Onur Cinar, 'Beginning Android 4', 1st Edn., Apress Publication, **2012**.
5. David Mark, 'Beginning iPhone Development with Swift', Apress Publication, **2014**.
6. Android Developer Site: http://developer.android.com/index.html.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. To be familiar with the Architecture of various Mobile Application Platform.
2. Ability to work on Android using various forms and menus.
3. Knowledge to publish your developed Mobile Application.
4. Using SQLite for connection to database type facilities.

CRYPTOGRAPHY & NETWORK SECURITY

Subject Code: **BITE2-660** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

The main objective of this course is to make student able to understand the basic concepts, services, threats and principles in network security, various security services and mechanisms in the network protocol stack.

UNIT-I

1. Security trends, Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruence, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite fields, continued fractions.

UNIT-II

2. Simple DES, Differential crypto analysis, DES –Modes of operation, Triple DES, AES, RC4, RSA, Attacks–Primality test –factoring.

UNIT-III

3. Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamal DSA.

UNIT-IV

4. Authentication applications–Kerberos, X.509, PKI–Electronic Mail security–PGP, S/MIME–IP security–Web Security–SSL, TLS, SET. Intruders, Malicious software, viruses and related threats, Firewalls, Security Standards.

Recommended Books

1. Wade Trappe, Lawrence C. Washington, 'Introduction to Cryptography with Coding Theory', 2nd Edn., Pearson, **2007**.
2. William Stallings, 'Cryptography and Network Security Principles and Practices', 4th Edn., Pearson/PHI, **2006**.
3. W. Mao, 'Modern Cryptography–Theory and Practice', 2nd Edn., Pearson Education, **2007**.
4. Charles P. Pfleeger, Shari Lawrence Pfleeger, 'Security in Computing', 3rd Edn., Prentice Hall of India, **2006**.
5. Behrouz Forouzan, 'Cryptography & Network Security', 2nd Edn., McGraw Hill, **2011**.

Learning Outcomes

Upon successful completion of this course, the student will be able to:

1. To understand the tools and description of java scripts
2. To XML and the study of Java beans and introduction to EJB'S
3. To understand Java servelet HTTP package and security issues.
4. To understand JSP Application Development and database programming using JDBC.

WEB TECHNOLOGIES

Subject Code: **BITE2-661** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

This course covers the major web development technologies and techniques. The topics covered include HTML5, Cascading Style Sheets, client side programming using JavaScript, HTML5, server side programming using ASP.NET, constructing web databases using PHP, XML, web services.

1. Internet and World Wide Web: Introduction, Internet Addressing, ISP, types of Internet Connections, Introduction to WWW, WEB Browsers, WEB Servers, URLs, HTTP, WEB Applications, Tools for web site creation.

2. HTML5: Introduction to HTML5, Lists, adding graphics to HTML5 page, creating tables, linking documents, forms, frames, Cascading Style sheets.

3. Java Script: Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, introduction to Cookies, Jquery.

4. AJAX: Introduction, HTTP Request, XMLHttpRequest, AJAX Server Script.

5. PHP: Introduction, syntax, statements, operators, PHP and MySQL, PHP and AJAX.

6. Introduction to ASP.net, J2EE, POJO, Java servlets and JSP.

Recommended Books

1. Deitel, Nieto, Lin and Sadhu, 'XML How to Program?', Pearson Education.
2. Ivan Bayross, 'Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGI, BPB'.
3. Steven M. Schafer, 'HTML, CSS, JavaScript, Perl, Python and PHP', Wiley India Textbooks.
4. Paul S. Wang, G. Keller, S. Katila, 'An Introduction to Web Design + Programming', Cengage Learning.
5. Jeffery C. Jackson, 'Web Technologies: A Computer Science Perspective', Pearson Education.
6. Stephen Walhter, Kevin Hoffman, Nate Dudek, 'ASP.NET 4 Unleashed', Pearson Education.
7. James Keogh, 'ASP.NET 2.0 Demystified', McGraw Hill.
8. Scott Mitchell, Sams, 'Teach Yourself ASP.NET 4 in 24 Hours', SAMS, Pearson Education.
9. Robin Nixon, 'Learning PHP, MySQL, and JavaScript', Shroff/O'Reilly.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Styles sheets.
3. Build dynamic web pages using JavaScript (client side programming).
4. Write non-trivial programs using C#.
5. Build interactive web applications using ASP.NET and C#.
6. Build web applications using PHP.
7. Construct and manipulate web databases using ADO.NET.
8. Create XML documents.
9. Create XML Schema.
10. Build and consume web services.

CLOUD COMPUTING

Subject Code: **BITE2-662** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

This course gives an introduction to cloud computing and its techniques, issues, and its services that will lead to design and development of a simple cloud service.

Introduction: Cloud Computing in a Nutshell, Layers and Types of Clouds, Desired Formats of Cloud, Cloud Infrastructure Management, Challenges and Risks

Virtualization: Virtualization of Computing, Storage and Resources.

Cloud Services: Introduction to Cloud Services IaaS, PaaS and SaaS

Software as a Service (SaaS): Evolution of SaaS, Challenges of SaaS Paradigm, SaaS Integration Services, SaaS Integration of Products and Platforms, Business – to Business Integration B2Bi Services.

Infrastructure as a Services (IaaS): Introduction, Background & Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in a Cloud Context.

Platform as a service (PaaS): Integration of Private and Public Cloud, Technologies and Tools for Cloud Computing, Resource Provisioning Services.

Map Reduce Programming models and Implementations: Introduction, Map Reduce Programming Model, Major Map Reduce Implementations for the Cloud, Map Reduce Impacts

Migrating into a Cloud: Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise Class Cloud Offering, Introduction to File System & Hadoop.

Management and Monitoring: Accounts Monitoring, User profiles in Cloud, Resource Allocation and Pricing in Cloud.

Security: Introduction, Cloud Storage: from LANs to WANs, Technologies for Data Security in Cloud Computing, Security Concerns, Legal issues and Aspects, Securing the Private and Public Cloud Architecture.

Recommended Books

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, ‘Cloud Computing: Principles and Paradigms’, Wiley Publications.
2. Toby Velte, Anthony Velte, ‘Cloud Computing: A Practical Approach’, McGraw Hill Osborne Media.
3. George Reese, ‘Cloud Application Architectures: Building Applications and Infrastructure in the Cloud’, O'Reilly Publication.
4. John Rhoton, ‘Cloud Computing Explained: Implementation Handbook for Enterprises’, Recursive Press.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Understand the hardware, software concepts and architecture of cloud computing.
2. Contrast the key technical and commercial issues concerning cloud computing versus traditional software models.
3. Realize the importance of virtualization technology in support of cloud computing.
4. Explore the issues related to cloud computing.

ENTERPRISE RESOURCE PLANNING

Subject Code: **BITE2-663** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To learn the concepts of Enterprise resource Planning. The course has all the required contents that are necessary for a graduate to understand the different strategies of an organization.

1. ERP AND TECHNOLOGY: Introduction, Related Technologies, Business Intelligence, E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining, OLAP, Product life Cycle management, SCM, CRM.

2. ERP IMPLEMENTATION: Implementation Challenges, Strategies, Life Cycle, Methodologies Package selection, Project Teams, Vendors and Consultants, Data Migration, Project management.

3. ERP IN ACTION & BUSINESS MODULES: Operation and Maintenance, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

4. ERP Application: Enterprise Application Integration, ERP II, Total quality management

ERP CASE STUDY: SAP AG, JD Edwards.

Recommended Books

1. Alexis Leon, 'ERP Demystified', 2nd Edn., Tata McGraw Hill, **2008**.
2. Mary Sumner, 'Enterprise Resource Planning', Pearson Education, **2007**.
3. Jim Mazzullo, 'SAP R/3 for Everyone', 2nd Edn., Pearson, **2007**.
4. Jose Antonio Fernandz, 'The SAP R /3 Handbook', Tata McGraw Hill, **2000**.
5. Biao Fu, 'SAP BW: A Step-by-Step Guide', 1st Edn., Pearson Education, **2003**.

Course Outcomes
Upon successful completion of this course, the student will be able to:
1. To understand the concepts of ERP and its related technologies.
2. To understand the implementation of ERP in an organization.
3. To have a deep understanding of different business modules of an organization.
4. To have a basic understanding of applications of ERP and various ERP software's.

PARALLEL AND DISTRIBUTED COMPUTING

Subject Code: **BITE2-664** **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To learn the advanced concepts of Parallel and Distributed Computing and its implementation for assessment of understanding the course by the students

UNIT-I

1. Introduction: Parallel Processing, Parallel Computers, Shared Memory Multiprocessing, Distributed Parallel Computing, Message Passing, Parallelism, Speedup, Utilizing Temporal Parallelism Utilizing Data Parallelism, Comparison of Temporal and Data Parallel Processing, Data Parallel Processing with Specialized processor.

2. Processes & Shared Memory Programming: Processes, Shared Memory Programming, forking for Creating Processes, Joining for Process Termination, Process Model Under UNIX.

UNIT-II

3. Basic Parallel Programming Techniques: Loop Splitting, self-scheduling, Contention and Mutual Exclusion, Introduction of Semaphores and Spin –Lock Implementation, Indirect scheduling, Barriers and Race Conditions Overcoming forward and backward data dependencies.

4. Thread-Based Implementation: Thread Management, Mutual Exclusion with Threads, Events and Condition Variables, Deviation Computation with Threads – POSIX/Java Threads.

UNIT-III

5. Distributed Computing Systems: Design goals, Transparencies, Fundamental Issues.

6. Distributed Coordination: Temporal ordering of events and global state detection, Process synchronization and Distributed mutual exclusion algorithms, inter process communication: Message passing model, Remote procedure call, Point to point and Group communication.

UNIT-IV

7. Issues in Distributed systems: Load balancing and Load sharing, Deadlock, MPI (Message passing Interface) and PVM (Parallel Virtual Machine) architecture and features.

Recommended Books

1. Steven Brawer, 'Introduction to Parallel Programming'.
2. M. Sasikumar, Dinesh Shikhare and P. Ravi Prakash, 'Introduction to Parallel Processing'.
3. Randy Chow, T. Johnson, 'Distributed Operating Systems and Algorithms', Addison Wesley.
4. A.S. Tanenbaum, 'Distributed Operating Systems', Prentice Hall.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Understand the concepts and issues related to parallel and distributed system.
2. Understand intricacies of parallel and distributed programming.
3. Design and develop the programs for parallel and distributed environment.
4. Manage security, performance reliability and other issues while designing in parallel and distributed environment.

NETWORK PROGRAMMING LAB.

Subject Code: **BITE2-628** **L T P C**
0 0 2 1

1. To study and implement various network commands like telnet, ftp, etc.
2. To study various system calls.
3. Programs related to interprocess communication.
4. Programs related to message queues.
5. 5.Programs related to pipes.
6. Programs related to file handling.
7. Programs related to process control.
8. Programs using Socket Programming.

SOFTWARE ENGINEERING LAB.

Subject Code: **BITE2-629** **L T P C**
0 0 2 1

1. Study and usage of OpenProj or similar software to draft a project plan.
2. Study and usage of OpenProj or similar software to track the progress of a project.

3. Preparation of a software requirement specification document, design document and testing phases related document for the same problem.
4. Preparation of software configuration management and risk management related documents.
5. Study and usage of any design phase CASE tool.
6. To perform unit testing and integration testing.
7. To perform various white box and black box testing techniques.
8. Testing a website.

SOFT SKILLS-IV

Subject Code: BHUM0-F94 **L T P C** **Duration: 25 Hrs.**
0 0 2 1

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Nonverbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004**.
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, **1985**.

3rd Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE4-301	Strength of Materials- I	3	1	0	40	60	100	4
BMEE4-302	Theory of Machines-I	3	1	0	40	60	100	4
BMEE4-303	Machine Drawing	1	0	4	40	60	100	3
BMEE4-304	Applied Thermodynamics -I	3	1	0	40	60	100	4
BMEE4-305	Workshop Technology	3	1	0	40	60	100	4
BMEE4-306	Engineering Materials & Metallurgy	3	0	0	40	60	100	3
BMEE4-307	Engineering Materials & Metallurgy Lab.	0	0	2	60	40	100	1
BMEE4-308	Strength of Materials Lab.	0	0	2	60	40	100	1
BMEE4-309	Applied Thermodynamics Lab.	0	0	2	60	40	100	1
BMEE4-310	Training-I#	0	0	4	60	40	100	2
Total		**16**	**4**	**10**	**500**	**500**	**1000**	**27**

#Training will be imparted in the Institution at the end of 2nd semester for Four (04) weeks duration (Minimum 36 hours per week). Industrial tour will also form part of this training.

4th Semester		Contact Hrs.			Marks			Credits
Code	**Course**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMEE4-411	Strength of Materials- II	3	1	0	40	60	100	4
BMEE4-412	Theory of Machines-II	3	1	0	40	60	100	4
BMEE4-413	Fluid Mechanics	3	0	0	40	60	100	3
BMEE4-414	Applied Thermodynamics - II	3	1	0	40	60	100	4
BMEE4-415	Basic Ship structure & Design-I	3	0	0	40	60	100	3
BMEE4-416	Fluid Mechanics Lab.	0	0	2	60	40	100	1
BMEE4-417	Workshop Technology Lab.	0	0	2	60	40	100	1
BMEE4-418	Theory of Machines Lab.	0	0	2	60	40	100	1
Total		**15**	**3**	**6**	**380**	**420**	**800**	**21**

5th Semester		Contact Hrs.			Marks			Credits
Code	Course	L	T	P	Int.	Ext.	Total	
BMEE4-519	Marine Auxiliary Machine	3	1	0	40	60	100	4
BMEE4-520	Ship Construction	3	1	0	40	60	100	4
BMEE4-521	Electrical Machines	3	1	0	40	60	100	4
BMEE4-522	Mechanics of Machines-I	3	1	0	40	60	100	4
BMEE4-523	Electronics	3	1	0	40	60	100	4
BMEE4-524	Workshop Practical (Marine)	0	0	2	60	40	100	1
BMEE4-525	Electrical Engg., Electronics & Microprocessor Lab.	0	0	2	60	40	100	1
BMEE4-526	Electrical Machine Lab.	0	0	2	60	40	100	1
BMEE4-527	Computer Aided Marine Engineering Design and Analysis Lab.	0	0	2	60	40	100	1
BMEE4-528	Training*	0	0	4	60	40	100	2
Total		**15**	**5**	**8**	**500**	**500**	**1000**	**26**

***The marks will be awarded on the basis of 06 weeks industrial training conducted after 4th semester**

6th Semester		Contact Hrs.			Marks			Credits
Code	Course	L	T	P	Int.	Ext.	Total	
BMEE4-629	Ship Operation Management	3	0	0	40	60	100	3
BMEE4-630	Design of Machines-I	3	1	0	40	60	100	4
BMEE4-631	Mechanics of Machines-II	3	1	0	40	60	100	4
BMEE4-632	Fluid Machinery	3	1	0	40	60	100	4
BMEE4-633	Naval Architecture	3	0	0	40	60	100	3
BMEE4-634	Marine Boilers Workshop	0	0	2	60	40	100	1
BMEE4-635	Fluid Machinery Lab.	0	0	2	60	40	100	1
BMEE4-636	Fire Fighting, Controls and Simulators Lab.	0	0	2	60	40	100	1
BMEE4-637	Material Testing Lab.	0	0	2	60	40	100	1
Total		**16**	**4**	**4**	**360**	**440**	**800**	**22**

Total Credits = 25 + 25 + 27 + 21 + 26 + 22 + 17 + 17 = 180

STRENGTH OF MATERIALS – I

Subject Code: BMEE4-301 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Course Objectives and Expected Outcomes: The course is designed to understand the basic concepts of stress, strain and their variations due to different type of loading. The concept of Mechanical properties, Poisson's ratio, bulk modulus, elastic modulus, modulus of rigidity, combined stress and strain, principal stress, principal plane, bending moment and shear force in beam under various loading conditions, understanding of torsional shear stress in solid and hollow shaft; principal and maximum shear stress in a circular shaft subjected to combined stresses, stresses in struts and columns subjected to axial load; bending stress, slope and deflection under different loading and supporting conditions. After the study of this course, a student is expected to analyze different stresses, strains and deflection for designing a simple mechanical element under various loading conditions.

Unit–I

Simple, Compound Stresses and Strains: Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, stress-strain diagram for ductile and brittle materials, extension of a bar due to without and with self-weight, bar of uniform strength, stress in a bar, elastic constants and their significance, relation between elastic constants, Young's modulus of elasticity, modulus of rigidity and bulk modulus. Temperature stress and strain calculation due to axial load and variation of temperature in single and compound bars. Two dimensional stress system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stress ellipse of stress and their applications. Generalized Hook's law, principal stresses related to principal strains.

Unit–II

Bending Moment (B.M.) and Shear Force (S.F.) Diagrams: S.F. and B.M. definitions; relation between load, shear force and bending moment; B.M and S.F diagrams for cantilevers, simply supported beams with or without overhangs, and calculation of maximum B.M. and S.F. and the point of contra flexure under the following loads:

a) Concentrated loads
b) Uniformity distributed loads over the whole span or part of span
c) Combination of concentrated and uniformly distributed load
d) Uniformly varying loads
e) Application of moments

Unit–III

Bending Stresses in Beams: Assumptions in the simple bending theory; derivation of formula and its application to beams of rectangular, circular and channel, I and T- sections. Combined direct and bending stresses in afore-mentioned sections, composite / flitched beams.

Torsion: Derivation of torsion equation and its assumptions and its application to the hollow and solid circular shafts. Torsional rigidity, combined torsion and bending of circular shafts; principal stress and maximum shear stresses under combined loading of bending and torsion.

Unit–IV

Columns and Struts: Introduction, failure of columns, Euler's formula, Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications.

Slope and Deflection: Relationship between moment, slope and deflection; method of integration, Macaulay's method, moment area method and use of these methods to calculate slope and deflection for the following:

a) Cantilevers
b) Simply supported beams with or without overhang
c) Under concentrated loads, uniformly distributed loads or combination of concentrated & uniformly distributed loads.

Recommended Books

1. D.S. Bedi, 'Strength of Materials', Khanna Book Publishing Company.
2. E.P. Popov, 'Mechanics of Materials', (SI Version), Prentice Hall India.
3. R.S Lehri and A.S. Lehri, 'Strength of Materials', Kataria and Sons.
4. S.S. Rattan, 'Strength of Materials', Tata McGraw Hill.
5. Timoshenko and Young, 'Elements of Strength of Materials', East West Press.
6. James M. Gere and Barry J. Goodno, 'Strength of Materials', Cengage Learning.

THEORY OF MACHINES-I

Subject Code: BMEE4-302 **L T P C** **3 1 0 4** **Contact Hrs.: 45**

Course Objectives &Expected Outcomes: The course under Theory of Machine-I has been designed to cover the basic concepts of kinematic aspects of mechanical machines and major parts used in running of the machines. The students will understand the basic concepts of machines and able to understand constructional and working features of important machine elements. The students should be able to understand various parts involved in kinematics of machines for different applications. The students shall also be able to understand requirements of basic machine parts which would help them to understand the design aspects of the machine parts.

Unit–I

Basic Concept of Machines: Link, Mechanism, Kinematic Pair and Kinematic Chain, Principles of Inversion, Inversion of a Four Bar Chain, Slider-Crank-Chain and Double Slider-Crank-Chain. Graphical and Analytical methods for finding: Displacement, Velocity, and Acceleration of mechanisms (including Corliolis Components).

Lower and Higher Pairs: Universal Joint, Calculation of maximum Torque, Steering Mechanisms including Ackerman and Davis approximate steering mechanism, Engine Indicator, Pentograph, Straight Line Mechanisms, Introduction to Higher Pairs with Examples.

Unit–II

Belts, Ropes and Chains: Material & Types of belt, Flat and V-belts, Rope & Chain Drives, Idle Pulley, Intermediate or Counter Shaft Pulley, Angle and Right Angle Drive, Quarter Turn Drive, Velocity Ratio, Crowning of Pulley, Loose and fast pulley, stepped or cone pulleys, ratio of tension on tight and slack side of belts, Length of belt, Power transmitted by belts including consideration of Creep and Slip, Centrifugal Tensions and its effect on power transmission.

Unit–III

Cams: Types of cams and follower, definitions of terms connected with cams. Displacement, velocity and acceleration diagrams for cam followers. Analytical and Graphical design of cam profiles with various motions (SHM, uniform velocity, uniform acceleration and

retardation, cycloidal Motion). Analysis of follower motion for circular, convex and tangent cam profiles.

Friction Devices: Concepts of friction and wear related to bearing and clutches. Types of brakes function of brakes. Braking of front and rear tires of a vehicle. Determination of braking capacity, Types of dynamometers, (absorption, and transmission).

Unit –IV

Flywheels: Turning moment and crank effort diagrams for reciprocating machines' Fluctuations of speed, coefficient of fluctuation of speed and energy, Determination of mass and dimensions of flywheel used for engines and punching machines.

Governors: Function, types and characteristics of governors. Watt, Porter and Proell governors. Hartnell and Willson-Hartnell spring loaded governors. Numerical problems related to these governors. Sensitivity, stability, isochronisms and hunting of governors. Governor effort and power, controlling force curve, effect of sleeve friction.

Recommended Books

1. S.S. Rattan, 'Theory of Machines', Tata McGraw Hill, New Delhi.
2. Jagdish Lal, 'Theory of Mechanisms & Machines', Metropolitan Book Co.
3. Thomas Beven, 'Theory of Machines', Longman's Green & Co., London.
4. W.G. Green, 'Theory of Machines', Blackie & Sons, London
5. V.P. Singh, 'Theory of Machines', Dhanpat Rai.

APPLIED THERMODYNAMICS-I

Subject Code: BMEE4-304 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Course Objectives and Expected Outcomes: This course is designed for comprehensive study of combustion and thermal aspects in internal combustion engines, steam power plants and its allied components. This will enable the students to understand combustion phenomenon and thermal analysis of steam power plant components. The students will be able to identify, track and solve various combustion problems and evaluate theoretically the performance of various components involved in steam power plants and internal combustion engines.

Unit–I

Combustion: Combustion Equations (Stoichiometric and non- Stoichiometric). Combustion problems in Boilers and IC engines/Calculations of air fuel ratio, Analysis of products of combustion, Conversion of volumetric analysis into gravimetric analysis and vice-versa, Actual weight of air supplied, Use of mols, for solution of combustion problems, Heat of formation, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.

IC Engines Introduction: Actual Engine Indicator diagrams and valve-timing diagrams for two stroke and four stroke S.I. and C.I. Engines; Construction and Working Principle of Wankel rotary engine; Principle of simple carburetor, Injection systems in Diesel and Petrol Engines (Direct Injection, MPFI in SI and CI Engines, respectively). Essential requirements for Petrol and Diesel Fuels. Theory of combustion in SI and CI Engines; Various stages of combustion; Pressure time/crank- Angle diagrams; Various phenomenon such as turbulence, squish and swirl, dissociation, pre-ignition/auto- ignition, and after burning etc.; Theory of knocking (i.e., detonation) in SI and CI Engines; Effect of engine variables on the Delay Period in SI and CI engines; Effect of various parameters on knock in SI and CI Engines; Methods employed to reduce knock in SI and CI Engines; Octane and Cetane rating of fuels; Knockmeter; Dopes and inhibitors; Performance curves/maps of SI and CI Engines; Effect of

knocking on engine performance; Effect of compression ratio and air-fuel ratio on power and efficiency of engine; Variation of engine power with altitude; Supercharging and turbo charging of SI and CI Engines; Advantages and applications of supercharging; Emissions from SI and CI Engines and methods to reduce/control them. Logarithmic plotting of PV-diagrams. High speed Engine Indicators.

Unit–II

Properties of Steam: Pure substance; Steam and its formation at constant pressure: wet, dry, saturated and super-heated steam; Sensible heat(enthalpy), latent heat and total heat (enthalpy) of steam; dryness fraction and its determination; degree of superheat and degree of sub-cool; Entropy and internal energy of steam; Use of Steam Tables and Mollier Chart; Basic thermodynamic processes with steam (isochoric, isobaric, isothermal, isentropic and adiabatic process) and their representation on T-S Chart and Mollier Charts (h-s diagrams). Significance of Mollier Charts.

Steam Generators: Definition: Classification and Applications of Steam Generators; Working and constructional details of fire-tube and water-tube boilers: (Cochran, Lancashire, Babcock and Wilcox boilers); Merits and demerits of fire-tube and water-tube boilers; Modern high pressure boilers (Benson boiler, La Mont boiler) and Super critical boilers (Once through boilers-Tower type); Advantages of forced circulation; Description of boiler mountings and accessories: Different types of Safety Valves, Water level indicator, pressure gauge, Fusible plug, Feed pump, Feed Check Valve, Blow-off Cock, Steam Stop-Valve, Economiser, Super-heater; Air pre-heater and Steam accumulators; Boiler performance: equivalent evaporation, boiler efficiency, boiler trial and heat balance; Types of draught and Calculation of chimney height.

Unit–III

Vapour Power Cycle: Carnot Cycle and its limitations; Rankine steam power cycle, Ideal and actual; Mean temperature of heat addition; Effect of pressure, temperature and vacuum on Rankine Efficiency; Rankine Cycle Efficiency and methods of improving Rankine efficiency: Reheat cycle, Bleeding (feed-water-heating), Regenerative Cycle, Combined reheat-regenerative cycle; Ideal working fluid; Binary vapour cycle, Combined power and heating cycles.

Steam Nozzles: Definition, types and utility of nozzles; Flow of steam through nozzles; Condition for maximum discharge through nozzle; Critical pressure ratio, its significance and its effect on discharge; Area of throat and at exit for maximum discharge; Effect of friction; Nozzle efficiency; Convergent and convergent-divergent nozzles; Calculation of Nozzle dimensions (length and diameters of throat and exit); Supersaturated (or metastable) flow through nozzle.

Steam Turbines: Introduction; Classification; Impulse versus Reaction turbines. Simple impulse turbine: pressure and velocity variation, Velocity diagrams/triangles; Combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, maximum work and maximum efficiency, effect of blade friction on velocity diagram, effect of speed ratio on blade efficiency, condition for axial discharge;

Unit–IV

DeLaval Turbine: Compounding of impulse turbines: purpose, types and pressure and velocity variation, velocity diagrams/triangles, combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, overall efficiency and relative efficiency;

Impulse-Reaction Turbine: pressure and velocity variation, velocity diagrams/triangles, Degree of reaction, combined velocity diagram/triangle and calculations for force, axial

thrust, work, power, blade efficiency, stage efficiency, overall efficiency and relative efficiency, maximum work and maximum efficiency; Calculations of blade height;
Multistaging: Overall efficiency and relative efficiency; Reheating, Reheat factor and condition curve; Losses in steam turbines; Back pressure and extraction turbines; Co-generation; Economic assessment; Governing of steam turbines.
Steam Condensers: Function; Elements of condensing unit; Types of condensers; Dalton's law of partial pressures applied to the condenser problems; Condenser and vacuum efficiencies; Cooling water calculations; Effect of air leakage; Method to check and prevent air infiltration; Description of air pump and calculation of its capacity; Cooling towers: function, types and their operation.

Recommended Books

1. R. Yadav, Sanjay and Rajay, 'Applied Thermodynamics', Central Publishing House.
2. J.S. Rajadurai, 'Thermodynamics and Thermal Engineering', New Age International (P) Ltd. Publishers.
3. D.S. Kumar and V.P. Vasandani, 'Heat Engineering', Metropolitan Book Co. Pvt. Ltd.
4. K. Soman, 'Thermal Engineering', PHI Learning Pvt. Ltd.
5. G. Rogers and Y. Mayhew, 'Engineering Thermodynamics', Pearson.
6. W.A.J. Keartan, 'Steam Turbine: Theory and Practice', ELBS Series.
7. Heywood, 'Fundamentals of IC Engines', McGraw Hill.
8. V. Ganeshan, 'Internal Combustion Engines', Tata McGraw Hill.

WORKSHOP TECHNOLOGY

Subject Code: BMEE4-305 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

1. Common workshop Tools: Description and uses of different types of Calipers, Straight edges, try squares, Vices, Hammers, Chisels, Scrapers, Files, Drills, Reamers, Tapes, V Blocks, Face plate, Marking blocks, Carpentry tools, pattern maker's tools, Smithy tools and Moulding tools. Application of hand tools as chisel, file and saw.
2. Metal cutting Machines: Kinematic analysis, specification, operation and inspection of the more important types of metal cutting machine tool including Centre lathes, Capstan and turret lathes, Automatic lathes, drilling and boring machines. Shaping slotting and planning machines, Milling and broaching machines.

UNIT-II

3. Machine Process & Machine Tools: The geometry of cutting processes, Chip formation, Cutting forces, Stresses and power; Friction of chip on tool. Generation and dissipation of heat ii cutting. Standard nomenclature for cutting tools. Cutting speeds and feeds, estimation of machining time. The fundamental Cutting process, geometrical control of the cutting edge Turning, Screw cutting and taper turning processes on Centre lathe.
4. Abrasive Process: Grinding, honing and lapping by hand and machines. Shears and punches. Wood working machines. Principles of jigs and fixtures Standardization.

UNIT-III

5. Measuring Instruments & Inspection: Description and use of steel rule, Vernier's scale, Micro-meter, Dial gauge, Depth gauge, thread gauge, Feeler gauge, Wire gauge, pattern maker's scale, Taper gauge, snap gauge, Plug gauge, Optical methods of measurement, Principles of interchange ability, limit system, Use of limit gauge.
6. Fitting and Overhauling: Types of packing and jointing materials and their uses, Design

considerations and construction of various types of valves and cocks, Reducing valves for steam and air. Bedding of bearings, marking of engine parts for fitting, machining operations fitting of keys, cotters, Pipe work.

UNIT-IV

7. Safety Measures: Sources of danger and methods of protection. Types of guards and safety devices, Factory Act regulations.

8. Welding: Welding Equipment & Applications, Electric welding (A.C & D.C) spot welding. Gas welding. Soldering & Brazing. Different welding & Electrodes, Solders & Brazing Fluxes. Defects in welding Safe working practices - Personal Protection Equipment

Recommended Books

1. A. Manna, 'A Textbook of Manufacturing Science and Technology', PHI Publishers.
2. H.S. Shan, 'Manufacturing Processes', Vol.-I, Pearson Publishers.
3. P.N. Rao, 'Manufacturing Technology, Foundry, Forming & Welding', Tata McGraw Hill.
4. R.S. Parmar, 'Welding Engineering & Technology', Khanna Publishers.
5. Serope Kalpakjian and Steven R. Schmid, 'Manufacturing Engineering and Technology', Pearson Publishers.

ENGINEERING MATERIALS & METALLURGY

Subject Code: BMEE4-306 **L T P C** **Contact Hrs.: 37**

3 0 0 3

Course Objectives and Outcomes: This course is designed to develop fundamental concepts of crystallography, phase transformation and heat treatment processes. The students will learn the atomic structure of metals, imperfections, diffusion mechanisms and theories of plastic deformation. They will also understand equilibrium diagrams, time-temperature transformation curves and heat treatment processes. Upon completion of the course, the students will be able to understand the concepts of crystal structure, microstructure and deformation. They will also be able to understand the phase diagrams which are useful for design and control of heat treating processes.

Unit–I

Crystallography: Atomic structure of metals, atomic bonding in solids, crystal structures, crystal lattice of body centered cubic, face centered cubic, closed packed hexagonal; crystalline and non-crystalline materials; crystallographic notation of atomic planes; polymorphism and allotropy; imperfection in solids: theoretical yield strength, point defects, line defects and dislocations, interfacial defects, bulk or volume defects. Diffusion: diffusion mechanisms, steady-state and non-steady state diffusion, factors affecting diffusion. Theories of plastic deformation, recovery, recrystallization.

Unit–II

Phase Transformation: General principles of phase transformation in alloys, phase rule and equilibrium diagrams, Equilibrium diagrams of Binary systems. Iron carbon equilibrium diagram and various phase transformations. Time temperature transformation curves (TTT curves): fundamentals, construction and applications.

Unit–III

Heat Treatment: Principles and applications. Processes viz. annealing, normalizing, hardening, tempering. Surface hardening of steels: Principles of induction and oxyacetylene flame hardening. Procedure for carburizing, nitriding and cyaniding. Harden-ability: determination of harden-ability. Jominy end-quench test. Defects due to heat treatment and their remedies; effects produced by alloying elements. Composition of alloy steels.

Unit–IV

Ferrous Metals and Their Alloys: Introduction, classification, composition of alloys, effect of alloying elements (Si, Mn, Ni, Cr, Mo, W, Al) on the structures and properties of steel.

Recommended Books

1. B. Zakharov, 'Heat Treatment of Metals', University Press.
2. T. Goel and R.S. Walia, 'Engineering Materials & Metallurgy'.
3. Sidney H. Avner, 'Introduction to Physical Metallurgy', Tata McGraw Hill.
4. V. Raghavan, 'Physical Metallurgy: Principles and Practice', PHI Learning.
5. Y. Lakhin, 'Engineering Physical Metallurgy', Mir Publishers.

ENGINEERING MATERIALS & METALLURGY LAB.

Subject Code: BMEE4-307 **L T P C**
0 0 2 1

EXPERIMENTS

1. Preparation of models/charts related to atomic/crystal structure of metals.
2. Annealing the steel specimen and study the effect of annealing time and temperature on hardness of steel.
3. Hardening the steel specimen and study the effect of quenching medium on hardness of steel.
4. Practice of specimen preparation (cutting, mounting, polishing, etching) of mild steel, aluminium and hardened steel specimens.
5. Study of the microstructure of prepared specimens of mild steel, Aluminium and hardened steel.
6. Identification of ferrite and pearlite constituents in given specimen of mild steel.
7. Determination of hardenability of steel by Jominy End Quench Test.

STRENGTH OF MATERIALS LAB

Subject Code: BMEE4-308 **L T P C**
0 0 2 1

EXPERIMENTS

1. To perform tensile test in ductile and brittle materials and to draw stress-strain curve and to determine various mechanical properties.
2. To perform compression test on Cast Iron.
3. To perform any one hardness tests (Rockwell, Brinell & Vicker's test).
4. To perform impact test to determine impact strength.
5. To perform torsion test and to determine various mechanical properties.
6. To perform Fatigue test on circular test piece.
7. To perform bending test on beam and to determine the Young's modulus and modulus of rupture.
8. Determination of Bucking loads of long columns with different end conditions.
9. To evaluate the stiffness and modulus of rigidity of helical coil spring.

APPLIED THERMODYNAMICS LAB.

Subject Code: BMEE4-309 **L T P C**
0 0 2 1

EXPERIMENTS

1. Study of construction and operation of 2 stroke and 4 stroke Petrol and Diesel engines using actual engines or models.
2. To plot actual valve timing diagram of a 4 stroke petrol and diesel engines and study its impact on the performance of engine.
3. Study of working, construction, mountings and accessories of various types of boilers.
4. To perform a boiler trial to estimate equivalent evaporation and efficiency of a fire tube/ water tube boiler.
5. Determination of dryness fraction of steam and estimation of brake power, Rankine efficiency, relative efficiency, generator efficiency, and overall efficiency of an impulse steam turbine and to plot a Willian's line.
6. Determine the brake power, indicated power, friction power and mechanical efficiency of a multi cylinder petrol engine running at constant speed (Morse Test).
7. Performance testing of a diesel engine from no load to full load (at constant speed) for a single cylinder/ multi- cylinder engine in terms of brake power, indicated power, mechanical efficiency and specific fuel consumption and to measure the smoke density. Draw/obtain power consumption and exhaust emission curves. Also make the heat balance sheet.
8. Performance testing of a petrol engine from no load to full load (at constant speed) for a single cylinder/ multi- cylinder engine in terms of brake power, indicated power, mechanical efficiency and specific fuel consumption and to measure the exhaust emissions. Also draw/obtain power consumption and exhaust emission curves.
9. Study of construction and operation of various types of steam condensers and cooling towers.

STRENGTH OF MATERIALS-II

Subject Code: BMEE4-411 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Course Objectives and Outcomes: The course is designed to understand the concepts of strain energy, resilience, stress under impact loading; shear stress distribution in a beam of various cross sections; stress in curved cross sections; stresses in helical, spiral and leaf springs; stress and strain analysis of thin, thick cylinder and spheres subjected to internal pressure; and various failure theories. The outcome of the course is to enhance deep and vigorous understanding of stress analysis in various machine elements, so that a student can properly analyze and design a mechanical member from the strength point of view under various conditions.

Unit–I

Strain Energy: Introduction to strain energy, energy of dilation and distortion. Resilience, stress due to suddenly applied loads. Castigliano's and Maxwell's theorem of reciprocal deflection.

Theories of Failure: Maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, total strain energy theory, shear strain energy theory.

Graphical representation and derivation of equation for these theories and their application to problems related to two dimensional stress systems.

Unit–II

Springs: Open and closed coiled helical springs under the action of axial load and/or couple. Flat spiral springs- derivation of formula for strain energy, maximum stress and rotation. Leaf spring deflection and bending stresses.

Thin cylinders and Spheres: Calculation of Hoop stress, longitudinal stress in a cylinder, effects of joints, change in diameter, length and internal volume. Principal stresses in sphere, change in diameter and internal volume.

Unit–III

Thick Cylinders: Derivation of Lame's equations, calculation of radial, longitudinal and hoop stresses and strains due to internal pressure in thick cylinders, compound cylinders, hub shrunk on solid shafts, shrinkage allowance and shrinkage stress.

Bending of Curved Beams: Calculation of stresses in cranes or chain hooks, rings of circular and trapezoidal section, and chain links with straight sides.

Unit–IV

Shear Stresses in Beams: Shear stress distribution in rectangular, circular, I, T and channel section; built up beams. Shear centre and its importance.

Rotational Discs: Stresses in rotating discs and rims of uniform thickness; disc of uniform strength.

Recommended Books

1. D.S. Bedi, 'Strength of Materials', Khanna Book Publishing Company.
2. G.H. Ryder, 'Strength of Materials', Macmillan India Ltd.
3. R.S. Lehri and A.S. Lehri, 'Strength of Materials', Vol.-2, S.K. Kataria and Sons.
4. S.S. Rattan, 'Strength of Materials', Tata McGraw Hills.
5. Timoshenko and Gere, 'Mechanics of Materials', CBS Publishers.

THEORY OF MACHINES – II

Subject Code: BMEE4-412 **L T P C** **Contact Hrs.: 45**

3 1 0 4

Course Objectives & Outcomes: The students will understand the basic concepts of inertia forces & couples applied to reciprocating parts of a machine. Students should be able to understand balancing of masses and design of gears & gear trains. They will also gain knowledge of kinematic synthesis and different applications of gyroscopic effect.

Unit–I

Static Force Analysis: Concept of force and couple, free body diagram, condition of equilibrium, static equilibrium of mechanism, methods of static force analysis of simple mechanisms. Power transmission elements, considerations of frictional forces.

Dynamic Force Analysis: Determination of forces and couples for a crank, inertia of reciprocating parts, dynamically equivalent system, analytical and graphical method, inertia force analysis of basic engine mechanism, torque required to overcome inertia and gravitational force of a four bar linkage.

Unit–II

Balancing: Necessity of balancing, static and dynamic balancing, balancing of single and multiple rotating masses, partial unbalanced primary force in an engine, balancing of reciprocating masses, and condition of balance in multi cylinder in line V-engines, concept of direct and reverse crank, balancing of machines, rotors, reversible rotors.

Unit–III

Gears: Toothed gears, types of toothed gears and its terminology. Path of contact, arc of contact, conditions for correct gearing, forms of teeth, involutes and its variants, interference and methods of its removal. Calculation of minimum number of teeth on pinion/wheel for involute rack, helical, spiral, bevel and worm gears. Center distance for spiral gears and efficiency of spiral gears.

Gear Trains: Types of gear trains, simple, compound and epicyclic gear trains, problems involving their applications, estimation of velocity ratio of worm and worm wheel.

Unit–IV

Gyroscopic Motion and Couples: Effect on supporting and holding structures of machines. stabilization of ships and planes, Gyroscopic effect on two and four wheeled vehiclesand stone crusher.

Kinematic Synthesis of Mechanism: Freudenstien equation, Function generation errors in synthesis, two and three-point synthesis, Transmission angles, least square techniques.

Recommended Books

1. S.S. Rattan, 'Theory of Machines', Tata McGraw Hill.
2. John, Gordon and Joseph, 'Theory of Machines and Mechanisms', Oxford University Press.
3. Hams Crone and Roggers,' Theory of Machines'.
4. Shigley, 'Theory of Machines', McGraw Hill.
5. V.P. Singh, 'Theory of Machines', Dhanpat Rai and Sons.

FLUID MECHANICS

Subject Code: BMEE4-413 **L T P C** **3 0 0 3** **Contact Hrs.: 38**

Course Objectives and Expected Outcomes: This course is designed for the undergraduate mechanical engineering students to develop an understanding of the behavior of fluids at rest or in motion and the subsequent effects of the fluids on the boundaries as the mechanical engineers has to deal with fluids in various applications. This course will also develop analytical abilities related to fluid flow. It is expected that students will be able to have conceptual understanding of fluids and their properties, apply the analytical tools to solve different types of problems related to fluid flow in pipes, design the experiments effectively and do the prototype studies of different types of machines and phenomenon.

Unit–I

Fundamentals of Fluid Mechanics: Introduction; Applications; Concept of fluid; Difference between solids, liquids and gases; Concept of continuum; Ideal and real fluids; Fluid properties: density, specific volume, specific weight, specific gravity, viscosity (dynamic and kinematic), vapour pressure, compressibility, bulk modulus, Mach number, surface tension and capillarity; Newtonian and non-Newtonian fluids.

Fluid Statics: Concept of static fluid pressure; Pascal's law and its engineering applications; Hydrostatic paradox; Action of fluid pressure on a plane submerged surface (horizontal, vertical and inclined): resultant force and centre of pressure; Force on a curved surface due to hydrostatic pressure; Buoyancy and flotation; Stability of floating and submerged bodies; Metacentric height and its determination; Periodic time of oscillation; Pressure distribution in a liquid subjected to:

i) constant acceleration along horizontal, vertical and inclined direction (linear motion),
ii) constant rotation.

Unit–II

Fluid Kinematics: Classification of fluid flows; Lagrangian and Euler flow descriptions; Velocity and acceleration of fluid particle; Local and convective acceleration; Normal and tangential acceleration; Path line, streak line, streamline and timelines; Flow rate and discharge mean velocity; One dimensional continuity equation; Continuity equation in Cartesian (x, y, z), polar (r, θ) and cylindrical (r, θ, z) coordinates; Derivation of continuity equation using the Lagrangian method in Cartesian coordinates; Rotational flows: rotation, vorticity and circulation; Stream function and velocity potential function, and relationship between them; Flow net.

Unit–III

Fluid Dynamics: Derivation of Euler's equation of motion in Cartesian coordinates, and along a streamline; Derivation of Bernoulli's equation (using principle of conservation of energy and equation of motion) and its applications to steady state ideal and real fluid flows; Representation of energy changes in fluid system (hydraulic and energy gradient lines); Impulse momentum equation; Kinetic energy and momentum correction factors; Flow along a curved streamline; Free and forced vortex motions.

Dimensional Analysis and Similitude: Need of dimensional analysis; Fundamental and derived units; Dimensions and dimensional homogeneity; Rayleigh's and Buckingham's π - method for dimensional analysis; Dimensionless numbers (Reynolds, Froudes, Euler, Mach, and Weber) and their significance; Need of similitude; Geometric, kinematic and dynamic similarity; Model and prototype studies; Similarity model laws.

Unit–IV

Internal Flows: Laminar and Turbulent Flows: Reynolds number, critical velocity, critical Reynolds number, hydraulic diameter, flow regimes; Hagen – Poiseuille equation; Darcy equation; Head losses in pipes and pipe fittings; Flow through pipes in series and parallel; Concept of equivalent pipe; Roughness in pipes, Moody's chart.

Pressure and Flow Measurement: Manometers; Pitot tubes; Various hydraulic coefficients; Orifice meters; Venturi meters; Borda mouthpieces; Notches (rectangular, V and Trapezoidal) and weirs; Rotameters.

Recommended Books

1. D.S. Kumar, 'Fluid Mechanics and Fluid Power Engineering', S.K. Kataria and Sons Publishers.
2. S.K. Som, G. Biswas and S. Chakraborty, 'Introduction to Fluid Mechanics and Fluid Machines', Tata McGraw Hill.
3. C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, 'Fluid Mechanics and Machinery', Oxford University Press.
4. Y.A. Cengel and J.M. Cimbala, 'Fluid Mechanics - Fundamentals and Applications', Tata McGraw Hill.
5. B.R. Munson, D.F. Young, T.H. Okiishi and W.W. Huebsch, 'Fundamentals of Fluid Mechanics', John Wiley and Sons.
6. J.F. Douglas and J.M. Gasiorek, J.A. Swaffield and L.B. Jack, 'Fluid Mechanics', Pearson.
7. V.L. Streeter, E.B. Wylie and K.W. Bedford, 'Fluid Mechanics', Tata McGraw Hill.

APPLIED THERMODYNAMICS-II

Subject Code: BMEE4-414 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Course Objectives and Expected Outcomes: This course is designed for providing comprehensive understanding and thermodynamic analysis of positive displacement air compressors and thermal turbo machines used in power generation, aircraft, spacecraft and rocket propulsion. The students will be able to understand the thermodynamic working as well as performance of thermal turbo power machinery. They will also be able to select various thermal devices required for aforesaid applications.

Unit–I

Air Compressors: Introduction: Classification of Air Compressors; Application of compressors and use of compressed air in industry and other places; Complete representation of compression process on P-v and T-s coordinates with detailed description of areas representing total work done and polytropic work done; Areas representing energy lost in internal friction, energy carried away by cooling water and additional flow work being done for un-cooled and cooled compression on T-S coordinates; Best value of index of compression; Isentropic, polytropic and isothermal efficiencies and their representation in terms of ratio of areas representing various energy transfers on T-s coordinates.

Reciprocating Air Compressors: Single stage single acting reciprocating compressor (with and without clearance volume): construction, operation, work input and best value of index of compression, heat rejected to cooling medium, isothermal, overall thermal, isentropic, polytropic, mechanical efficiency, Clearance Volumetric efficiency, Overall volumetric efficiency, effect of various parameters on volumetric efficiency, free air delivery; Multistage compressors: purpose and advantages, construction and operation, work input, heat rejected in intercoolers, minimum work input, optimum pressure ratio; isothermal, overall thermal, isentropic, polytropic and mechanical efficiencies; Performance curves.

Unit–II

Positive Displacement Rotary Compressors: Introduction: Comparison of rotarypositive displacement compressors with reciprocating compressors; Classification of rotary compressors; Construction, operation, work input and efficiency of positive displacement type of rotary compressors like Roots blower, Lysholm compressor and Vane Type Blower.

Thermodynamics of Dynamic Rotary Compressors: Applications of Steady Flow Energy Equation and thermodynamics of dynamic (i.e., centrifugal and axial flow m/cs) compressors; Stagnation and static values of pressure, Temperature and enthalpy etc. for flow through dynamic rotary machines; Complete representation of compression process on T-S coordinates with detailed description of areas representing total work done, polytropic work done; ideal work required for compression process, areas representing energy lost in internal friction, energy carried away by cooling water on TS coordinates for an uncooled and cooled compression; isentropic, polytropic, and isothermal efficiencies as ratios of the areas representing various energy transfers on T-S coordinates.

Unit–III

Centrifugal Compressors: Complete thermodynamic analysis of centrifugal compressor stage; Polytropic, isentropic and isothermal efficiencies; Complete representation of compression process in the centrifugal compressor starting from ambient air flow through the suction pipe, Impeller, Diffuser and finally to delivery pipe on T-S coordinates; Pre-guide vanes and pre-whirl; Slip factor; Power input factor; Various modes of energy transfer in the

impeller and diffuser; Degree of Reaction and its derivation; Energy transfer in backward, forward and radial vanes; Pressure coefficient as a function of slip factor; Efficiency and out-coming velocity profile from the impeller; Derivation of non-dimensional parameters for plotting compressor characteristics; Centrifugal compressor characteristic curves; Surging and choking in centrifugal compressors.

Axial Flow Compressors: Different components of axial flow compressor and their arrangement; Discussion on flow passages and simple theory of aero foil blading; Angle of attack; coefficients of lift and drag; Turbine versus compressor blades; Velocity vector; Vector diagrams; Thermodynamic analysis; Work done on the compressor and power calculations; Modes of energy transfer in rotor and stator blade flow passages; Detailed discussion on work done factor, degree of reaction, blade efficiency and their derivations; Isentropic, polytropic and isothermal efficiencies; Surging, Choking and Stalling in axial flow compressors; Characteristic curves for axial flow compressor; flow parameters of axial flow compressor like Pressure Coefficient, Flow Coefficient, Work Coefficient, Temperature-rise Coefficient and Specific Speed; Comparison of axial flow compressor with centrifugal compressor and reaction turbine; Field of application of axial flow compressors.

Unit–IV

Gas Turbines: Classification and comparison of the Open and Closed cycles; Classification on the basis of combustion (at constant volume or constant pressure); Comparison of gas turbine with a steam turbine and IC engine; Fields of application of gas turbines; Position of gas turbine in power industry; Thermodynamics of constant pressure gas turbine cycle (Brayton cycle); Calculation of net output, work ratio and thermal efficiency of ideal and actual cycles; Cycle air rate, temperature ratio; Effect of changes in specific heat and that of mass of fuel on power and efficiency; Operating variables and their effects on thermal efficiency and work ratio; Thermal refinements like regeneration, inter-cooling and re-heating and their different combinations in the gas turbine cycle and their effects on gas turbine cycle i.e. gas turbine cycle. Multistage compression and expansion; Dual Turbine system; Series and parallel arrangements; Closed and Semi-closed gas turbine cycle; Requirements of a gas turbine combustion chamber; Blade materials and selection criteria for these materials and requirements of blade materials; Gas turbine fuels.

Jet Propulsion: Principle of jet propulsion; Description of different types of jet propulsion systems like rockets and thermal jet engines, like,

(i) Athodyds (ramjet and pulsejet),
(ii) Turbo jet engine, and
(iii) Turboprop engine.

Thermodynamics of turbojet engine components; Development of thrust and methods for its boosting/augmentation; Thrust work and thrust power; Propulsion energy, Propulsion and thermal (internal) efficiencies; Overall thermal efficiency; Specific fuel consumption; Rocket propulsion, its thrust and thrust power; Propulsion and overall thermal efficiency; Types of rocket motors (e.g. solid propellant and liquid propellant systems); Various common propellant combinations (i.e. fuels) used in rocket motors; Cooling of rockets; Advantages and disadvantages of jet propulsion over other propulsion systems; Brief introduction to performance characteristics of different propulsion systems; Fields of application of various propulsion units.

Recommended Books

1. R. Yadav, Sanjay and Rajay, 'Applied Thermodynamics', Central Publishing House.
2. J.S. Rajadurai, 'Thermodynamics and Thermal Engineering', New Age International (P) Ltd. Publishers.

3. D.S. Kumar and V.P. Vasandani, 'Heat Engineering', Metropolitan Book Co. Pvt. Ltd.
4. K. Soman, 'Thermal Engineering', PHI Learning Pvt. Ltd.
5. G. Rogers and Y. Mayhew, 'Engineering Thermodynamics', Pearson.
6. D.G. Shephered, 'Principles of Turbo machinery', Macmillan.
7. H. Cohen, G.F.C. Rogers and M. Sarvan, 'Gas Turbine Theory, Longmans.

BASIC SHIP STRUCTURE & DESIGN-1

Subject Code: BMEE4-415 **L T P C** **Contact Hrs.: 38**
3 0 0 3

UNIT-I

1. Ships Terms: Various terms used in ship Construction with reference to Ship's parameter e.g. L.B.P. Moulded Depth, Moulded draught etc. General Classification of Ships. Stresses in Ship's structure: Hogging, Sagging, Racking, Pounding, Panting, etc. and Strength members to counteract the same.

UNIT-II

2. Sections and Materials Use: Type of section like Angles, Bulb Plates. Flanged beams used in ship construction. Riveting & Welding. Testing of welds. Fabricated components. Bottom & side Framing: Double bottoms, Water tight floors, Solid and bracket floors, Longitudinal framing keels, side framing like Tank side brackets, Beam knee, Web Frame, etc.

3. Shell & Decks: Planting system for shells, Deck plating & Deck girders, discontinuities like hatches and other openings. Supporting & closing arrangements, mid-ship Section of ships.

UNIT-III

4. Bulk heads & Deep Tanks: Water tight bulkheads, Arrangements of plating and stiffeners. Water tight openings through bulkheads for electric cables pipes and shafting. Deep tank for oil fuel or oil cargo corrugated bulk heads.

UNIT-IV

5. Theory of Fire: Introduction, safety and fire triangle, fire prevention Construction, operation and merits of different types of portable and non-portable fire extinguishers and fixed fire extinguishing installations for ships.

6. Firefighting Equipment: Fire pumps, construction, firefighting in port and dry dock, Action required and practical techniques adopted for extinguishing fires in accommodation, machinery spaces, boiler rooms, Cargo holds, galley etc. Fire fighting in port and dry dock.

Recommended Books

1. Djeyers, 'Ship Design'.
2. Reeds, 'Ship Design'.

FLUID MECHANICS LAB.

Subject Code: BMEE4-416 **L T P C**
0 0 2 1

EXPERIMENTS

1. To determine the metacentric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulli's energy equation.

3. To determine the coefficient of discharge for an obstruction flow meter (venturi meter/ orifice meter)
4. To determine the discharge coefficient for a V- notch or rectangular notch.
5. To study the transition from laminar to turbulent flow and to ascertain the lower critical Reynolds number.
6. To determine the hydraulic coefficients for flow through an orifice.
7. To determine the friction coefficients for pipes of different diameters.
8. To determine the head loss in a pipe line due to sudden expansion/ sudden contraction/ bend.
9. To determine the velocity distribution for pipeline flow with a pitot static probe.
10. Experimental evaluation of free and forced vortex flow.

WORKSHOP TECHNOLOGY LAB.

Subject Code: BMEE4-417 **L T P C**
0 0 2 1

EXPERIMENTS

Casting:

1. To determine clay content, moisture content, hardness of a moulding sand sample.
2. To determine shatter index of a moulding sand sample.
3. To test tensile, compressive, transverse strength of moulding sand in green condition.
4. To determine permeability and grain fineness number of a moulding sand sample.

Welding:

1. To make lap joint, butt joint and T- joints with oxy- acetylene gas welding and manual arc welding processes
2. To study MIG, TIG and Spot welding equipment and make weld joints by these processes.

Machining and Forming:

1. To study constructional features of following machines through drawings/sketches:
   a) Grinding machines (Surface, Cylindrical)
   b) Hydraulic Press
   c) Draw Bench
   d) Drawing and Extrusion Dies
   e) Rolling Mills
2. To grind single point and multipoint cutting tools
3. To prepare job on Lathe involving specified tolerances; cutting of V- threads and square threads.
3. To prepare job on shaper involving plane surface,
4. Use of milling machines for generation of plane surfaces, spur gears and helical gears; use of end mill cutters.
5. To determine cutting forces with dynamometer for turning, drilling and milling operations.

Note: At least one industrial visit must be arranged for the students for the live demonstration of Casting, Welding, Forming and Machining processes.

THEORY OF MACHINES LAB.

Subject Code: BMEE4-418 **L T P C**
0 0 2 1

EXPERIMENTS

1. To draw displacement, velocity & acceleration diagram of slider - crank and four bar mechanism.
2. To study the various inversions of kinematic chains.
3. Conduct experiments on various types of governors and draw graphs between height and equilibrium speed of a governor.
4. Determination of gyroscopic couple (graphical method).
5. Balancing of rotating masses (graphical method).
6. Cam profile analysis (graphical method)
7. Determination of gear- train value of compound gear trains and epicyclic gear trains.
8. To draw circumferential and axial pressure profile in a full journal bearing.
9. To determine coefficient of friction for a belt-pulley material combination.
10. Determination of moment of inertia of flywheel.

MARINE AUXILIARY MACHINERY

Subject Code: BMEE4-519 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

ENGINE ROOM LAYOUT: Layout of main and auxiliary machinery in Engine Rooms in different ships.

Engine Room Piping Arrangements & Fittings: Steam and condensate system, water hammering in pipes, Expansion joints in pipelines, Bilge – ballast, fuel oil bunkering and transfer system, bunkering procedure, precautions taken, fuel oil service system to main and auxiliary engines, lubricating oil and Engine cooling system to main and auxiliary engines, central cooling and central priming systems, control and service air system, domestic fresh water and sea water (Hydrophore) service system, drinking water system, fire main system.

UNIT-II

VALVES AND COCKS: Straight way cocks, right angled cock, 'T' cock, spherical cock, Boiler gauge glass cock (cylindrical cock).

Valves: Globe valves, SDNR valve, swing check valve (storm valve), gate valves, butterfly valves, relief valves, quick closing valves, pressure reducing valves, control valves, change over valve chests, fuel oil transfer chest, valve actuators, steam traps.

Jointings: Packings, Insulation of materials, Types, - Various applications. Seals – purpose of bearing seal, description and application of non-rubbing seals and rubbing seals, simple felt seal, seals suitable for various peripheral speeds, V-ring seals, Lip seals.

Filters and Strainers: Filtration, filter elements basket strainers, duplex strainers, edge type strainers, autokleen strainers, back flushing strainers, magnetic filter, rotary filters, fine filters.

OPERATION & MAINTENANCE: Prevention of oil, garbage, sewage, air pollution and IMO requirement as per MARPOL act. Operation,
construction, maintenance of oil water separator both manual and automatic versions. Construction, operation, maintenance of incinerator and the of sewage plant.

UNIT-III

THEORY OF OIL PURIFICATION: Construction, operation, maintenance of fuel oil and lub oil purifiers, clarifiers together with self de sludge operation. Theory of air compression and uses of compressed air on board. construction, operation, maintenance of main air compress and emergency air compressors. Types of bow thrusters, operation, maintenance of the same and Deck machinery, operation, maintenance of cargo winches, windless mooring winches.

METHODS OF SHAFT ALIGNMENT: Construction, operation, maintenance of - thrust block. - intermediate shaft. Construction, operation, maintenance stern tube and stern tube bearing both water cooled and oil cooled together with sealing glands

Stresses in shafting, i.e. intermediate shaft, thrust shaft and screw shaft.

UNIT-IV

DRY DOCKING: Preparation and procedure to dry docking vessel. Maintenance of hull, underwater fittings and machine maintenance and repairs during dry dock Removal and maintenance of rudder and propeller. Removal and maintenance of tail shaft and stern tube bearing.

LINE SYSTEMS: Piping diagrams - Drawing and working principle of the line diagram of – Bilge-Ballast- Fuel oil transfer Fuel oil Service-. Cooling Water – Lubricating oil – Compressed Air - Steam Line – Exhaust Gas – Feed Water.

Recommended Books

1. D.W. Smith, 'Marine Auxiliary Machinery', 6th Edn., Butterworth, London, **1987**.
2. H.D. McGeorge, 'Marine Auxiliary Machinery', 7th Edn., Butterworth, London, **2001**.
3. D.W. Smith, 'Marine Auxiliary Machinery', 6th Edn., Butterworth, London, **1987**.
4. H.D. McGeorge, 'Marine Auxiliary Machinery', 7th Edn., Butterworth, London, **2001.**

SHIP CONSTRUCTION

Subject Code: BMEE4-520 **L T P C** **Contact Hrs.: 45**

3 1 0 4

UNIT-I

SHIP TERMS: Various terms used in ship construction with reference to ship's parameter e.g. L.B.P. – Moulded Depth - Moulded draught etc. - General classification of ships.

Stresses in Ship's structure: Hogging – Sagging – Racking – Pounding – Panting etc., and Strength members to counteract the same.

Sections and Materials Use: Type of sections like angles – Bulb plates flanged beams used in ship construction – Riveting & Welding testing of welds – Fabricated components.

UNIT-II

BOTTOM & SIDE FRAMING: Double bottoms, watertight floors solid and bracket floors – Longitudinal framing keels –side framing like tank side brackets – Beam knee – Web frame etc.

Shell & Decks: Plating systems for shells – Deck plating & Deck Girders-discontinuities like hatches and other openings – supporting & closing arrangements-mid-ship section of ships.

Bulk heads & Deep Tanks: water tight bulkheads – Arrangement of platings and stiffeners – water tight sliding doors – Water tight openings through bulkheads for electric cables pipes and shafting – Deep tank for oil fuel or oil cargo corrugated bulkheads.

UNIT-III

FORE & AFT END ARRANGEMENTS: Fore end arrangement, arrangements to resist pounding bulbous bow – Types of sterns stern frame and rudder – Types of rudder –

Supporting of rudder – Locking pintle –Bearing pintle – Pallister bearing shaft tunnel – Tunnel bearings.

FREE BOARD AND TONNAGE: Significance and details of markings various international Regulations. Shipyard Practice: layout of a shipyard – Mould loft –Optical marking – Automatic plate cutting, Fabrication and assembly etc.

Ship Types: Tankers – Bulk Carriers – Container ships – L.N.G., L.P.G., and Chemical carriers – Lash ships – Passenger ships – Dredgers – Tugs etc., - Constructional details and requirements.

UNIT-IV

OFFSHORE TECHNOLOGY: Drilling ships and Platforms – Supply vessels – firefighting arrangement – Pipe laying ships – special auxiliary service ships.

Ship Surveys: Survey rules – Functions of ship classification – Societies – Surveys during construction – Periodical surveys for retention of class.

Recommended Books

1. D.J. Eyres, 'Ship Construction', 4th Edn., Butterworth – Heinemann, Oxford, **1994**.
2. E.A. Stokoe, 'Reed's Ship Construction for Marine Engineers', 1st Edn., Thomas Reed Publication, London, **2000**.
3. A.J. Young, 'Ship Construction sketch & Notes', 1st Edn., Butterworth–Heinemann, London, **1980**.
4. H.J. Pursey, 'Merchant Ship Construction'.

ELECTRICAL MACHINES

Subject Code: BMEE4-521 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Alternators-general arrangement of alternators, construction of salient pole and cylindrical rotor types of stator windings, single and double layer windings, e.m.f. equation of an alternator, distribution and pitch factor, waveform of generated e.m.f., alternator on load, percentage regulation, internal voltage drops, production of rotating magnetic field, resultant magnetic field distribution, mathematical derivation of the rotating field condition, magneto-motive force or ampere-turn waveform distribution, reversal of direction of rotation of rotating field.

Synchronous alternator and motor Armature reaction in synchronous alternator, armature reactance, prediction of voltage regulation, open circuit test, short circuit test, synchronous impedance method, torque/angle characteristics, infinity bus bar, synchronizing current, torque and power, hunting of Phase swinging, parallel operation of alternators, a.c. generators in parallel excitation control, throttle control, load sharing –KW and KVA, principle of action of three-phase synchronous motor, effects of varying load and excitation, methods of starting, advantages and disadvantages of synchronous motor.

MECHANICS OF MACHINES - I

Subject Code: BMEE4-522 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

MECHANISMS: Introduction – science of mechanisms – terms and definitions – planar, spherical and spatial mechanisms, mobility classification of mechanisms (indexing mechanism, reciprocating mechanisms, etc.,) straight line generators – kinematic inversion –

slider crank chain inversions – four bar chain inversions – Grashoff's law– mechanical advantage. Determination of velocities and acceleration in mechanisms – relative motion method (graphical) for mechanisms having turning, sliding and rolling pair – Coriolis acceleration – analysis using vector mathematics for a four bar mechanism - analysis using complex numbers and loop closure equations for slider crank mechanism, inverted slider crank mechanism – four bar mechanism.

UNIT-II

SYNTHESIS OF MECHANISMS: Classification of kinematics synthesis problems – Tchebycheff spacing – two points synthesis – slider crank mechanism – three position synthesis – four bar mechanism and slider crank mechanism – Freudenstein method – analytical and graphical design – four bar linkage for body guidance – design of four bar linkage as a path generator.

UNIT-III

CAMS: Types of cams and followers – follower's motions – uniform, parabolic, SHM, cycloidal and polynomial – synthesis of cam profiles for different followers – undercutting in cams – pressure angle – determination of minimum radius of curvature using design charts – Vamum's Nomogram – cams of specified contour – eccentric circle cam.

THEORY OF GEARING: Classification of gears, law of gearing, nomenclature – involutes as a gear tooth profile – lay out of an involute gear, producing gear tooth – interference and undercutting – minimum number of teeth to avoid interference, contact ratio, internal gears – cycloid tooth profiles – comparison of involutes and cycloidal tooth forms, non-stadard spur gears – extended centre distance system – long and short addendum system – epicyclic gear trains – inversions of epicyclic gear trains, specified ratio and torque calculations, automobile differential, Wilson four speed automobile gear box.

UNIT-IV

CONTROL MECHANISMS: Governors – gravity controlled and spring controlled – governor characteristics – governor effort and power, gyroscopes – gyroscopic forces and couple – forces on bearing due to gyroscopic action – gyroscopic effects on the movement of air planes and ships, stability of two-wheel drive and four-wheel drive, gyroscopic effects in grinding machines.

Recommended Books

1. J.S. Rao, and R.V. Dukkipatti, 'Mechanism and Machinery Theory', 2nd Edn., New Age International, Mumbai, **1992**.
2. S.S. Rattan, 'Theory of Machines', Tata McGraw Hill Publishing Company Ltd., New Delhi, **1998**.
3. J.E. Shingley & John Joseph Uivker, Jr., 'Theory of Machines and Mechanisms', 2nd Edn., McGraw Hill International Editions, London, **1981**.
4. A. Ghosh and A.K. Mallick, 'Theory of Mechanisms and Machines', Affiliated East-West Pvt. Ltd., New Delhi, **1988**.

ELECTRONICS

Subject Code: BMEE4-523 **L T P C** **Contact Hrs.: 45**

3 1 0 4

Transistor: Transistor as a small signal amplifier and Frequency Response. Transistorised power amplifier. Relation between Maximum Output Power, Efficiency & Power Dissipation. Characteristics and applications of Field Effect Transistor (FET) &Injunction Transistor (UJT).

Regulated Power Supplies: Series & Shunt Regulated Power Supplies. Regulator ICs like 78XX,79XX, 723.
Oscillators: Requirements for Oscillations, phase shift Oscillators, Wein Bridge Oscillator, Crystal Oscillators, Decoupling Filters.
Transistor Power Amplifier: Design Theory, Basic Complementary symmetry, Pracitcal Complementary push-pull amplifier, Transistor, Phase inverter Relation between Maximum Output power and load resistance and Transistor dissipation.
Wave Shaping and Switching: Clipping, Clamping, time base or Sweep Generator, Multivibrators & Schmitt Triggers.
Operation Amplifier Theory: Concept of Differential Amplifiers. Its use in DP-AMPS. Linear OP –amp circuits.
Converters: Digital to Analog Converters (Binary weighted, R2R) with applications. Analog to Digital Converters (Simultaneous, Counter Type) with applications Digital Circuit &
Boolean Algebra: Logic systems, Logic Gates, Codes. Boolean Algebra and simplification of logical equations. Types of flip-flops, Shift Registers, Counters, Multiplexers and Demultiplexers.
TTL & CMOS Logic Families: TTL NAND gate. Different TTL Series with typical specifications. Development of CMOS Logic. Typical specifications of CMOS family.
Electronics Instruments: Cathode Ray Oscilloscope, Digital Voltmeters and frequency meters, Multimeters; Vacuum Tube voltmeter and signal Generators, Signal generation-operating principle – application; signal generation as used on board ship like measuring and controlling various variables including rpm, pressure, flow, temperature level, strain. Q-meters.
Industrial Electronics: Silicon Controlled Rectifier (SCR) and other devices, VI characteristic. Application of Power rectification, Speed control of DC motor, Inverters. Photo Electric Devices. IC 555 Internal Block Diagram, application as Monostable & Bistable Multivibrator.
Communication Equipment Overview: Need of Modulation & Demodulation. Generation of AM & FM with waveforms. Pulse Communication. Radio Transmitter & Receivers. Introduction to RADAR.
Introduction to Microprocessors: 8085 Microprocessors architecture, instruction sets. Introduction to Microcontrollers.

Recommended Books

1. P.S. Bhimbra, 'Power Electronics'.
2. Malvino Leach, 'Digital Principles and Applications'.
3. Ramesh Gaonkar, 'Microprocessors and Microcomputers'.

WORKSHOP PRACTICAL (MARINE)

Subject Code: BMEE4-524 **L T P C**
0 0 2 1

EXPERIMENTS

1. Dismantling, overhauling, inspection & assembling of a A/E cyl. Head.
2. Dismantling, overhauling, inspection & assembling of Cylinder liner, piston & piston ring.
3. Dismantling, overhauling, inspection & assembling of main bearing & bottom end bearing.
4. C/Shaft deflection & inspection of C/case.

5. Dismantling & overhauling of M/E exhaust valve.
6. Dismantling & overhauling of M/E cylinder head relief v/v, Air staring v/v.
7. Dismantling & overhauling of Turbochargers.
8. Working principles & demonstration of working of a hydraulic steering gear system, safety checks & routine inspection.
9. Detection of cracks & dealing with cracked pieces
10. To fabricate & weld a pipe with given pipe length & flanges.
11. To repair leaks, pipe by fitting a doubler.
12. To make a pipe line with bends (welding).
13. Practice of welding.
14. Practice of Brazing & Soldering.
15. Detection of cracks & dealing with cracked pieces
16. Tracing of pipelines.
17. Turning, cutting and similar operations by Lathe machine.

Using a simulator, the Following experiments are to be performed

1. To start and stop the engine;
2. To change engine's load and speed;
3. To change ambient operating conditions;
4. To simulate engine faults in varying degrees;
5. To mix different simulations;
6. To watch engine operation parameters'
7. To watch functions inside the cylinder;
8. To simulate the engine sound which varies with speed;
9. To carry out maintenance and repairs;
10. To try out different maintenance strategies;
11. To print engine data.

ELECTRICAL ENGINEERING, ELECTRONICS AND MICRO PROCESSOR LAB.

Subject Code: BMEE4-525 **L T P C**
0 0 2 1

EXPERIMENTS

(A) ELECTRICAL ENGG. LABORATORY

1. Load Test on D.C. Shunt Motor
2. Load Test on D.C. Series Motor
3. O.C.C. & load characteristic of self/separately excited D.C. Generator.
4. Parallel operation of D.C. Shunt Generator
5. Speed control of D.C. Shunt Motor.
6. Load O.C. & S.C. test on single-phase transformer.
7. Parallel operation of single-phase transformers.
8. To connect similar single-phase transformers in the following ways.
9. Y-Y, A-A, A-Y and Y-A.
10. Pole changing motor for various speeds.
11. Determination of characteristics of an A/C brush less generator.
12. Synchronization of 3-phase alternator.
13. Trouble shooting in Electric Motors and Transformers.
14. Exercises in Power Wiring and earthing.

(B) ELECTRONICS / MICROPROCESSOR LABORATORY

1. To study the volt-ampere characteristics of a high current semiconductor diode.
2. To study the volt-ampere characteristics of a diode and Zener diode.
3. To study the half wave and full wave rectification circuit without and with filter circuit.
4. To study the volt-ampere characteristics of a Transistor.
5. To study the volt-ampere characteristics of Field Effect Transistor.
6. To study the characteristics of Silicon Control Rectifier.
7. To study the Transistor Feed Back Amplifier.
8. To study the Integrated Circuit operational amplifier.
9. To study the logic training board.
10. To study the speed control of D.C. motor using Thyristor.
11. Arithmetic operations using 8085
12. Logical operations using 8085
13. Array operations using 8085
14. Speed & Direction Control of Stepper motor using 8085.

ELECTRICAL MACHINES LAB.

Subject Code: BMEE4-526 **L T P C**
0 0 2 1

EXPERIMENTS

1. To study and run rotary convertor under different conditions to record the generated voltage on d.c. side against variation of load.
2. To perform load test on a 6-pulse, 2-way bridge rectifier and to obtain the characteristic curves.
3. To study the slip-torque characteristics of an induction motor and to find out the full load slip.
4. To study the different types of Motors, connect the motor AG. supply, run the motor and obtain its speed load characteristics. (The experimental multi-motor set).
5. To determine the regulation of a 3-phase alternator by synchronous impedance method.
6. To compute full load input, torque, slip, power factor and efficiency of 3-phase induction motor from circle diagram. Also to compare the results from the circle diagram with actual full load test on the motor.
7. Synchro-transmitter and Repeater.
8. Transformer connections.
9. Determination of phase-sequence of the given 3-phase supply.
10. Study of single-phase controller.
11. Observation of the wave-form of magnetizing current and hysteresis loop.
12. Study of transformer differential relay.

COMPUTER AIDED MARINE ENGINEERING DESIGN AND ANALYSIS LAB.

Subject Code: BMEE4-527 **L T P C**
0 0 2 1

EXPERIMENTS

UNIT-I

ENGINEERING DESIGN AND COMPUTER AIDED DESIGN:

The design process, concept, analysis, feasibility, Selection of materials and manufacturing considerations in design, Design with reference to repairs and reconditioning, specifically for working out at sea with its restrictions and limitations. Role of computers - Computer Aided Engineering - Computer Aided Design - Design for Manufacturability – Computer Aided Manufacturing - Benefits of CAD.

UNIT-II

COMPUTER AIDED DESIGN AND FINITE ELEMENT ANALYSIS:

Creation of Graphic Primitives - Graphical input techniques - Display transformation in 2-D and 3-D – Viewing transformation - Clipping - hidden line elimination – Mathematical formulation for graphics - Curve generation techniques - Geometric Modeling – Wireframe, Surface and Solid models - CSG and B-REP Techniques - Features of Solid Modeling Packages - Parametric and features - Interfaces to drafting, Design Analysis -Exposure to FEA packages.

UNIT-III

TYPES OF LOADING AND DESIGN CRITERIA:

static loads, impact loads, repeated loads, variable and cyclic loads, combined and reversible loads. Stress concentration and design factors, fatigue strength, modes of failure, design stresses, factor of safety, theories of failure, wear, corrosion, design criteria, S-N curve Goodman and Soderberg equations.

UNIT-IV

JOINTS, SHAFTS AND COUPLINGS:

Design of cotter joints, knuckle joints, bolted joints, welded joints, riveted joints. Design of shafts and couplings – Drafting using CAD packages.

BELTS, FRICTION CLUTCHES AND BRAKES:

Design of Belt drives and hoists (Wire ropes), Multiple plate clutches, cone clutch, centrifugal clutch block brakes, internally expanding shoe brakes, external band brakes, differential band brakes - Solid modelling using CAD packages.

Recommended Books

1. Goutam Prohit and Goutam Ghosh, 'Machine Drawing with AutoCAD', 1st Impression, Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2007.
2. J.E. Shigley, 'Mechanical Engineering Design', 1st metric Edn., McGraw Hill, New Delhi, **1986**.
3. R.S. Khurmi and J.K. Gupta, 'Machine Design', 5th Edn., Eurasia Publishing, New Delhi, **2005**.
4. Sadhu Singh, 'Computer Aided Design and Manufacturing', Khanna Publishers, New Delhi, **1998**.
5. Abdulla Sharif, 'Machine Design', 3rd Edn., Dhanpat Roy & Sons, New Delhi, **1995**.
6. Pandya & Shaw, 'Elements of Machine Design', 1st Edn., Charotar Publishing, Mumbai, **1997**.
7. Groover and Zimmers, 'CAD / CAM: Computer Aided Design and Manufacturing', Prentice Hall of India, New Delhi, **1994**.

SHIP OPERATION AND MANAGEMENT

Subject Code: BMEE4-629 **L T P C** **Contact Hrs.: 37**
3 0 0 3

Brief History of Shipping: Modern shipping practice. Marine vehicles and cargoes. Development in Shipping and cargo handling Principal shipping organizations. Liner and tramp shipping services, Conference systems. Chartering, Charter parties. Theory of freight rates and fares. Rate fixation machinery and government control. Bills of lading. Carriage of goods by sea act. Cargo Surveys and protests.
Role of Classification Society
Marine Insurance: Underwriting and loss adjusting principles applied to Marine cargo insurance. Hull policy, particular average General average, P & I Clubs. Ownerships of vessels, Shipping Company and its administration. Capitalization and finance, Ecemonics of new and second hand tonnage. Subsidies.
Ship Operations: Planning sailing schedules. Voyage estimates Economic factors. Commercial Shipping Practice. Manning of ships. Engagement and disadvantage of crew D. L. B. Seaman's welfare.
Merchant Shipping Act: Registration of ship. Ship's papers. Port Procedures. Pilotage, Duties regarding pollution. Collision, Explosion fire etc. Vessels in distress. Shipping casualty's penalties under Merchant Shipping Act.

MACHINE DESIGN-I

Subject Code: BMEE4-630 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

1. Meaning of design with special reference to machine design. Definition and understanding of various types of design, Elaborated Design process.
2. Design and Creativity: Systematic design conceptualization, product design definition, underlying principles of design in Aesthetics and ergonomics, free body diagram for components design.

UNIT-II

3. **General Design Considerations:**
a) Concept of tearing, bearing, shearing, crushing, bending etc.
b) Selection of materials, Basic criteria of selection of material, their designation, mechanical properties of those materials in brief.
c) Study of Stress concentration, factor of safety under different loading conditions.
3. Basic Design: Design for static loading, design for variable loading for both limited and unlimited life, concept of fatigue and endurance strength.
4. Design of fasteners:
a) **RIVETS:** Design of rivets for boiler joints, lozenge joints (uniform strength joint), eccentrically loaded riveted joints.
b) **BOLTS:** Understanding the various stresses/failure in bolted joints, design of cylindrical covers, basic and eccentrically loaded bolts
c) **WELDS:** Design for various loading conditions in torsion, shear or direct load, eccentrically loaded welded joints.

d) **MISCELLENEOUS:** Design of spigot and socket cotter joint, Gib and Cotter joint and knuckle joint.

UNIT-III

5. Design of Transmission Shaft Design of both solid and hollow shafts for transmission of torque, bending moments and axial forces, Design of shaft for critically speed, Design of shaft for rigidity and Design of stepped shafts for assembly.

6. Design of Keys and Couplings: Design of sunk keys under crushing and shearing, design of splines, design of sleeve and solid muff coupling, clamp or compression coupling, rigid and flexible flange coupling, design of universal joint

UNIT-IV

7. Lever Design: Basic lever design, design of foot and hand lever, cranked lever, bell crank lever, safety valve lever and shoe brake lever.

8. Design of Pipe Joints: Stresses in pipe joints, design of circular flange pipe joint, oval flanged pipe joints, square flange pipe joint.

Recommended Books

1. Shigley, 'Machine Design', Tata McGraw Hill.
2. Juvinal, 'Machine Design', John Wiley Publishers.
3. Spots, 'Machine Design', Prentice Hall.
4. Norton, 'Machine Design', Prentice Hall.
5. Khurmi, 'Machine Design'.
6. Goyal and Bahl, 'Machine Design', Standard Publishers.
7. 'Product Design and Development', Prentice Hall.
8. 'Design Data Book', Compiled by PSG College of Engineering & Technology, Coimbatore.

MECHANICS OF MACHINES – II

Subject Code: BMEE4-631 **L T P C** **Contact Hrs.: 45**

3 1 0 4

UNIT-I

Toothed Gearing: Types of gears, condition for transmission of constant velocity; methods of avoiding interference; Transmission of power by gear trains on parallel shafts; Rack and pinion, Bevel gears, Worm and worm wheel, Spur gears Helical gears, Spiral gears; Epicylic gear trains, Torque on gear trains, acceleration of gear trains.

Balancing: Balancing of masses rotation in different planes, dynamic forces at bearings; Primary and secondary balance of multicylinder in-line Engines and configurations.

UNIT-II

Gyroscope: Gyroscopic couple. Vector representation to torque and angular movement, Steady rectangular precession, vector treatment; Steady conical precession; Motion involving Steady precession; Application to Ship's stabilization. Free Harmonic Vibrations, Linear motion of an elastic system, Angular motion of an elastic System. Differential equation of motion. Free Vibration of springs in series and parallel. Simple and compound pendulums. Single and two degrees of freedom.

UNIT-III

Torsional Vibrations: Single rotor system, rotor at end and rotor in the middle. Effect of inertia of Shaft. Two rotor system, rotors at both ends and rotors at one end. Three rotor and Multirotor system. Torsionally equivalent shafts, Geared system.

Forced Vibrations: Forced Linear and angular Vibrations, Periodic force transmitted to

support, periodic movement of the support. Transverse vibrations of beams: Single Concentrated load, effect of the mass of the beam, Energy method-several concentrated Loads uniformly distributed load, Dunkerley's empirical method for several Concentrated loads. Whirling of Shafts-Whirling of shafts, critical speed, effect to slope of the disc, effect of end thrust.

UNIT-IV

Damped Vibrations: Idea of Viscous and Coulomb damping, Linear and angular vibrations with Viscous damping, Forced damped liner and angular Vibrations, Periodic movement of support.

FLUID MACHINERY

Subject Code: BMEE4-632 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

1. General Concepts: Impulse momentum principle; jet impingement on stationary and moving flat plates, and on stationary or moving vanes with jet striking at the centre and tangentially at one end of the vane; calculations for force exerted, work done and efficiency of jet. Basic components of a turbo machine and its classification on the basis of purpose, fluid dynamic action, operating principle, geometrical features, path followed by the fluid and the type of fluid etc. Euler's equation for energy transfer in a turbomachine and specifying the energy transfer in terms of fluid and rotor kinetic energy changes.

UNIT-II

2. Pelton Turbine: Component parts and operation; velocity triangles for different runners, work output; Effective head, available power and efficiency; design aspects such as mean diameter of wheel, jet ratio, number of jets, number of buckets with working proportions

3. Francis and Kaplan Turbines: Component parts and operation; velocity triangles and work output; working proportions and design parameters for the runner; Degree of reaction; Draft tubes – its function and types. Function and brief description of commonly used surge tanks.

UNIT-III

4. Centrifugal Pumps Layout and Installation: Main elements and their functions; Various types and classification; Pressure changes in a pump - suction, delivery and manometric heads; vane shape and its effect on head-capacity relationships; Departure from Euler's theory and losses; pump output and efficiency; Minimum starting speed and impeller diameters at the inner and outer periphery; Priming and priming devices, Multistage pumps - series and parallel arrangement; submersible pumps. Construction and operation; Axial and mixed flow pumps; Trouble shooting - field problems, causes and remedies.

5. Similarity Relations and Performance Characteristics: Unit quantities, specific speed and model relationships, scale effect; cavitation and Thoma's cavitation number; Concept of Net Positive Suction Head (NPSH) and its application in determining turbine / pump setting

UNIT-IV

6. Reciprocating Pumps: Components parts and working; pressure variations due to piston acceleration; acceleration effects in suction and delivery pipes; work done against friction; maximum permissible vacuum during suction stroke; Air vessels.

7. Hydraulic Devices and Systems: Const., operation and utility of simple and differential accumulator, intensifier, fluid coupling and torque converter, Air lift and jet pumps; gear, vane and piston pumps.

Recommended Books

1. R.L. Daughaty, 'Hydraulic Turbines', McGraw Hill Book Co.
2. Jagdish Lal, 'Hydraulic Machines', Metropolitan Book Co. Pvt. Ltd.
3. D.S. Kumar, 'Fluid Mechanics and Fluid Power Engineering', S.K. Kataria and Sons, Delhi.

NAVAL ARCHITECTURE

Subject Code: BMEE4-633 **L T P C** **Contact Hrs.: 37**
3 0 0 3

UNIT-I

Geometry of Ship & Hydrostatic Calculation: Ships lines, Displacement Calculation, First and Second moment of area, Simpsons rules, application to area and volume, Trapezoidal rule, mean and mid-ordinate rue, Tchebycheff's rule and their applications, Tonnes per Cm. Immersion. Coefficient of form, Wetted surface area, Similar figures. Centre of gravity, effect of addition and removal of masses, Effect of suspended mass.

UNIT-II

Transverse Stability of Ships: Statical stability at small angles of heel, Calculation of B.M. Metacentric, inclining experiment, Free surface effect, stability at large angles of heel, curves of statical stability, dynamical stability, angle of loll; stability of a wall sided ship. Resistance & Power: Frictional, Residuary & Total resistance, Froude's Law of comparison, Effective power calculations, Ships correlation Factor (SCF), Admiralty co-efficient, Fuel Coefficient and Fuel consumption. Effect of viscosity and application of ITTC formula.

Longitudinal Stability and Trim: Longitudinal BM, Moment to change trim one Cm. Change of trim, change of L.C.B. with change of trim, Change of trim due to adding or deducting weights, alteration of draft due to change in density, flooding calculations, Floodable length curves, M.O.T. method for determination of floodable lengths, factors of subdivision, Loss of stability due to grounding, Docking stability. Pressure on chocks.

UNIT-III

Strength of Ships: Curves of buoyancy and weight, curves of load, shearing force and bending moments, Alternate methods, standard Conditions, Balancing Ship on wave, Approximation of max, shearing force and bending moment, method of estimating B.M. & Deflection. Longitudinal Strength, Moment of Inertia of Section Modulus.

Propulsion & Propellers: Definitions, apparent and real ship wake, thrust, relation between power, relation between mean pressure and speed, measurement of pitch, cavitation, propeller types, fixed pitch, Variable Pitch, ring propeller, Kort nozzles, Voith Schneider propeller, theory, Blade element theory, Law of similitude and model tests with propellers, propulsion test, Geometry and geometrical properties of screw propellers, ship model correlation ship trials.

UNIT-IV

Rudder Theory: Action of the Rudder in turning a ship, force on rudder, Torque on stock, calculation of force torque on non-rectangular rudder, angle of heel due to force torque on rudder, Angle of heel when turning. Types of rudder, model experiments and turning trials, Area and shape of rudder, position of rudder, stern rudder Bow rudders.

Motion of Ship on Waves: Theory of waves, Trochoidal waves, relationship between line of orbit centres and the undisturbed surface, Sinusoidal waves. Irregular wave pattern, Wave spectra, Wave amplitudes, rolling in unresisting media, rolling in resisting media, practical

aspects of rolling, Antirolling devices, Forces caused by rolling and pitching, Heaving and Yawing.

MARINE BOILERS WORKSHOP

Subject Code: BMEE4-634 **L T P C**
0 0 2 1

1. **Types of Marine Boilers:** Comparison of smoke tube and water boilers.
2. **Smoke Tube Boilers:** Various types in marine use, Principal dimensions and staying of flat surface of multitubular cylindrical Boilers. Vertical Auxiliary Boilers. Water Tube Boilers.
3. **Superheater:** Economizer, Air preheater & steam preheater; circulation and use of Unheated Down comers in highly rated boilers; Superheat temperature control.
4. **Attemperators and Desuperheaters:** Waster heat boilers; Waste heat recovery calculation.
5. **Safety Valves:** Improved High Lift, Full lift and full Bore type: Gauge glass- Ordinary plate type and remote Indicator.

FLUID MACHINERY LAB.

Subject Code: BMEE4-635 **L T P C**
0 0 2 1

EXPERIMENTS

1. Determination of various efficiencies of Hydraulic Ram
2. To draw characteristics of Francis turbine
3. To study the constructional features of reciprocating pump and to perform test on it for determination of pump performance
4. To draw the characteristics of Pelton Turbine
5. To draw the various characteristics of Centrifugal pump
6. Determine the effect of vane shape and vane angle on the performance of centrifugal fan.

FIRE FIGHTING, CONTROLS AND SIMULATOR LAB.

Subject Code: BMEE4-636 **L T P C**
0 0 2 1

1. Fire hazard aboard ships – inflammability, fire extinguishing use. Control of class A, B & C fires.
2. Fire protection built in ships, extinction systems, and escape means.
3. System for tankers, statutory requirements for firefighting systems and equipment on different vessels.
4. Firefighting equipment: fire pumps, hydrants and hoses, couplings, nozzles and International shore connection, Construction, Operation and merits of different types of portable extinguishers.
5. Non-portable and fixed fire extinguishers, installation for ships. Properties of chemical used, bulk cabondioxide, and inert gas systems.
6. Firemen outfit its use and care, maintenance, testing and recharging of appliances, preparation, and fire appliance survey.

7. Fire Control: Action required and practical techniques adopted for extinguishing fires in accommodation, machinery spaces, boiler rooms, Cargo holds, galley etc.,
8. Fire fighting in port and dry dock. Procedure for re-entry after putting off fire, rescue operations from affected compartments.
9. First aid, Fire organisation on ships. Fire signal and muster.

MATERIAL LAB.

Subject Code: BMEE4-637 **L T P C**
0 0 2 1

EXPERIMENTS

1. To determine the behaviour of different materials when subjected to Tension and to obtain the following Tensile properties of materials on Universal Testing Machine:
   (i) UTS, (ii) Yield Stress, (iii) Young's Modulus, (iv) Breaking Stress, (v) Percentage Elongation, (vi) Percentage reduction in area and (vii) Plotting of Curve of –Stress vs. Strain.
2. To determine the behaviour of materials under direct shear force and to study the effect of it and to calculate the shear stress of material.
3. To study the behaviour of materials when subjected to bending and to find out the effect of such act on material and to calculate the bending stress of materials.
4. Determination of the behaviour of different materials when subjected to sudden shock and to the impact resistance quality or the impact strength of the materials.
5. To determine the hardness of materials by indenting a hardened steel ball into the specimen under test by an applied specified load on the ball.
6. Determination of behaviour of ductile materials when subjected to torsion and to obtain: i) Max. torsion stress ii) Modulus of rigidity iii) Plotting of curve of Angle of Twist vs. Torque.
7. To determine the stiffness of spring for a) round wire, b) square section wire when subjected to compression.
8. Determination of compressive stress and strain of materials under compressive force applied to the material.
9. To find out the Tensile stress of materials on hand operated Tensile testing machine.

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-317	Food Production Operations	3	0	0	40	60	100	3
BHOM2-318	Food & Beverage Operations	3	0	0	40	60	100	3
BHOM2-319	Front Office Operations	3	0	0	40	60	100	3
BHOM2-320	Accommodation Operations	3	0	0	40	60	100	3
BHOM2-321	Food Production Operations Lab.	0	0	8	60	40	100	4
BHOM2-322	Food & Beverage Operations Lab.	0	0	2	60	40	100	1
BHOM2-323	Front Office Operations Lab.	0	0	2	60	40	100	1
BHOM2-324	Accommodation Operations Lab.	0	0	2	60	40	100	1
Departmental Elective-I (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-363	Food & Beverage Controls							
BHOM2-364	Food Safety & Quality							
Departmental Elective-II (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-365	Management in Tourism							
BHOM2-366	Communication Skills In English							
Workshop on Research Methodology		1	0	0	Non Evaluative			0
Total		**19**	**0**	**14**	**480**	**520**	**1000**	**25**

SEMESTER 4th		Marks					Credits
Subject Code	**Subject Name**	**External**			**Internal**	**Total**	
BHOM2-425	20 Weeks Industrial Exposure Training	50 Training Report	50 Training Report	50 Viva Voce	50 Log Book	200	20
Total		**50**	**50**	**50**	**50**	**200**	**20**

FOOD PRODUCTION OPERATIONS

Subject Code: BHOM2-317 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: This paper will give the basic knowledge of cooking to the beginners. They will get versed with different kinds of regional cuisines, quantity food cooking/ volume feeding, indenting, various equipment used.

UNIT-1

QUANTITY FOOD PRODUCTION EQUIPMENT: Equipment required for mass/volume feeding heat and cold generating equipment, Care and maintenance of this equipment, Modern developments in equipment manufacture.

MENU PLANNING: Basic principles of menu planning – recapitulation, Points to consider in menu planning for various volume feeding outlets such as Industrial, Institutional, Mobile Catering Units, Planning menus for School/college students, Industrial workers, Hospitals, Outdoor parties, Theme dinners, Transport facilities, cruise.

UNIT-2

INDENTING: Principles of Indenting for volume feeding, Portion sizes of various items for different types of volume feeding, modifying recipes for indenting for large scale catering, Practical difficulties while indenting for volume feeding, PLANNING: Principles of planning for quantity food production with regard to Space allocation, Equipment selection, Staffing.

UNIT-3

VOLUME FEEDING: Institutional and Industrial Catering, Types of Institutional & Industrial Catering, Problems associated with this type of catering, Scope for development and growth, Hospital Catering, Highlights of Hospital Catering for patients, staff, visitors, Diet menus and nutritional requirements, Off Premises Catering, Reasons for growth and development, Menu Planning and Theme Parties Concept of a Central Production Unit Problems associated with off-premises catering Mobile Catering Characteristics of Rail, Airline (Flight Kitchens and Sea Catering) Branches of Mobile Catering, Quantity Purchase & Storage, Introduction to purchasing, Purchasing system, Purchase specifications, Purchasing techniques, Storage.

UNIT-4

REGIONAL INDIAN CUISINE: Introduction to Regional Indian Cuisine, Heritage of Indian, Cuisine, Factors that affect eating habits in different parts of the country, Cuisine and its highlights of different states/regions/communities to be discussed: Geographic location, Historical background, Seasonal availability, Special equipment, Staple diets, Specialty cuisine for festivals and special occasions.

STATES: Andhra Pradesh, Bengal, Goa, Gujarat, Karnataka, Kashmir, Kerala, Madhya Pradesh, Maharashtra, North Eastern States, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh/Uttaranchal.

COMMUNITIES: Parsee, Chettinad, Hyderabadi, Lucknowi, Avadhi, Malbari/Syrian, Christian and Bohri **DISCUSSIONS:** Indian Breads, Indian Sweets, Indian Snacks.

RECOMMENDED BOOKS

1. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons INC.
2. K. Arora, 'Theory of Cookery', Frank Brothers.
3. Fuller J. Barrie & Jenkins, 'Accompaniments & Garnishes from Waiter; Communicate'.
4. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.
5. Philip E. Thangam, 'Modern Cookery', Vol.-I, Orient Longman.

FOOD & BEVERAGE SERVICE OPERATIONS

Subject Code: BHOM2-318 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, and procedures among trainees. The students will be well versed with alcoholic beverages in detail.

UNIT-1

ALCOHOLIC BEVERAGE: Introduction and definition, Production of Alcohol: Fermentation and Distillation Process, Classification with examples.

WINES: Definition, History Classification with examples, Table/Still/Natural, Sparkling, Fortified, Aromatized, Production of each classification, Old World Wines: Principal wine regions wine laws, grape varieties, production and brand names (France, Germany, Italy, Spain, Portugal) New World Wines Principal wine regions wine laws, grape varieties, production and brand names, (India, Chile, South Africa,, Algeria, New Zealand, USA, Australia), Food & Wine Harmony, Storage of wines, Wine terminology.

UNIT-2

DISPENSE BAR: Introduction and definition, Bar layout – physical layout of bar, Bar stock – alcohol & non-alcoholic beverages, Bar equipment.

BEER: Introduction & Definition, Types of Beer, Production of Beer, Storage.

UNIT-3

SPIRITS: Introduction & Definition, Production of Spirit (Pot-still method, Patent still method) Production of Whisky, Rum, Gin, Brandy, Vodka, Tequila, Different Proof Spirits, American Proof, British Sikes Scale Gay - Lussac) OIML Scale.

UNIT-4

APERITIFS: Introduction and Definition, Different types of Aperitifs Vermouth (Definition, Types & Brand names), Bitters (Definition, Types & Brand names)

LIQUEURS: Definition & History, Production of Liqueurs, Broad Categories of Liqueurs (Herb, Citrus, Fruit/Egg, Bean & Kernel), Popular Liqueurs (Name, colour, predominant flavour & country of origin)..

RECOMMENDED BOOKS

1. Dennis R. Lillicrap. & John A. Cousins, 'Food & Beverage Service', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.
3. Lillicrap & Cousins, 'Food & Beverage Service', ELBS.
4. John Fuller, 'Modern Restaurant Service', Hutchinson.
5. Grahm Brown, 'The Waiter Handbook', Global Books & Subscription Services, New Delhi.

FRONT OFFICE OPERATIONS

Subject Code: BHOM2-319 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at familiarizing the students with various functions of front office and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills.

UNIT-1

COMPUTER APPLICATION IN FRONT OFFICE OPERATION: Role of information technology in the hospitality industry, Factors for need of a PMS in the hotel, Factors for purchase of PMS by the hotel, Introduction to OPERA & Amadeus.

CONTROL OF CASH AND CREDIT

UNIT-2

FRONT OFFICE (ACCOUNTING): Accounting fundamentals, Guest and non-guest accounts, Accounting system (Non automated, semi-automated and fully automated).

UNIT-3

CHECK OUT PROCEDURES: Guest accounts settlement (Cash and credit, Indian currency and foreign currency, Transfer of guest accounts, Express check out)

NIGHT AUDITING: Functions, Audit procedures (Non automated, semi-automated and fully automated).

UNIT-4

FRONT OFFICE AND GUEST SAFETY AND SECURITY: Importance of security systems, Safe deposit, Key control, Emergency situations (Accident, illness, theft, fire, bomb).

FRENCH Expressions de politesse et les commander et Expressions encouragement, Basic conversation related to Front Office activities such as {Reservations (personal and telephonic), Reception (Doorman, Bell Boys, Receptionist etc.), Cleaning of Room & change of Room etc.}.

RECOMMENDED BOOKS

1. Sudhir Andrews, 'Front Office Training Manual', Tata McGraw Hill.
2. Karsavina & Brooks, 'Managing Front Office Operations', Educational Institution, HAMA.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar,
4. S.K.I. Bhavnagar, 'Front office Operation Management', Frank Brothers.
5. Karsavina & Brooks, 'Managing Front Office Operations'.
6. James Socrates Bard, 'Hotel Front Office Management', 4th Edn., Wiley International.

ACCOMMODATION OPERATIONS

Subject Code: BHOM2-320 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organisation of housekeeping, its systems and functions. A blend of theory and practical will be used to develop sensitivity and high work ethics towards guest care and linen room, uniforms, laundry and basics of flower arrangement.

UNIT-1

LINEN ROOM: Activities of the Linen Room, Layout and equipment in the Linen Room, Selection criteria for various Linen Items & fabrics suitable for this purpose, Purchase of Linen, Calculation of Linen requirements, Linen control-procedures and records, Stocktaking- procedures and records, Recycling of discarded linen, Linen Hire.

UNIT-2

UNIFORMS: Advantages of providing uniforms to staff, Issuing and exchange of uniforms; type of uniforms, Selection and designing of uniforms, Layout of the Uniform room.

SEWING ROOM: Activities and areas to be provided, Equipment provided.

UNIT-3

LAUNDRY: Commercial and On-site Laundry, Flow process of Industrial Laundering-OPL, Stages in the Wash Cycle, Laundry Equipment and Machines, Layout of the Laundry, Laundry Agents, Dry Cleaning, Guest Laundry/Valet service, Stain removal.

UNIT-4

FLOWER ARRANGEMENT: Flower arrangement in Hotels, Equipment and material required for flower arrangement, Conditioning of plant material, Styles of flower arrangements, Principles of design

as applied to flower arrangement.

INDOOR PLANTS: Selection and care.

RECOMMENDED BOOKS

1. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELBS with Holder & Stoughton Ltd.
2. Sudhir Andrews, 'Hotel House Keeping a Training Manual', Tata McGraw Hill Ltd., New Delhi.
3. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
4. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)', CRC Publisher.
5. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations (II End.)', Wiley.
6. Tucker Schneider, 'The Professional Housekeeper', Wiley.
7. Manoj Madhukar, 'Professional Management of Housekeeping', Rajat Publications.

FOOD & BEVERAGE CONTROL

Subject Code: BHOM2-463 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the food and beverage control, procedures, functions, production and sales control.

UNIT-1

FOOD COST CONTROL: Introduction to Cost Control, Define Cost Control, The Objectives and Advantages of Cost Control, Basic costing, Food costing

RECEIVING CONTROL: Aims of Receiving, Job Description of Receiving Clerk/Personnel, Equipment required for receiving, Documents by the Supplier (including format), Delivery Notes, Bills/Invoices, Credit Notes, Statements, Records maintained in the Receiving Department, Goods Received Book, Daily Receiving Report, Meat Tags, Receiving Procedure, Blind Receiving, Assessing the performance and efficiency of receiving department, Frauds in the Receiving Department, Hygiene and cleanliness of area.

UNIT-2

FOOD CONTROL CYCLE: Purchasing Control, Aims of Purchasing Policy, Job Description of Purchase Manager/Personnel, Types of Food Purchase, Quality Purchasing, Food Quality Factors for different commodities, Definition of Yield, Tests to arrive at standard yield, Definition of Standard Purchase Specification, Advantages of Standard Yield and Standard Purchase Specification, Purchasing Procedure, Different Methods of Food Purchasing, Sources of Supply, Purchasing by Contract, Periodical Purchasing, Open Market Purchasing, Standing Order Purchasing, Centralized Purchasing, Methods of Purchasing in Hotels, Purchase Order Forms, Ordering Cost, Carrying Cost, Economic Order Quantity, Practical Problems.

UNIT-3

STORING & ISSUING CONTROL: Storing Control, Aims of Store Control, Job Description of Food Store Room Clerk/personnel, Storing Control, Conditions of facilities and equipment, Arrangements of Food, Location of Storage Facilities, Security, Stock Control, Two types of foods received- direct stores (Perishables/non-perishables), Stock Records Maintained Bin Cards (Stock Record Cards/Books), Issuing Control, Requisitions, Transfer Notes, Perpetual Inventory Method, Monthly Inventory/Stock Taking, Pricing of Commodities, Stock taking and comparison of actual physical inventory and Book value, Stock levels, Practical Problems, Hygiene & Cleanliness of area.

UNIT-4

PROUCTION CONTROL: Aims and Objectives, Forecasting, Fixing of Standards, Definition of standards (Quality & Quantity), Standard Recipe (Definition, Objectives and various tests), Standard Portion Size (Definition, Objectives and equipment used), Standard Portion Cost (Objectives & Cost Cards) Computation of staff meals.

SALES CONTROL: Sales - ways of expressing selling, determining sales price, Calculation of selling price, factors to be considered while fixing selling price, Matching costs with sales, Billing procedure - cash and credit sales, Cashier's Sales summary sheet.

RECOMMENDED BOOKS

1. Lea R Dopson, 'Food & Beverage Cost Control', Wiley.
2. R.D. Boardman, 'Hotel & Catering Costing & Budgets', Heinemann.
3. D. Hughes and M. Bannion, 'Introductory Foods', The Macmillan Co. Ltd., New York.
4. T.E. Philip, 'Modern Cookery for Teaching and the Trade', Vol.-I, Orient Longman Ltd.

FOOD SAFETY AND QUALITY

Subject Code: BHOM2-464 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The students will get to learn about various micro-organisms in food, knowledge of food spoilage, food contaminants and adulterants.

UNIT-1

Basic Introduction to Food Safety, Food Hazards & Risks, Contaminants and Food Hygiene.

MICRO-ORGANISMS IN FOOD: General characteristics of Micro-Organisms, based on their occurrence and structure, Factors affecting their growth in food (intrinsic and extrinsic), Common food borne micro-organisms: {Bacteria, (spores/capsules), Fungi, Viruses, Parasites.

FOOD SPOILAGE & FOOD PRESERVATION: Types & Causes of spoilage, Sources of contamination, Spoilage of different products (milk and milk products, cereals and cereal products, meat, eggs, fruits and vegetables, canned products), Basic principles of food preservation, Methods of preservation (High Temperature, Low Temperature, Drying, Preservatives & Irradiation).

UNIT-2

BENEFICIAL ROLE OF MICRO-ORGANISMS: Fermentation & Role of lactic and bacteria, Fermentation in Foods (Dairy foods, vegetable, Indian foods, Bakery products and alcoholic beverages), Miscellaneous (Vinegar & anti-biotic).

FOOD BORNE DISEASES: Types (Infections and intoxications), Common diseases caused by food borne pathogens, Preventive measure

FOOD ADDITIVES: Introduction, Types (Preservatives, anti-oxidants, sweeteners, food colours and flavours, stabilizers and emulsifiers).

UNIT-3

FOOD CONTAMINANTS & ADULTERANTS: Introduction to Food Standards, Types of Food contaminants (Pesticide residues, bacterial toxins mycotoxins, seafood toxins, metallic contaminants, residues from packaging material), Common adulterants in food, Method of their detection (basic principle).

FOOD LAWS AND REGULATIONS: National - National – PFA Essential Commodités Act (FPO, MPO etc.), International – Codex Alimentarius, ISO, Regulatory Agencies – WTO, Consumer Protection Act.

QUALITY ASSURANCE: Introduction to Concept of TQM, GMP and Risk Assessment, Relevance of Microbiological standards for food safety, HACCP (Basic Principle and implementation).

UNIT-4

HYGIENE AND SANITATION IN FOOD SECTOR: General Principles of Food Hygiene, GHP for commodities, equipment, work area and personnel, Cleaning and disinfect ion (Methods and agents commonly used in the hospitality industry), Safety aspects of processing water (uses & standards), Waste Water & Waste disposal, RECENT CONCERNS: Emerging pathogens, genetically modified foods, Food labeling. Newer trends in food packaging and technology, BSE (Bovine Serum Encephalopathy).

RECOMMENDED BOOKS

1. H.L. Cracknell & G. Nobis, 'The New Catering Repertoire', Vol. I, Macmillan.
2. N.S. Mahay, M. Shadaksharaswamy, 'Foods: Facts and Principles', International Publishers, New Delhi, **2001.**
3. 'Food & Beverage Law: Food Safety and Hygiene', Aman Publications.
4. 'The HACCP Food Safety Training Manual', Wiley.
5. 'The Prevention of Food Adulteration Act', **1954.**

MANAGEMENT IN TOURISM

Subject Code: BHOM2-465 **L T P C** **Duration: 40 Hrs.**

3 0 0 3

Course Objectives: The course has been designed to familiarise the learners with functions and skills keeping in view their applicability in tourism.

UNIT-1

UNDERSTANDING ENTREPRENEURSHIP AND MANAGEMENT: Concept and Functions, Entrepreneurship: Concept and Functions, Corporate Forms in Tourism, Management Issues in Tourism. Understanding Organizational Theory, Understanding Organizations, Planning and Decision Making, Organizing, Monitoring and Controlling.

UNIT-2

Organizational Behaviour Issues, Small Group Behaviour, Inter Personal Behaviour, Inter Group Behaviour, Supervisory Behaviour; Management Functions, Human Resource Management, Financial Management, Operations Management, Marketing Management, Information Technology and Management.

UNIT-3

Managing Financial Operations, Understanding P & L Statements, Understanding Balance Sheet, Profitability Analysis, Project Formulation and Appraisal; Managerial Practices in Tourism, Tour Operators, Travel Agencies, Hotels, Public Relations.

UNIT-4

Managerial Practices in Tourism, Food Services, Tourist Transport, Airlines, Airports; Convention Promotion and Management, Convention Industry, Planning Conventions, Management and Implementation of Conventions.

RECOMMENDED BOOKS

1. P.N. Seth, 'Successful Tourism Management', Sterling Publishers, New Delhi.
2. R. Srinivasan and S.A. Chunawalia, 'Management Principles & Practice', Himalaya Publishing House, New Delhi.
3. L.M. Prasad, 'Principles & Practice of Management', Sultan Chand & Sons, New Delhi.
4. A.K. Bhatia, 'Tourism Development: Principles, Practices and Philosophies', Sterling Publishers,

New Delhi.
5. John R. Walker, 'Introduction to Hospitality', Pearson.

COMMUNICATION SKILLS IN ENGLISH

Subject Code: BHOM2-466 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: It aims at making you aware of how a communicative situation influences the choice of sentence structure and vocabulary.

UNIT-1

Letters, Some Concepts in Communication, Formal Letters, Informal Letters, Conversation, Formal Conversation: Face-to-Face, Informal Conversation: Face-to-Face, Discussions; Telephone Conversation.

UNIT-2

Other Forms of Official Communication: Memoranda, Reports, Minutes of Meetings, Telegrams and Telexes; Interviews and Public Speaking, Interviews, Debates, Discussions, Speeches, Seminar Talks.

UNIT-3

Diaries, Notes, Tables and Figures, Diaries: Private, Diaries: General, Travelogues, Notes, Tables, Charts and Graphs; Mass Media: Print: Writing for Newspapers, Articles for Journals, Advertising.

UNIT-4

Writing for Radio, Writing for Radio-1: The Movement of Sounds, Writing for Radio-2: The Movement of Ideas, Radio Drama; Mass Media: Television: A Television Script, Television Drama, Documentary and Feature Programmes, Interviews, Media, Contexts and Words.

RECOMMENDED BOOKS

1. W.W.S. Bashkir and N.S. Prabhu, 'English Through Reading', MacMillan, **1978.**
2. R.C. Sharma and K. Mohan, 'Business Correspondence and Report Writing', Tata McGraw Hill, **1994.**
3. Lynn Van Der Wagen, 'Communications in Tourism & Hospitality', Hospitality Press.
4. K.K. Sinha, 'Business Communication'.
5. Dale Carnegie, 'How to Win Friends and Influence People', Pocket Books.

Lesikar & Flatley, 'Basic Business Communication', Tata McGraw Hills.

FOOD PRODUCTION OPERATIONS LAB.

Subject Code: BHOM2-422 **L T P C**
0 0 8 4

To formulate 36 sets of menus from the following dishes and to include more dishes from the respective regions.

Maharashtra, Awadhi, Bengal, Goa, Punjabi, South India (Tamilnadu, Karnataka, Kerala), Rajasthan, Gujarat, Hyderabad, Kashmiri:

Suggested Menus:

MAHARASTRIAN

MENU 01

Masala Bhat, Kolhapuri Mutton, Batata Bhajee, Masala Poori, Koshimbir, Coconut Poli.

MENU 02

Moong Dal Khichdee, Patrani Macchi, Tomato Saar, Tilgul Chapatti, Amti, Basundi.

AWADHI
MENU 01
Yakhni Pulao, Mughlai Paratha, Gosht Do Piaza, Badin Jaan, Kulfi with Falooda.
MENU 02
Galouti Kebab, karkhani, Gosht Korma, Paneer Pasanda, Muzzafar.
BENGALI
MENU 01
Ghee Bhat, Macher Jhol, Aloo Posto, Misti Doi.
MENU 02
Doi Mach, Tikoni Pratha, Baigun Bhaja, Payesh.
MENU 03
Mach Bhape, Luchi, Sukto, Kala Jamun.
MENU 04
Prawan Pulao, Mutton Vidalloo, Beans Foogath, Dodol.
GOAN
MENU 01
Arroz, Galina Xacutti, Toor Dal Sorak, Alle Belle.
MENU 02
Coconut Pulao, Fish Caldeen, Cabbage Foogath, Bibinca.
PUNJABI
MENU 01
Rada Meat, Matar Pulao, Kadhi, Punjabi Gobhi, Kheer.
MENU 02
Amritsari Macchi, Rajmah Masala, Pindi Chana, Bhaturas, Row Di Kheer.
MENU 03
Sarson Da Saag, Makki Di Roti, Peshawari Chole, Motia Pulao, Sooji Da Halwa.
MENU 04
Tandoori Roti, Tandoori Murg, Dal Makhani, Pudinia Chutny, Baingan Bhartha, Savian.
SOUTH INDIAN
MENU 01
Meen Poriyal, Curd Rice, Thoran, Rasam, Pal.
MENU 02
Tamarind Rice, Kori Gashi, Kalan, Sambhar, Savian Payasam.
MENU 03
Coconut Rice, Chicken Chettinad, Avial, Huli, Mysore Pak
RAJASTHANI
MENU 01
Gatte Ka Pulao, Lal Maas, Makki Ka Soweta, Chutny (Garlic), Dal Halwa.
MENU 02
Dal Batti Churma, Besan Ke Gatte, Ratalu Ki Subzi, Safed
Mass.
GUJRATI
MENU 01
Sarki, Brown Rice, Salli Murg, Gujrati Dal, Methi Thepla, Shrikhand.
MENU 02
Gujrati Khichadi, Oondhiyu, Batata Nu Tomato, Osaman, Jeera Poori, Mohanthal.

HYDERABADI

MENU 01

Sofyani Biryani, Methi Murg, Tomato Kut, Hare Piaz ka Raita, Double Ka Meetha.

MENU 02

Kachi Biryani, Dalcha, Mirchi Ka Salan, Mix Veg. Raita, Khumani Ka Meetha.

KASHMIRI

Two menus may be formed out of the Dishes given as under:

Rice and Bread Preparations: Mutaegen, Pulao (Kashmiri), Plain Rice, Girdeh, Lawas

Meat Preparations: Gushtaba, Rista, Marchevangan korma, Macch Kofta, Yakhean Kaliya, Tabak Maaz, Rogon Josh

Vegetables and Potato: Ruwangan chaman,Choek wangan,Chaman Qaliyan Alleh Yakhean, Dum Aloo Kashmiri, Nader Palak, Razma Gogji

Sweet Dishes: Kongeh Phirin (Sooji phirni with Saffron), Aae't phirin (Wheat Flour Phirni), Halwa

Chutneys: Mujeh cheten, Ganda Cheten, Dueen cheten, Aleh cheten (pumpkin chutney)

Note: In addition to above each institute to formulate 08 (eight) set of regional menus including snacks, sweets etc.

FOOD & BEVERAGE SERVICE OPERATIONS LAB.

Subject Code: BHOM2-423 **L T P C**
0 0 2 1

1. Dispense Bar - Organizing Mise-en-place

Task-01: Wine service equipment
Task-02: Beer service equipment
Task-03: Cocktail bar equipment
Task-04: Liqueur / Wine Trolley
Task-05 Bar stock - alcoholic & non-alcoholic beverages Task-06 Bar accompaniments & garnishes
Task-07 Bar accessories & disposables

2. Service of Wines

Task-01 Service of Red Wine
Task-02 Service of White/Rose Wine
Task-03 Service of Sparkling Wines
Task-04 Service of Fortified Wines
Task-05 Service of Aromatized Wines
Task-06 Service of Cider, Perry & Sake

3. Service of Aperitifs

Task-01 Service of Bitters
Task-02 Service of Vermouths

4. Service of Beer

Task-01 Service of Bottled & canned Beers

Task-02 Service of Draught Beers

5. Service of Spirits

Task-01 Service styles - neat/on-the-rocks/with appropriate mixers
Task-02 Service of Whisky
Task-03 Service of Vodka
Task-04 Service of Rum
Task-05 Service of Gin
Task-06 Service of Brandy
Task-07 Service of Tequila

6. Service of Liqueurs

Task-01 Service styles - neat/on-the-rocks/with cream/en frappe
Task-02 Service from the Bar
Task-03 Service from Liqueur Trolley

7. **Wine & Drinks List**

Task-01 Wine Bar
Task-02 Beer Bar
Task-03 Cocktail Bar

8. Matching Wines with Food

Task-01 Menu Planning with accompanying Wines
a) Continental Cuisine
b) Indian Regional Cuisine
Task-02 Table laying & Service of menu with accompanying Wines
a) Continental Cuisine
b) Indian Regional Cuisine

9. Matching Wines with Food

Task-01 Menu Planning with accompanying Wines
a) Continental Cuisine
b) Indian Regional Cuisine
Task-02 Table laying & Service of menu with accompanying Wines
a) Continental Cuisine
b) Indian Regional Cuisine

FRONT OFFICE OPERATIONS LAB.

Subject Code: BHOM2-424 **L T P C**
0 0 2 1

Course Objectives: Hands on practices of computer application (Hotel Management System) related to Front Office procedures, such as, Reservation, Registration, Guest History, Telephones, Housekeeping, Daily transactions), Front office Accounting Procedures Manual accounting, Machine accounting, Payable, Accounts Receivable, Guest History, Yield Management Role Play, Situation Handling).

Suggestive List of Task for Front Office Operation System

1	Hot function keys
2	Create and update guest profiles
3	Send confirmation letters
4	Print registration cards

5	Make FIT reservation & group reservation
6	Make an Add-on reservation
7	Amend a reservation
8	Cancel a reservation-with deposit and without deposit
9	Log onto cahier code
10	Process a reservation deposit
11	Pre-register a guest
12	Put message and locator for a guest
13	Put trace for guest
14	Check in a reserved guest
15	Check in day use
16	Check -in a walk-in guest
17	Maintain guest history
18	Make sharer reservation
19	Add a sharer to a reservation
20	Make A/R account
21	Take reservation through Travel Agent/Company/ Individual or Source
22	Make room change
23	Make check and update guest folios
24	Process charges for in-house guests and non-resident guests.
25	Handle allowances and discounts and packages
26	Process advance for in-house guest
27	Put routing instructions
28	Print guest folios during stay
29	Processing foreign currency exchange/ cheque exchange
30	Process guest check out by cash and credit card
31	Check out without closing folio-Skipper accounts
32	Handle paymaster folios
33	Check out using city ledger
34	Print guest folio during check out
35	Close bank at end of each shift
36	Check room rate and variance report
37	Tally Allowances for the day at night
38	Tally paid outs for the day at night
39	Tally forex for the day at night
40	Credit check report

ACCOMMODATION OPERATIONS LAB.

Subject Code: BHOM2-424 **L T P C**
0 0 2 1

01	Layout of Linen and Uniform Room/Laundry
02	Laundry Machinery and Equipment
03	Stain Removal
04	Flower Arrangement

05	Selection and Designing of Uniforms

WORK SHOP ON RESEARCH METHODOLOGY

Course Objectives: This subject is taught to prepare students on how to approach the subject of Research Project in the 3rd year. Inputs can be given to the students during the institute tenure but topics allotted only after return from IT. This will help students perceive the subject in a better fashion while the vacation period between the two years (2nd & 3rd year) utilized for exploratory research and self-study.

UNIT-1

INTRODUCTION TO RESEARCH METHODOLOGY: Meaning and objectives of Research, Types of Research, Research Approaches, Significance of Research, Research methods vs Methodology, Research Process, Criteria of Good Research, Problem faced by Researches, Techniques Involved in defining a problem.

UNIT-2

RESEARCH DESIGN: Meaning and Need for Research Design, Features and important concepts relating to research design, Different Research design, Important Experimental Designs.

UNIT-3

SAMPLE DESIGN: Censure and sample Survey, Implication of Sample design, Steps in sampling design, Criteria for selecting a sampling procedure, Characteristics of a good sample design, Different types of Sample design, Measurement Scales, Important scaling Techniques.

UNIT-4

METHODS OF DATA COLLECTION: Collection of Primary Data, Collection through Questionnaire and schedule collection of secondary data, Difference in Questionnaire and schedule, Different methods to collect secondary data.

DATA ANALYSIS INTERPRETATION AND PRESENTATION TECHNIQUES: Hypothesis Testing, Basic concepts concerning Hypothesis Testing, Procedure and flow diagram for Hypothesis Testing, Test of Significance, Chi-Square Analysis, report Presentation Techniques.

RECOMMENDED BOOKS

1. Alan Bryman, Emma Bell, 'Business Research Methods', Oxford University Press.
2. Ritchie Goeldner, 'Travel Tourism & Hospitality Research', John Wiley.
3. J.R. Brent Ritchie (Editor), Charles R. Goeldner (Editor), 'Travel, Tourism, and Hospitality Research: A Handbook for Managers and Researchers', 2nd Edn., Wiley International.
4. Judith Bell, 'How to Complete your Research Project Successfully', USB Publisher Distributors, Delhi.
5. Ranjit Kumar, 'Research Methodology – A Step by Step Guide for Beginners', Pearson.

INDUSTRIAL EXPOSURE TRAINING

Subject Code: BHOM2-317

Course Objectives: Objective of industrial training is to provide to students the feel of the actual working environment and to gain practical knowledge and skills, which in turn will motivate, develop and build their confidence. Industrial training is also expected to provide the students the basis to identify their key operational area of interest.

1. Attendance in the 3rd Semester would be calculated on the basis of feedback given by Hotels. Industrial Training will require an input of 120 working days i.e. (20-week x 06 days = 120 days). A

student can avail leave to a maximum of 15% (15 days) only with prior permission of the hotel authorities. Similarly, the institute Director can condone an additional 10% (10 days) on production of a medical certificate.

a) Students who are unable to complete a **minimum of 45 days** of Industrial Training would be disallowed from appearing in the term end examinations as per University Rules.
b) Students who complete **more than 45 days of industrial** training but are unable to complete **75 days** due to medical reasons may complete the rest of the training during the summer vacation. Such students will be treated as 'absent' in Industrial Training and results declared as per University Examination Rules.

2. For award of marks, 20% marks of IT would be on the basis of feed-back from the industry in a prescribed Performance Appraisal Form (PAF). It will be the students' responsibility to get this feed-back/assessment form completed from all the four departments of the hotel for submission to the institute at the end of Industrial Training. For the remaining 80% marks, students would be assessed on the basis of seminar/presentation before a select panel. The presentation would be limited to only one key area of the student's interest. A hard copy of the report will also have to be submitted to the panel.
3. Responsibilities of institute, hotel and the student/trainee with aims & objectives have been prescribed for adherence. Once the student has been selected/deputed for Industrial Training by the institute, he/she shall not be permitted to undergo IT elsewhere. In case students make direct arrangements with the hotel for Industrial Training, these will necessarily have to be approved by the institute. Students selected through campus interviews will not seek Industrial Training on their own.
4. There will be no inter change of candidates from one batch to another i.e. winter batch to summer batch and vice versa.

RESPONSIBILITIES OF THE TRAINEE

The trainee should

a) be punctual.
b) maintain the training logbook up-to-date.
c) be attentive and careful while doing work.
d) be keen to learn and maintain high standards and quality of work.
e) interact positively with the hotel staff.
f) be honest and loyal to the hotel and towards their training.
g) get their appraisals signed regularly from the HOD's or training manager.
h) Gain maximum from the exposure given, to get maximum practical knowledge and skills.
i) attend the training review sessions / classes regularly.
j) be prepared for the arduous working condition and should face them positively.
k) adhere to the prescribed training schedule.
l) take the initiative to do the work as training is the only time where you can get maximum exposure.
m) On completion of Industrial Training, handover all the reports, appraisals, logbook and completion certificate to the institute.

RESPONSIBILITIES OF THE INSTITUTE

The Institute should

a) give proper briefing to students prior to the industrial training
b) make the students aware of the industry environment and expectations.
c) notify the details of training schedule to all the students.
d) coordinate regularly with the hotel especially with the training manager.

e) visit the hotel, wherever possible, to check on the trainees.
f) sort out any problem between the trainees and the hotel.
g) take proper feedback from the students after the training.
h) brief the students about the appraisals, attendance, marks, logbook and training report.
i) ensure that change of Industrial Training hotel is not permitted once the student has been interviewed, selected and has accepted the offer.
j) ensure that change of Industrial Training batch is not permitted.
k) ensure trainees procure training completion certificate from the hotel before joining institute.

RESPONSIBILITIES OF THE HOTEL

First Exposure: A young trainee's first industry exposure is likely to be the most influential in that person's career. If the managers / supervisors are unable or unwilling to develop the skills young trainees need to perform effectively, the latter will set lower standards than they are capable of achieving, their self-images will be impaired, and they will develop negative attitudes towards training, industry, and - in all probability - their own careers in the industry. Since the chances of building successful careers in the industry will decline, the trainees will leave in hope of finding other opportunities. **If on the other hand, first managers/supervisors help trainees achieve maximum potential, they will build the foundations for a successful career.**

Hotel should

a) give proper briefing session/orientation/induction prior to commencement of training.
b) make a standardized training module for all trainees.
c) strictly follow the structured training schedule.
d) ensure cordial working conditions for the trainee.
e) co-ordinate with the institute regarding training programme.
f) be strict with the trainees regarding attendance during training.
g) check with trainees regarding appraisals, training report, log book etc.
h) inform the institute about truant trainees.
i) allow the students to interact with the guest.
j) specify industrial training's "Dos and Don'ts" for the trainee.
k) ensure issue of completion certificate to trainees on the last day of training.

Industrial Training (Performance Appraisal)
Maharaja Ranjit Singh Punjab Technical University, Bathinda

Name of Student: _____
University Roll No: _____
Name of the Hotel: _____
Duration: 5 weeks (30 working days) From:_____to: _____
Department: F&B / FP / HK / FO and Other Ancillary Departments

Appearance		
Immaculate Appearance, Spotless uniform, Well-groomed hair, Clean nails &		5
Smart Appearance, Crisp uniform, Acceptable hair, Clean nails and hands		4
Well Presented, Clean Uniform, Acceptable hair, Clean nails & hands		3
Untidy hair, Creased ill kept uniform, Hands not clean at times		2
Dirty / disheveled, Long / unkempt hair, Dirty hands & long nails		1
Allotted		**/5**
Punctuality / Attendance (__days present out of 30 days)		
On time, Well Prepared, Ready to commence task, Attendance Excellent	100%	5
On time, Lacks some preparation but copes well, Attendance Very good	90%	4
On time, Some disorganized aspects-just copes, Attendance Regular	80%	3
Occasionally late, Disorganized approach, Attendance irregular	60%	2
Frequently late, Not prepared, Frequently absent without excuse	50%	1
Allotted		**/5**
Ability to Communicate (Written / Oral)		
Very confident, demonstrates outstanding confidence & ability both		5
Confident, Delivers information		4
Communicates adequately, but lacks depth and confidence		3
Hesitant, lacks confidence in spoken / written communication		2
Very inanimate, unable to express in spoken or written work		1
Allotted		**/5**
Attitude to Colleagues / Customers		
Wins / retains highest regard from colleagues has an outstanding rapport with		5
Polite, considerate and firm, well liked.		4
Gets on well with most colleagues, Handles customers well.		3
Slow to mix, weak manners, is distant has insensitive approach to customers		2
Does not mix, relate well with colleagues & customers		1
Allotted		**/5**
Attitude to Supervision		

Welcomes criticism, Acts on it, very co-operative		5
Readily accepts criticism and is noticeably willing to assist others		4
Accepts criticism, but does not necessarily act on it		3
Takes criticism very personally, broods on it		2
Persistently disregards criticism and goes own way		1
Allotted		**/5**
Initiative / Motivation		
Very effective in analyzing situation and	Demonstrates ambition to achieve	5
resourceful in solving problems	Progressively	
Shows ready appreciation and willingness to	Positively seeks to improve knowledge	4
tackle problems	performance	
Usually grasps points correctly	Shows interest in all work undertaken	3
Slow on the uptake	Is interested only in areas of work	2
Rarely grasps points correctly	Lacks drive and commitment	1
Allotted		**/5**
Reliability / Comprehension		
Is totally trust worthy in any working situation? Understands in detail, why and how the		5
Can be depended upon to identify work requirements and willing to complete		4
Appreciates, how and why the job is done?		
Gets on with the job in hand. Comprehends, but doesn't fully understand work in hand		3
Cannot be relied upon to work without supervision. Comprehends only after constant		2
Requires constant supervision. Lacks any comprehension of the application		1
Allotted		**/5**
Responsibility		
Actively seeks responsibility at all times.		5
Very willing to accept responsibility.		4
Accepts responsibility as it comes.		3
Inclined to refer matters upwards rather than make own decision.		2
Avoids taking responsibility.		1
Allotted		**/5**
Quality of Work		
Exceptionally accurate in work, very thorough usually unaided.		5
Maintains a high standard of quality		4
Generally good quality with some assistance.		3
Performance is uneven.		2
Inaccurate and slow at work.		1
Allotted		**/5**
Quantity of work		

Outstanding in output of work.	5
Gets through a great deal.	4
Output satisfactory.	3
Does rather less than expected.	2
Output regularly insufficient	1
Allotted	**/5**
Total Allotted	**/50**

Stipend Paid per Month: Rs._____
Name of Appraiser: _____ **Signature:** _____
Designation of Appraiser: _____ **Date:** _____
Signature of Student:_____ **Date:** _____

BACHELOR OF MANAGEMENT STUDIES (AIRLINES, TOURISM AND HOSPITALITY)

Total Contact Hours = 22 **Total Marks = 700** **Total Credits = 22**

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM1-101	Basics of Tourism	4	0	0	40	60	100	**4**
BHOM1-102	Geography for Tourism	4	0	0	40	60	100	**4**
BHOM1-103	Indian Society and Culture	3	0	0	40	60	100	**3**
BHOM1-104	Business Communication	3	0	0	40	60	100	**3**
BHOM1-105	Principles of Management	3	0	0	40	60	100	**3**
BHOM1-106	Accounting for Managers	3	0	0	40	60	100	**3**
BHOM1-107	Event Management Report	2	0	0	100	0	100	**2**
Total		**22**	**0**	**0**	**340**	**360**	**700**	**22**

**During first semester student will organise/participate in an event field trip will be after first semester*

Total Contact Hours = 22 **Total Marks = 700** **Total Credits = 22**

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM1-208	Components of Tourism	4	0	0	40	60	100	4
BHOM1-209	Tourism Products of India: Art and Architecture	4	0	0	40	60	100	4
BHOM1-210	Legal Environment for Tourism	4	0	0	40	60	100	4
BHOM 1-211	Introduction of Statistics	3	0	0	40	60	100	3
BHOM1-212	Business Economics	3	0	0	40	60	100	3
BHOM1-213	Environment Studies	2	0	0	0	100*	100	2
BHOM1-214	Field Trip Report	2	0	0	100	0	100	2
Total		**22**	**0**	**0**	**300**	**400**	**700**	**22**

**Qualifying Marks 50%.*

***Leadership Development Camp (Adventure Tour) will be after second semester or during third semester*

BASICS OF TOURISM

Subject Code: BHOM1-101 **L T P C** **Duration: 45 Hrs**
4 0 0 4

Course Objectives

This course shall introduce learner to tourism's growth and development. The course also highlights the role of tourism as an economic intervention and its significance in economy; Course discusses the global nature of tourism, tourism product and emerging trends in tourism industry. It is also important to appreciate the future of tourism.

UNIT-I (12 Hrs)

Historical Development, Transportation advances, the Concept of Tourism, Definition and meaning of tourist, traveller, visitor, excursionist & transit visitor, International tourist & Domestic Tourist, Typologies of Tourists.

UNIT-II (12 Hrs)

Concept of demand & supply in tourism, factors affecting demand and supply in tourism. Tourism Product, Features of Tourism Product, Types of Tourism Product (TOPs, ROPs, BTEs), Difference of tourism product from other consumer products.

UNIT-III (11 Hrs)

Tourism paradigms – Eco tourism, Green tourism, Alternate tourism, Heritage tourism, sustainable tourism, cultural tourism

UNIT-IV (10 Hrs)

Factors inhibiting growth of tourism, travel industry in the 21st century, future tourism scenario.

Recommended Books

1. A.K. Bhatia, 'International Tourism: Fundamental and Practice', Sterling Publisher, New Delhi.
2. E.L. Hudman and D.E. Hawkins, 'Tourism in Contemporary Society: An Introductory Text, New Jersey, Prentice Hall.
3. K.K. Kamra and M. Chand, 'Basics of Tourism: Theory, Operation and Practice', Knishka Delhi.
4. D.E. Lundberg, The Tourist Business. New York: Van Nostrand.
5. Reinhold Mill, R.C. and A.M. Morrison, 'The Tourism System', Prentice Hall, New Jersey.
6. Robert McIntosh, W. Goeldner, R. Charles, 'Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc., New York, **1990.**
7. P.N. Seth, 'Successful Tourism Management', Sterling Publisher, New Delhi.

GEOGRAPHY FOR TOURISM

Subject Code: BHOM1-102 **L T P C** **Duration: 45 Hrs**
4 0 0 4

Course Objectives

Geography is the basic edifice of tourism. The knowledge of geography shall give an extra edge to the students in designing the itineraries for the travellers, suggesting them various destinations to the clients for their travel etc.

UNIT-I (12 Hrs)

Importance of Geography in Tourism: Geography and Tourism Interface, Geography-Locational Aspects: Latitude, Longitude, Location of Places, Map Reading, International Date Line, Time Zones

UNIT-II (10 Hrs)

Geography-Physical and Human Aspects: Relief, Climate, Flora & Fauna, Economy, Population, Transportation & Communication

UNIT-III (12 Hrs)

Case Studies of selected Indian States: Himachal Pradesh, Rajasthan, Uttar Pradesh and North Eastern Hill States (Relief, Climate, Natural Vegetation, Wildlife, Economy, Transportation, Fairs & Festivals, Important Tourist Centres of each State)

UNIT-IV (11 Hrs)

Case Studies of selected Indian States: Madhya Pradesh Orissa, Kerala & Tamil Nadu (Relief, Climate, Natural Vegetation, Wildlife, Economy, Transportation, Fairs & Festivals, Important Tourist Centres of each State

Recommended Books

1. B.G. Boniface and Chris Cooper, 'The Geography of Travel and Tourism Oxford', Butterworth Heinemann.
2. C.M. Hall and J. Page Stephen, 'The Geography of Tourism and Recreation: Environment, Place & Space', Routledge, London.
3. Pearce Douglas, 'Tourism Today: A Geographical Analysis', Longman, New York.
4. R.L. Singh, 'India- A Regional Geography', Varanasi: National Geographical Society of India.
5. N.P. Seth, 'Successful Tourism Management', Sterling Publisher, New Delhi.
6. Sarina Singh et. al., 'India', Lonely Planet Publications.

INDIAN SOCIETY AND CULTURE

Subject Code: BHOM1-103 **L T P C** **Duration: 40 Hrs**

3 0 0 3

Course Objectives

It is the Indian society and culture, which is the main tourist product of India. A thorough knowledge about this is required for any tourism professional, so that it can be utilised in future. This course will brief learner about the core understanding of Indian society, culture and various religions in India

UNIT-I (10 Hrs)

Structure of Indian Society, Dharma, Varnashrama, development of caste system in India, Rites and Rituals, Multiplicity of Indian culture, unity in diversity, main characteristics of Indian culture

UNIT-II (10 Hrs)

Major Religions of India

1. Hinduism, Buddhism, Jainism
2. Islam, Christianity and Sikhism

UNIT-III (10 Hrs)

Fairs and Festivals of India

1. Ganapati-puja, Diwali, Holi, Dussehara, Puja-Navaratra, Pongal, Onam, Id, Muharram, Gurpurab, Christmas
2. Kullu-Dussehra, Maghi Mela, Baisakhi, Pushkar, Kumbh-Haridwar, Allahabad, Kurukshetra-Solar Eclipse

UNIT-IV (10 Hrs)

1. Indian Cuisine, Traditional Dresses and Ornaments.
2. Dance and Music of India.

Recommended Books

1. V.S. Agrawal, 'The Heritage of Indian Art', Govt. of India Publication.
2. A.L. Basham, 'The Wonder that was India', Tapling Publishing Co., New York.
3. Tadgell Christopher, 'The History of Architecture in India', Penguin, New Delhi.
4. Daljeet and P.C. Jain, 'Indian Miniature Paintings', Brijwasi Art Press.
5. Dalmia Yashodhra, 'Contemporary Indian Art: Other Remedies', Marg Publisher, Mumbai.
6. Jagannathan Shankutala, 'Hinduism-An Introduction', Vakils, Feffer and Simon, Mumbai.
7. Keay John, 'India: A History', Harper Collins.
8. Pattanaik Devdutt, 'A Handbook of Hindu Mytholog', Penguin Global.
9. Thapar Romila and Percival Spear, 'History of India', Orient Longman, New Delhi.

BUSINESS COMMUNICATION

Subject Code: BHOM1-104 **L T P C** **Duration: 40 Hrs**

3 0 0 3

Course Objectives

The primary objective of Business Communication is to introduce the student to various forms of written and oral communication that are necessary in real-life business situations, perfecting verbal and non-verbal communication skills. Further this course will try to develop overall personality of students

UNIT-I (10 Hrs)

Meaning, types, barriers and mechanism of communication, Non-verbal communication, organizational setting of business communication, Face to face conversation.

UNIT-II (10 Hrs)

Professional use of telephone, interviews, group discussion and presentations

UNIT-III (10 Hrs)

Customer care, appropriate mannerism, handling customers, nature of complaint, handling objections, responding to a complaint & negotiation, resolving conflict

UNIT-IV (10 Hrs)

Basic personality traits-dress, address, gestures and manners; self-evaluation and development-identification of strength & weaknesses; overcoming hesitation & fear of facing public; corrective & developmental exercises- confidence building, mock interviews, role plays.

Recommended Books

1. Lynn Vander Wagen, 'Communication, Tourism & Hospitality', Hospitality Press Pvt. Ltd.
2. M.D. Jitendra, 'Organizational Communication', Rajat Publications.
3. Jon & Lisa Burton, 'International Skills in Travel & Tourism', Longman Group Ltd.
4. Rayon, V. Lesikar, John D. Petit, J.R. Richard, D. Irwin, 'Business Communication', INC.

PRINCIPLES OF MANAGEMENT

Subject Code: BHOM1-105 **L T P C** **Duration: 40 Hrs**
3 0 0 3

Course Objectives: This is the basic introductory course for learners of business management. This course helps learners to use management skills and techniques in all routine managerial activities in all aspects of businesses effectively and efficiently. Besides, the awareness about manager's role in handling the individuals in an organization will also be the focus of course

UNIT-I (10 Hrs)

Introduction: Concept of Management, Scope, Functions and Principles of Management, Evolution of Management Thought

UNIT-II (10 Hrs)

Planning: Process of Planning, Objectives, Policy & Procedures, Forecasting & Decision Making.

UNIT-III (10 Hrs)

Organizing: Meaning, Importance, Patterns of Organization, Life & Staff relationship, Centralization & decentralization, Staffing: Nature & scope of Staffing, Manpower planning, Selection & Training, Performance & Appraisal

UNIT-IV (10 Hrs)

Directing: Nature & scope of directing, Motivation & Leadership, Communication. Controlling: Concept of Managerial Control, Responsibilities of Managers

Recommended Books

1. R. Srinivasan and S.A. Chunawalia, 'Management Principles & Practice', Himalaya Publishing House, New Delhi.
2. L.M. Prasad, 'Principles & Practice of Management', Sultan Chand & Sons, New Delhi.
3. Koontz Harold and Heinz Weihrich, ,Management', Mc Graw Hill.
4. Burton and Thakur, 'Management Today- Principles and Practices', Tata McGraw Hill.

ACCOUNTING FOR MANAGERS

Subject Code: BHOM1-106 **L T P C** **Duration: 40 Hrs**
3 0 0 3

Course Objectives

The course intends to give learners an understanding of the accounting procedures in an organization. It will help to students to understand and apply the concepts of accounting to solve business problems.

UNIT-I (10 Hrs)

Accounting-Meaning, Objectives, Classification, Accounting Equation, Accounting concepts and conventions, Profit and Loss Account and Balance Sheet

UNIT-II (10 Hrs)

Finance & Financial Management – Meaning, aims, Nature, Scope, Objectives and functions of financial management. Sources of finance, Statement of Changes in Financial position – Funds flow Analysis. Cash Flow Analysis – Ratio analysis

UNIT-III (10 Hrs)

Working Capital Management –Significance, Classification, Theory and Planning of Working Capital, estimating need for working capital, Techniques of Forecasting Working capital requirements.

UNIT-IV (10 Hrs)

Cost Accounting, Cost Sheet/Tender/Marginal Costing & Break even Analysis, Budgetary Control.

Recommended Books

1. M. Pandey, Financial Management, Vikas Publishing, New Delhi.
2. M.Y. Khan, 'Financial Management', Tata Mc. Grand Hill Publishing Co. Ltd., New Delhi.
3. R.K. Sharma and Shashi K. Gupta, 'Management Accounting', Kalyani Publisher, Ludhiana.
4. R.L. Gupta, 'Booking keeping & Accounting', Sultan Chand, New Delhi.
5. T.S. Grewal, 'Introduction to Accounting', S. Chand.
6. Khan and Jain, 'Cost Accountancy', Tata McGraw Hill

EVENT MANAGEMENT REPORT

Subject Code: BHOM1-107 **L T P C** **Duration: 40 Hrs**

3 0 0 3

Course Objectives

The objective of this course is to enable students to

a) Develop and relate theory to practice
b) Help themselves in making an informed career choice after exposure to the actual work environment
c) Observing the systems, processes, interactions and human relations

Evaluation: Student presentations would be organised based on their reports. Presentations would be organized according to a predetermined schedule. A panel of teachers would evaluate the presentations, draft reports and participations. They would give students feedback on their reports. Based on feedback, students would submit a final report which would be evaluated by an internal examiner, nominated by the University, out of 50 points.

COMPONENTS OF TOURISM

Subject Code: BHOM1-208 **L T P C** **Duration: 45 Hrs**

4 0 0 4

Course Objectives

This course will brief learners about the various components of tourism, enabling them to understand the concept of tourism in detail. In this course learner will try to relate tourism with its core sectors. This knowledge will be helpful in shaping a future tourism professional.

UNIT-I (12 Hrs)

Approaches to study tourism: Product, Institutional, Managerial, Geographical and Economic Approach; Concept of interdisciplinary approach to study tourism; Travel Motivation: Categorization of tourists according to their motive of travel; S.C. Plog's Psychographic classification of tourist Motivations. Components of the tourism System.

UNIT-II (12 Hrs)

Tourism Product; Tourism market- a basket of goods and services; Various types of Tourism Attractions; Linkages between the major components of Tourism Industry

UNIT-III (11 Hrs)

Transport as a Component of Tourism, Different types of transportations (Rail, Road, Water and Air); Travel Business through the ages.

UNIT-IV (10 Hrs)

Accommodations Industry, Meaning of Accommodation, Types of Accommodation; Accommodation industry through the ages

Recommended Books

1. R.A. Cook, L.J. Yale and J.J. Marqua, 'Tourism: The Business of Travel, New Jercey', Prentice Hall of India.
2. S. Medlik, 'Managing Tourism', Oxford, Butterworth Heinemann.
3. R.C. Mill and A.M. Morrison, 'The Tourism System', New Jersey, Prentice Hall of India.
4. J.R. Walker, 'Introduction to Hospitality', New Jersey, Prentice Hall of India.
5. P.N. Seth, 'Successful Tourism Management', Sterling Publisher, New Delhi.

TOURISM PRODUCT OF INDIA: ART AND ARCHITECTURE

Subject Code: BHOM1-209 **L T P C** **Duration: 45 Hrs**

4 0 0 4

Course Objectives

A thorough knowledge about the various product offered in tourism is a must for a tourism professional who shall be, in the future involved in the product development and in product sales & marketing.

UNIT-I (10 Hrs)

Elements of Indian Art; (Dance, Music, Literature, Cinema, Handicrafts).

UNIT-II (11 Hrs)

Indian Sculptures- Ancient, Medieval and Modern; Evolution through the ages; Main tourist centres in India

UNIT-III (12 Hrs)

Indian Architecture- Ancient, Medieval and Modern; growth and development through the ages; Different style of architecture in India - Hindu, Buddhist and Islamic.

UNIT-IV (12 Hrs)

Indian Paintings - Ancient, Medieval and Modern; Various schools of Paintings; Important Museums, Art Galleries and Libraries of India

Recommended Books

1. V.S. Agrawal, 'The Heritage of Indian Art', Govt. of India Publication.
2. A.L. Basham, 'The Wonder that was India', Tapling Publishing Co., New York.
3. Tadgell Christopher, 'The History of Architecture in India', Penguin, New Delhi.
4. Daljeet and P.C. Jain, 'Indian Miniature Paintings', Brijwasi Art Press.
5. Dalmia Yashodhra, 'Contemporary Indian Art: Other Remedies', Marg Publisher, Mumbai.
6. Jagannathan Shankutala, 'Hinduism-An Introduction', Vakils, Feffer and Simon, Mumbai.
7. Keay John, 'India: A History', Harper Collins.
8. Pattanaik Devdutt, 'A Handbook of Hindu Mythology', Penguin Global.
9. Thapar Romila and Percival Spear, 'History of India', Orient Longman, New Delhi.

LEGAL ENVIRONMENT FOR TOURISM

Subject Code: BHOM1-210 **L T P C** **Duration: 45 Hrs**
4 0 0 4

Course Objectives

A thorough knowledge about legal and regulatory environment for tourism is needed for any tourism professional. This knowledge is required for entrepreneurial and vocational endeavours.

UNIT-I (11 Hrs)

Indian Contract Act, 1972, Contract of Indemnity and Guarantee, Contract of Agency; Partnership Act 1932, Sale of Goods 1930

UNIT-II (10 Hrs)

Companies Act 1956: Nature and Types of Companies, Formation, Memorandum and Articles of Associations Prospectus.

UNIT-III (12 Hrs)

Negotiable Act 1881: Nature and types Negotiation and Assignment, Types of Negotiable Instrument, Cheques, Letter of Credit, Traveller letter of Credit, Commercial, Letter of Credit

UNIT-IV (12 Hrs)

Consumer Protection Act and Tourism, FEMA; Important regulations related with tourism and hospitality business

Recommended Books

1. S.S. Malik, 'Ethical, Legal and Regulatory Aspects of Tourism Business', Delhi.
2. M. Rahul Sajnani, 'Indian Tourism Business – A Legal Perspective'.
3. N.D. Kapoor, 'Mercantile Law', S. Chand and Co.
4. M.C. Kuchhal, 'Mercantile Law' Vikas Publishing House.
5. V.K. Batra & Kalra, 'Mercantile Law', Tata McGraw Hill.

INTRODUCTION TO STATISTICS

Subject Code: BHOM1-211 **L T P C** **Duration: 40 Hrs**
3 0 0 3

Course Objectives

The objective of this course is to make the student acquaint with the basic knowledge of statistics, enabling them to appreciate and implement this knowledge in in developing business strategies. The objective of this course is also to acquaint the participants with concepts and techniques used in statistics

UNIT-I (10 Hrs)

Statistics – Definitions, Importance, uses in Business, Conducting Statistical Enquiry, Classification & Tabulation, Graphical Presentations, Frequency Distribution; Measures of Central Tendency, Measures of Variation, Skewness.

UNIT-II (09 Hrs)

Correlation Analysis & Regression Analysis

UNIT-III (10 Hrs)

Theory of Index Numbers – Meaning & Uses, Methods of Construction, Test of Consistency, Fixed & Chain Base, Wholesale & Consumer price index

UNIT-IV (10 Hrs)

Time Series Analysis – Components, Trends, Least Square Methods, Moving Average & Ratio-&-Trend Methods

Recommended Books

1. S.P. Gupta, 'Statistical Methods', Sultan Chand & Sons, New Delhi.
2. C.R. Reddy, 'Quantitative Methods for Management', Himalaya Publishing House.
3. V.K. Kapoor, 'Statistics', Sultan Chand & Sons, New Delhi.

BUSINESS ECONOMICS

Subject Code: BHOM1-212 **L T P C** **Duration: 40 Hrs**
3 0 0 3

Course Objectives

Most of managerial decision making has to have economic considerations. It is therefore important for a manager to understand the concepts of economics and refer to same in managing, planning and controlling. The objective of this course is to acquaint the participants with concepts and techniques used in economics both at micro and macro levels.

UNIT-I (10 Hrs)

Concepts of Economics: Wealth Oriented View, Welfare View, Scarcity View, Development View, Nature, Scope and Application of Managerial Economics

UNIT-II (10 Hrs)

Economics of Consumer Analysis: Law of Diminishing Marginal utility, Law of substitution & Consumer Surplus; Demand Analysis, Law of Demand, Determinants of Demand, Elasticity of Demand, Demand forecasting.

UNIT-III (10 Hrs)

Economics of Production Analysis: Return to scale, Law of Returns and Production Function, Concept of Profit and Break-even Analysis.

UNIT-IV (10 Hrs)

Concept of Price determination: Price determination under perfect, imperfect, monopoly & oligopoly.

Recommended Books

1. O.P. Chopra, 'Managerial Economics', Tata McGraw Hill.
2. P.L. Mehta, 'Managerial Economics', Sultan Chand, New Delhi.
3. H.S. Agarwal, 'Micro Economics', Ane Books.
4. Jeoldean, 'Managerial Economics', Prentice Hall of India.

ENVIRONMENT STUDIES

Subject Code: BHOM1-213 **L T P C** **Duration: 35 Hrs**
2 0 0 2

Course Objectives

The knowledge of environmental studies is the need of hour these days. It is pre-requisite for every young professional to understand and appreciate this knowledge, so that he/she can use that knowledge in practice throughout his/her life

UNIT-I (10 Hrs)

Environment Concept: Introduction, concept of biosphere-lithosphere, hydrosphere, atmosphere; Natural resources-their need and types; principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.

Atmosphere: Parts of atmosphere, components of air; pollution, pollutants, their sources, permissible limits, risks and possible control measures.

Hydrosphere: Types of aquatic systems. Major sources (including ground water) and uses of water, problems of the hydrosphere, fresh water shortage; pollution and pollutants of water, permissible limits, risks and possible control measures.

Lithosphere: Earth crust, Soil-a life support system, its texture, types, components, pollution and pollutants, reasons of soil erosion and possible control measures.

UNIT-II (10 Hrs)

Forests: Concept of forests and plantations, types of vegetation and forests, forests, factors governing vegetation, role of threes and forests in environment, various forestry programmes of the Govt. of India, Urban forests, Chipko Andolan.

Conservation of Environment: The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems-soil, water, air, wildlife, forests.

Management of Solid Waste: Merits and demerits of different ways of solid waste management-open, dumping, landfill, incineration, resource reduction, recycling and reuse, vermicomposting and vermiculture, organic farming.

UNIT-III (10 Hrs)

Indoor Environment: Pollutants and contaminants of the in-house environment; problems of the environment linked to urban and rural lifestyles; possible adulterants of the food; uses and harms of plastics and polythene; hazardous chemicals, solvents and cosmetics.

Global Environmental Issues: Global concern, creation of UNEP; Conventions on climate change, Convention on biodiversity; Stratospheric ozone depletion, dangers associated and possible solutions.

Indian Laws on Environment: Indian laws pertaining to Environmental protection: Environment (Protection) Act, 1986; General information about Laws relating to control of air, water and noise pollution. What to do to seek redressal.

UNIT-IV (05 Hrs)

Biodiversity: What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and Indian, Biodiversity Act, 2002.

Noise and Microbial Pollution: Pollution due to noise and microbes and their effects.

Human Population and Environment: Population growth and family welfare programme, Human Health, HIV/AIDS, Human rights.

Social Issues: Environmental Ethics: Issues and possible solution, problems related to lifestyle, sustainable development; Consumerisms and waste generation.

Local Environmental Issues: Environmental problems in rural and urban areas. Problem of congress grass & other weeds, problems arising from the use of pesticides and weedicides, smoking etc.

FIELD TRIP REPORT

Subject Code: BHOM1-214 **L T P C**
2 0 0 2

Course Objectives

The objective of this course is to enable students to

a) Develop and relate theory to practice
b) Help themselves in making an informed career choice after exposure to the actual work environment
c) Observing the systems, processes, interactions and human relations in the organization
d) Get an opportunity to understand the expectations of industry

e) Prepare themselves for final placements.

Evaluation: After the first semester students will undertake a trip to any popular itinerary in India and during the semester they would be submitting a report of the same. Student presentations would be organised based on their reports. Presentations would be organized according to a predetermined schedule. A panel of teachers would evaluate the presentations, draft reports and participations. They would give students feedback on their reports. Based on feedback, students would submit a final report, which would be evaluated by an internal examiner, nominated by the University, out of 100 points.

BACHELOR OF MANAGEMENT STUDIES (AIRLINES, TOURISM AND HOSPITALITY) (3 YEARS) SYLLABUS 2016 BATCH

Total Contact Hours = 19 **Total Marks = 500** **Total Credits = 19**

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA01	Basics of Tourism	4	0	0	40	60	100	**4**
BTA02	Tourism Products and Services Part-1	4	0	0	40	60	100	**4**
BTA03	Basics of Management	3	0	0	40	60	100	**3**
BTA04	Geography of Tourism-1	4	0	0	40	60	100	**4**
BTA05	Customer Care & Interpersonal Skills	4	0	0	40	60	100	**4**
Total		**19**	**0**	**0**	**200**	**300**	**500**	**19**

Total Contact Hours = 20 **Total Marks = 500** **Total Credits = 20**

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA06	Tourism Products and Services Part-2	4	0	0	40	60	100	4
BTA07	Tourism Industry Profile	4	0	0	40	60	100	4
BTA08	Tourism Management	4	0	0	40	60	100	4
BTA09	Geography of Tourism-2	4	0	0	40	60	100	4
BTA10	Human Resource Management	4	0	0	40	60	100	4
Total		**20**	**0**	**0**	**200**	**300**	**500**	**20**

Total Contact Hours = 26 **Total Marks = 700** **Total Credits = 25**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA11	Dimensions of International Tourism	4	0	0	40	60	100	**4**
BTA12	Geography of Tourism-3	4	0	0	40	60	100	**4**
BTA13	Sales, Marketing and PR in Service Industry	4	0	0	40	60	100	**4**
BTA14	Business Communication	4	0	0	40	60	100	**4**
BTA15	Basics of Computer-1 Lab.	0	0	2	60	40	100	**1**
BTA16	Front Office Operations- Reservations and Registrations	4	0	0	40	60	100	**4**
BTA17	English-1	4	0	0	40	60	100	**4**
Total		**24**	**0**	**2**	**300**	**400**	**700**	**25**

Total Contact Hours = 26 **Total Marks = 700** **Total Credits = 25**

SEMESTER 4th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA18	Total Quality Management	4	0	0	40	60	100	4
BTA19	Automation in Tourism Industry, Airlines and Hospitality	4	0	0	40	60	100	4
BTA20	Travel Agency and Tour Operations	4	0	0	40	60	100	4
BTA21	Airlines Management	4	0	0	40	60	100	4
BTA22	Basics of Computers-2 Lab.	0	0	2	60	40	100	1
BTA23	Hospitality Management (Focus- F & B, Housekeeping)	4	0	0	40	60	100	4
BTA24	English-2	4	0	0	40	60	100	4
Total		**24**	**0**	**2**	**300**	**400**	**700**	**25**

Total Contact Hours = 18 **Total Marks = 500** **Total Credits = 17**

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA25	Tourism Policy in India	4	0	0	40	60	100	**4**
BTA26	Resort Management	4	0	0	40	60	100	**4**
BTA27	Destination Marketing & Management	4	0	0	40	60	100	**4**
BTA28	Research Methodology and Management Decisions	4	0	0	40	60	100	**4**
BTA29	Conference & Events Management Lab.	0	0	2	60	40	100	**1**
Total		**16**	**0**	**2**	**220**	**280**	**500**	**17**

Total Contact Hours = 30 **Total Marks = 100** **Total Credits = 15**

SEMESTER 6th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTA30	Industrial Training & Project	0	0	30	40	60	100	**15**
Total		**0**	**0**	**30**	**40**	**60**	**100**	**15**

Total Credits = 19 + 20 + 25 + 25 + 17 + 15 = 121

BASICS OF TOURISM

Subject Code: BTA01 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction- Tourism, The relationship between leisure, recreation and tourism
Travel Lingo, Classification of tourism in terms of: Destination visited – International tourism and domestic tourism, Purpose of Visit – Cultural tourism, Business Tourism, VFR, Pilgrimage tourism etc., Mode of travel arrangement – Inclusive travel and Independent travel.

UNIT-II

Motivation of Travel- (Given by McIntosh)
Physical motivations: travel for sports and adventure, rest and relaxation, health and medical reasons etc.
Cultural motivations: pilgrimage tourism, cultural curiosity etc.
Interpersonal Motivation: meeting new people, VFR, etc. Status and Prestige motivation: business motivation.
Travel Motivations Given by Grey-Wander lust and SunLust.

UNIT-III

Global Tourism- Description of the development of tourism in the Ancient era, Imperial era (Roman travelers, Greek travelers, Indian travelers), Silk Route and Grand tours, Thomas Cook and the development of tourism, & Present scenario of the tourism industry.
Factors that have led to the Growth of Tourism
Technology and destination development
Changing social patterns
Changing Living standards.

UNIT-IV

Barriers to the Growth of Tourism- Factors existing at the destination: terrorism, & political and social environment, Factors barring a potential tourist from traveling: time, cost, and social barriers.
Domestic tourism- Definition and Significance of Domestic tourism, Difference between the domestic tourist and International tourist,
Positive and Negative Impacts of Tourism- Economic Impacts, Socio-culture Impacts, Environmental impacts.

UNIT-V

Carrying Capacity- Types of carrying capacity: Physical, biological, Social carrying capacity, Importance of carrying Capacity, Effect of host population on the carrying capacity.
Sustainable and Eco-tourism- Definition of Eco tourism, Benefits and Importance of Eco tourism, Agenda 21, Definition and bodies promoting Sustainable tourism, Principles of Sustainable tourism, Difference between Mass and Green Tourism.

TOURISM PRODUCT AND SERVICES-1

Subject Code: BTA02 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction- Product, Tangible and Intangible products, Difference between Product and

service, Tourism Product (5 A's), Accommodation, Accessibility, Attraction, Activities, Amenities.

UNIT-II

Accommodation Sector- Introduction of Hotel Industry in India, Types of Hotels, Five Star Hotels in India, Leading Hotel chains, Budget Hotels, Heritage Hotels.

UNIT-III

Transportation Sector- Introduction of transportation Industry in India, Roadways, National and State Highways, Express Highways, Railways, Various Tourist trains: Palace on wheels, Deccan Odyssey, Fairy Queen, Airways: Domestic Airlines operating in India, Waterways, National waterways.

UNIT-IV

Attractions- Natural Attractions: Mountains, Beaches, Forests, Islands, National parks and Wild Life Sanctuaries, Cultural Attractions: Fairs and Festivals, Paintings, Museums, Historical Monuments, Handicrafts, Cuisines.

UNIT-V

Activities- Sports - Winter and summer sports – Mountaineering, Trekking, Skiing, Skating, Water Bases sports: White water rafting, River Crossing, Angling, Surfing, Kayaking, Boating, Parasailing, - Aero sports: Hand Gliding, hang gliding, Ballooning, Bungee Jumping.

BASICS OF MANAGEMENT

Subject Code: BTA03 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction to Management:
Concept, Nature, functions, process, Traits of a successful manager and managerial role. Management and society: Business ethics and social responsibilities.

UNIT-II

Planning: Nature, purpose, Types and process of planning.

UNIT-III

Organizing:
Concept of organizing and organization. Line & Staff, Span of control. Delegation Decentralization Organization structure.

UNIT-IV

Directing:
Communication-Process and types of communication, Barriers and principles of effective communication, Motivation- Meaning, Theories – Maslow and Herzberg, Leadership Co-ordination: Meaning, definition, Principles of co-ordination, Techniques of effective co-ordination

UNIT-V

Leadership:
Concept, Qualities of a successful leader: factors influencing performance of leaders. Styles of leadership, Management Grid. Controlling – Process. Methods and techniques.

GEOGRAPHY OF TOURISM-1

Subject Code: BTA04 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

India: General introduction, states & capitals, physiographic units, seasons and climatic regions & their impacts on tourism. Natural vegetation & wild animals of India & wild life tourism, India: a destination for all reasons & seasons.

UNIT-II

The Northern Mountains: General introduction of the Himalayas & other ranges, their importance for religious, hill station & adventure tourism. A case study of Sri Nagar, Shimla, Nainital, Darjeeling & Gangtok.

UNIT-III

The Central Plains: General introduction of deserts & central plains. Their importance for cultural, religious & adventure tourism. A case study of Amritsar, Jaipur, Delhi, Lucknow, Kolkata.

UNIT-IV

The Peninsula: General features of Indian peninsula with their tourism significance. A case study of Bhopal, Khajuraho, Hyderabad, Banglore, Ooty

UNIT-V

The Coastal Plains and Islands: General features of coastal regions, their importance for religious, cultural & beach tourism. A case study of Mumbai, Goa, Cochin, Chennai, Andaman & Nicobar.

RECOMMENDED BOOKS

1. Ahmad, Aizaz, 'General Geography of India', NCERT, New Delhi.
2. Goh Cheong Long, 'An Economics Atlas of India', Oxford University.
3. 'National Atlas of India', Govt. of India Publication, Calcutta, **1997**.
4. 'Atlas of World', Oxford Press, New Delhi.
5. R.L. Singh, 'A Regional Geography', National Geographical Society of India, Varanasi, **1989**.
6. 'Manorama Year Book', 2009
7. 'India Year Book 2009', Publication Division. Govt. of India, New Delhi.
8. 'Tourism Planner'.
9. Tour Brochures etc.
10. 'Lonely Planet – India'.
11. Ravi Bhushan Kumar, 'Coastal Tourism & Environment', AOH Publishing Corporation, New Delhi.
12. R.N. Pillai, 'Pilgrimage in India'.
13. M.S. Kohli, 'Mountaineering in India', Vikas Publishing House, New Delhi.

CUSTOMER CARE & INTERPERSONAL SKILLS

Subject Code: BTA05 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Who is a customer? internal customer, external customer
Who is a service provider?
Why are some service providers better than others?

Who is a satisfied/ dissatisfied customer?
What are the consequences of satisfied/ dissatisfied customers?

UNIT-II

What is Quality?
What is customer satisfaction?
What is customer delight?

UNIT-III

Key areas of customer care
The product or the service itself
Sales and promotion of the service
After sales support to the customer
Organizational culture

UNIT-IV

Customer Feedback, feedback tools
Converting Customer care philosophy into everyday action
Developing customer trust and loyalty - online
Grooming and Etiquette
Telephone Handling Skills

UNIT-V

Complaint Management
Transactional Analysis in Customer Care
Customer care in airlines
Customer care in hotels
Case studies and Role Plays

TOURISM PRODUCT OF INDIA

Subject Code: BTA06 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Natural Resources: Wildlife Sanctuaries, National Parks and Natural Reserves in India (Jim Corbett Tiger Reserve, Bharatpur Bird Sanctuary, Valley of Flowers, Kanha, Kaziranga, Sasan Gir, Dachigam, Ranthambhore and Keoladeo Ghana)
Hill Stations: Mussoorie, Srinagar, Shimla, Munnar and Ooty.
Beaches and Islands: Beaches in Goa, Kerala, Orissa. Andman Nicobar & Lakshdweep islands.

UNIT-II

Popular Tourist Resources: Delhi, Agra, Jaipur, Khajuraho, Varanasi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Mahabalipuram, Madurai, Tanjore, Hampi, Ellora, Elephanta, Konark and Fatehpur Sikri
Monuments: Qutub Minar, Atala Mosque (Jaunpur), Kirtistambha (Chittor), Sher Shah Suri's Tomb, Sikandara, Red Fort (Delhi), Taj Mahal, Golden Temple (Amritsar), Hawa Mahal (Jaipur), Bara Imambara (Lucknow).

UNIT-III

Pilgrimage Destinations: **Hindu**: Charo Dham Yatra, Jyotirlinga Yatra, Devi Yatra Vindhyachal (U.P.) Kamakhya (Assam), Vaishnavadevi, Kashi, Prayag, Gaya, Ayodhya, Mathura–Vrindavana, Allahabad, Ujjain, Hardwar, Nasik, Gangasagar.
Buddhist: Lumbini, Bodhgaya, Sarnath, Kushinagar, Sharavasti, Sankisa, Vaishali, Rajgriha, Kapilvastu, Nalanda, Sanchi, Ajanta.

Jain: Kashi, Pavapuri, Shatrunjaya, Girnar, Mt. Abu, Sharavanbelgola, Palitana
Muslim: Ajmer Sharif, Nizamuddin (Delhi), Fatehpur Sikri, and some important Mazars.
Sikh: Patna, Nanded, Guru-ka-Tal (Agra), Amritsar.
Saint: Kabir, Tulasi, Raidas, Sankaracharya.

UNIT-IV

Fairs and Festivals: Kumbha, Pushkar, Sonepur, Dadari, Tarnetar, Chhatha, Pongal/Makar-Sankranti, Baishakhi, Meenakshi Kalyanam, Holi,Gangaur, Onam, Durga Puja, Ramalila, Diwali, Kartik Purnima (Dev Deepawali, Guru Parb), Dashahara (Kullu),Rathyatra, Nag Nathaiya (Varanasi), Bhrawafat, Id-ul-Fitr, Easter, Christmas, Carnival (Goa), Burhawa Mangal (Varanasi), Ganga Mahotsava, Taj Mahotsava, Khajuraho Mahotsava and Desert Festival.

UNIT-V

Handicrafts and Handlooms. History of Dance Styles and main Gharanas of North Indian Music. History of Drama in India and its present scenario.

RECOMMENDED BOOKS

1. S.P. Gupta, K. Lal, M. Bhattacharya, 'Cultural Tourism in India'. D.K. Print, **2002**.
2. M. Dixit and C. Sheela, 'Tourism Products', New Royal Book, **2001**.
3. 'Oki Morihiro, Fairs and Festivals', World Friendship Association, Tokyo, **1988.**
4. Mitra, Devla, 'Buddhist Architecture', Calcutta.
5. Michell, George, 'Monuments of India', Vol. 1. London.
6. Davies, Philip, 'Monuments of India', Vol. II, London.
7. Brown Percy, 'Indian Architecture (Buddhist and Hindu)', Bombay.
8. Brown Percy, 'Indian Architecture (Islamic period)', Bombay.
9. R.E. Hawkins, 'Encyclopaedia of Indian Natural History'.
10. Vatsayana, Kapila, 'Indian Classical Dance', New Delhi.
11. Swami, Prayaganand, 'History of Indian Music'.
12. Jain, Jyotindra & Arti, Aggrawala, 'National Handicrafts and Handlooms Museum'.
13. H. Mode & S. Chandra, 'Indian Folk Art', Bombay.
14. R.J. Mehta, 'Handicrafts & Industrial Arts of India', New York.
15. Grewal, Bikram, 'Indian Wildlife'.

TOURISM INDUSTRY PROFILE

Subject Code: BTA07 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-1

Introduction To Luxury Railways
Luxury Trains in India
1. Royal Rajasthan on Wheels
2. Golden Chariot
3. Deccan Odessy

UNIT-II

Travel and Tourism Organizations
Chapter 1 - IATA
History, Growth and Development
IATA Goals
IATA Approval Membership
Chapter 2 - UFTAA
Introduction

Membership
Functions
Chapter 3 - FHRAI
Introduction
Membership
Functions

UNIT-III

Travel Agency and Tour Operations Business
Chapter 1 – Kuoni Destination Management, India
Introduction
Principle Services Offered
Chapter 2 – Thomas Cook
Introduction
Principle Services Offered

UNIT-IV

Accommodation Sector
Chapter 1 – Oberoi Hotels
Introduction
Activities of the Group
Oberoi/Philae Nile Cruiser
The Oberoi, New Delhi
The Oberoi Vanyavilas, Ranthambore

UNIT-V

Aviation Industry
Chapter 1 – Jet Airways
Introduction
Products and Services
Chapter-2 Kingfisher Airlines
Introduction
Products and Services

TOURISM MANAGEMENT

Subject Code: BTA08 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Definition of management Concept-Development of management- managerial skills of tourism-management of tourism-components of tourism- accommodation-attractions-accessibility-management of environment.

UNIT-II

Management of Tourism Marketing: Segmentation-marketing mix-tour pricing- types of demand and supply and marketing research.

UNIT-III

Nature and Classification of Tourism: Basic nature of tourism, Nature of tourism: Leiper's Model, TGR, TR, TDR, Varied benefits of tourism, Indian concept of classification of tours/tourism.

UNIT-IV

Tourism Planning: Need for tourism planning, Essentials of planning, Eight-point planning process, Aims of tourism planning, Significance of planning.

UNIT-V

Infrastructure of tourism management: Structural components, Important tourist services, The seasonal character of tourism, Suggestions for improvement of tourism

Tourism organizational set up in India: Structure of department of tourism, NTO & its Functions.

GEOGRAPHY OF TOURISM-2

Subject Code: BTA09 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Brief introduction of continents & oceans. Map reading. Greenwich mean time. International date line. Elements of weather & climate. Climatic zones of the world. Natural vegetation of the world. Main tourist activities in different climatic zones.

UNIT-II

Asia: General geographical features; physiography, climate, vegetation main countries, capitals & their tourist attractions. A Case study of Japan, Singapore, Sri Lanka, Saudi Arabia.

UNIT-III

Europe: General geographical features; physiography, climate, vegetation. Main countries, capitals & their tourist attractions. A Case study of France, United Kingdom, Switzerland, Netherlands

UNIT-IV

Americas: General geographical features of North & South Americas; physiography, climate, vegetation, main countries, capitals & their tourist attractions. A Case study of the U.S.A. (only 5 destinations), Canada, Brazil, Cuba.

UNIT-V

Other Countries: General geographical features of given countries with information about physiography, climate, vegetation & tourist attractions of South Africa, Egypt, Australia, New Zeeland.

HUMAN RESOURCE MANAGEMENT

Subject Code: BTA10 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Introduction to Human Resource Management: Definitions, Functions of Personnel Management, Objectives of Personnel Management, Qualities of a Good Personnel Manager.

UNIT-II

Human Resource/Man Power Planning: Definitions, Need of Manpower Planning, Objectives of Hr Planning, Advantages Disadvantages of Manpower Planning, Process/Steps.

UNIT-III

Recruitment: Definition, Sources of Recruitment, Internal Sources of Recruitment& (Advantages, Dis-Advantages), External Sources (Advantages, Disadvantages)

Selection: Definition, steps in Selection Process (Application Blank, Initial Interview of the Candidates, Employment Tests, Interviews, Checking Reference, Physical or Medical Examination, Final Interview & Induction).

UNIT-IV

Training and Development: Training Definition, Importance of Training, The Training Process, Training Methods (On The Job- Job Instruction Training, Job Rotation, Special Assignments) off the job (Vestibule Training), Lecture Method, Conference. Method, Seminar or Team Discussion, Case Study Method Development- Definition, Need, Methods - On The Job -Off The Job

Performance Appraisal: Definition, Objectives, Process, Methods-
-Past Oriented
-Future Oriented

UNIT-V

Job Evaluation: Definition, Objectives, Principles, Methods-Non Analytical, Analytical

Employee Remuneration: Definition, Components, Factors Influencing Employee Remuneration, Concept of Wages.

DIMENSIONS OF INTERNATIONAL TOURISM

Subject Code: BTA11 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Trends and critical issues of World Tourism, Understand the supply and demand of Tourist Travel, Reasons for Tourism Flow patterns, Outline the evolution of International Travel and transport developments that have affected tourism.

UNIT-II

The Role of the State in Tourism
National Tourism Organization
Department of Tourism, India
ITDC
DGCA
AAI
FHRAI

UNIT-III

Travel Retailing
Travel Agency & Tour Operations
Functions of a Travel Agency
Departments of Travel Agency
Package Tours & its Components
Client Handling activities in Travel Agency
Star Cruises: Overview

UNIT-IV

Travel Industry Fairs
Participation Advantages
ITB
WTM
PATA Travel Mart
ICCA

UNIT-V

International Tourism Organizations
Need & Significance for Organizations

UFTAA
WATA
ASTA
WTO
PATA & PATA Chapters
IATA
ICAO
IHA

GEOGRAPHY OF TOURISM-3

Subject Code: BTA12 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Geography of travel and tourism - definitions and concepts
The tourism system - tourism-generating areas, destination areas, transit zones

UNIT-II

The multiple forms tourism - destinations, characteristics, types of tourists, distance travelled, the determinants of demand for tourism - travel propensity and frequency, influence of the economic, demographic, political environment, personal variables, barriers to travel.

UNIT-III

Geography of resources for tourism - the nature of tourist resources at different spatial scales, resources and "unique selling propositions"

UNIT-IV

The importance of climate - climatic variables affecting tourism, the distribution of world climates (zones, regions) and their significance for tourism

UNIT-V

The importance of transport in tourism - spatial interaction between components of the tourist system, transport elements, costs, modes, routes, networks, air and surface transport, Future geography of travel and tourism - some prospects.

SALES & MARKETING IN TOURISM

Subject Code: BTA13 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Marketing- Definition, Marketing Concepts (Need, Want, Demand, TQM, Product, Customer value, Customer satisfaction, Exchange &Transaction, Market), Difference between marketing and Selling, Marketing Orientation (Product concept, Production concept, Selling concept, Marketing concept, Societal marketing concept), Modern marketing concepts (Green marketing, Mobile marketing, Cross-cultural marketing, Web marketing, Tele marketing, Relationship marketing, Buzz marketing)

UNIT-II

Analysis and Selection of Market: Measuring and forecasting tourism demand; Forecasting methods, Managing capacity and demand. Market segmentation and positioning (STP).

UNIT-III

Marketing Mix Elements- 7 P's of marketing –Product (Levels, Classification, Branding, Packaging, PLC) Place (Distribution channels Definition, why use intermediaries? How they add value? Channel functions, Marketing intermediaries in hospitality industry) Price

(Definition, Marketing strategies, Initiating price change), Promotion (Definition, Functions, Promotion mix – Advertising, Sales Promotion, Personal Selling, Public Relations), People, Processes, Physical Evidence.

UNIT-IV

Sales Management- Definition, sales person's role, prospect management, buying process, AIDA's theory of selling, personal selling process, closing strategies, function of sales management.

UNIT-V

Public Relations: Definition / Meaning, Need for public relations, The concept of public – internal / external publics, Comparison between advertising, promotion, publicity and pr, PR tools – media / non-media, PR Campaign, PR in Tourism.

BUSINESS COMMUNICATIONS

Subject Code: BTA14 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Meaning, Role, Functions, Importance and essentials of Communication in Business Organizations, Process of Business Communication, Communication Models, Barriers to effective communication. Importance of Communication in: Negotiation, Conflict Management

UNIT-II

Classification of Communication: Formal & Informal, Personal, Inter-personal, Group and Mass, Vertical & Horizontal, Upward & Downward, One-way & Two-way, Verbal & Non-verbal, Understanding – proxemics, kinesics.

UNIT-III

Business Correspondence: Principles of Letter Writing, Types of Business Letters – Sales letters, Requests, Response, letters, Complaint letters, Adjustment letters, Inquiry appeals, Resume Writing, Report Writing, Cross Cultural Communication., Importance of Dressing / Manners & Etiquettes in Business Communication.

UNIT-IV

Presentation Skills: What is a presentation – elements of presentation – designing a presentation. Advanced visual support for business presentation- types of visual aid NEGOTIATIONS SKILLS What is negotiations – nature and need for negotiation – factors affecting negotiation – stages of negotiation process – negotiation strategies.

UNIT-V

Group Communication: Meetings –Planning meetings – objectives – participants – timing – venue of meetings – leading meetings. Media management – the press release-press conference – media interviews Seminars – workshop – conferences. Business etiquettes.

BASICS OF COMPUTER-1 LAB.

Subject Code: BTA15 **L T P C**
0 0 2 1

UNIT-I

Basic Computing: Computer Fundamentals –Theory -Definitions, Elements of a computer system, -Hardware Features and uses, -Components of a computer.

UNIT-II

Windows Operations: Creating folders/shortcuts/renaming files/deleting files, exploring windows, quick menu

UNIT-III

Office Work: The study and use of typical micro–computer storage software packages such as word processor, spreadsheet and MS Office (Word, Excel, PowerPoint, Access and Outlook Express).

UNIT-IV

Internet: E-mail and electronic highway, Internet.

UNIT-V

Computer Presentation: Introduction to a statistical package (SPSS), Presentation Graphic Tools. Multimedia technology. Role of Computers in Travel and Tourism.

RECOMMENDED BOOKS

1. T. Lucey, 'Management Information Systems', D.P. Publications.
2. Clark A, Small Business Computer Systems, Hodder & Stoughton, **1987**.
3. L.K. Parkinson & S.T. Parkinson, 'Using the Micro-computer in Marketing', McGraw Hill, **1987**.
4. B. Braham, 'Computer System in Hotel & Catering Industry', Cassell, **1988.**

FRONT OFFICE OPERATIONS

Subject Code: BTA16 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Front Office Operations: Terminology, Front office functions: Information, Reservations, Reception, Lobby, Cashiering, Night Auditor, Telephones, Emergencies. Front office's interaction with other departments.

UNIT- II

Reservation System and Procedure: Manual Reservation, Automated Reservation, Central Reservation Office, Individual Reservations, Group Reservations, Walk-ins, Reservation Holder, Room Assignment.

UNIT- III

Determining Room Availability and Assignment: Terminology (room revenue, corporate traveler, no-show, due-out, turn-away, walk-in, group booking, stay-over, full-house management, run of the house, occupancy rate, blocked rooms, yield management, and guaranteed payment)

UNIT-IV

Registration Procedure: Registration Card / Form, Payment Method, Rooming, Housekeeping Report, Special Situation, Special Guests, Reports, Overbooking.

UNIT-V

Cashier and Billing Procedures: Terminology (source documents, voucher, department journal, folio, posting, city ledger, cash sheet, petty cash, float, and point of-sale), Billing procedures, Guest Accounting cycle, Charges, Late Charges, Cashier's Responsibilities, Payment.

Night Auditor: Purpose of Hotel Night Audit, Elements necessary for completing night audit, Manual and Automatic Posting, Process of Night Auditing.

RECOMMENDED BOOKS

1. Robert Woods, Jack Ninemeier, David Hayes, & Michele Austin, 'Professional Front Office Management', **2007**. Pearson/Prentice Hall, ISBN 0-13-170069-3.

2. Sudhir Andrew, 'Front Office Operations'.

ENGLISH–1

Subject Code: BTA17 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Grammar

1. Articles, Parts of Speech, Tenses, Voice
2. Direct and Indirect Narration, Transformation of Sentences, Idioms and
3. Proverbs
4. Common Errors in English
5. Vocabulary
6. Punctuation
7. Story Construction
8. Paragraph Writing

TOTAL QUALITY MANAGEMENT

Subject Code: BTA18 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Origin of the Quality Movement, Historical Development of the Quality Movement, Concept of Total Quality Management, The Quality Gurus, The Baldrige Quality Award, Total Quality Management, Key Elements of TQM.

UNIT-II

The Total Quality Management Tool Kit, Definition of the Seven Statistical Tools, Pareto Diagrams, Cause & Effects Diagram, Histograms, Control Charts, Scatter Diagram, Graphs, Check Sheets

UNIT-III

Quality Aspects in a Service Organization, Why Service organizations are different? What matters most to customers? Managing Quality in Service organizations, Quality Control, Just- in-time concept, Deming's Principle.

UNIT-IV

Human Resource Development and Quality Management, Role of HRD, Training and development, Changes related to performances and its measurement, Importance of Frontline staff, building a Quality organization, Organizing and implementing- Total Quality Management, Roles in organizational transition to TQM.

UNIT-V

Small groups and Employee involvement, Teams for TQM., Quality Circles, Benchmarking, Educating the customers about Quality, ISO Series, Obstacles to TQM

AUTOMATION IN TOURISM INDUSTRY, AIRLINES & HOSPITALITY

Subject Code: BTA19 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Automation in the tourism industry:
An Introduction
Importance of Information Technology in Tourism

Automation in the hotel, airlines and travel business

UNIT-II

IATA:
Importance
Role
History

UNIT-III

Introduction to CRS:
The need for a CRS system
History of the CRS system
Use of the CRS by Airlines and Travel Agents
Benefits and importance of the CRS system to the Travel trade
Introduction to Amadeus
Basic commands applicable to Amadeus+ Practical

UNIT-IV

Ticketing Process:
Components of an electronic ticket
Types of tickets: Manual ticket/ Automated Ticket/e-ticket
Ticket coupons
Difference between I ticket and e-ticket
What are Special fare?
Various kinds of special fares

UNIT-V

Billing and Settlement Plan (BSP)
What is BSP?
Advantages of BSP to travel Agents
Describe various stages of BSP operations
A short introduction to Standard Traffic Documents (STD)

TRAVEL AGENCY AND TOUR OPERATIONS

Subject Code: BTA20 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-1

ITINERARY PLANNING
Itinerary and its importance
Types of Itineraries
Factors to keep in mind while designing an Itinerary
Itineraries for Inbound and domestic tourists: Golden triangle, Rajasthan tour, kerela tour
Popular outbound Itineraries of Singapore, Malaysia, Thailand, Europe Tour, Australia Tour

UNIT-II

PACKAGE TOURS
Package tour and its components
Practical components of a standard package tour
Designing & Costing of a package tour

UNIT-III

VISAS
Difference between Passport and Visa
Types of Passport & Visa

Preparing Visa cases
Formalities required for Various Visas like: Schenegen, Dubai and Far East

UNIT-IV

FOREX
Basic overview of FOREX
Forex Terminology- TCs, Cash currency, BTQ, LERMS

UNIT-V

HOW TO SET UP A TRAVEL AGENCY
IATA Rules and Regulations.
CASE STUDY DISCUSSION
(Including the profile of the company, area of specialization, Tag Lines, CEOs and Top shots)
Thomas Cook
La Passage to India
Travelguru.com

AIRLINES MANAGEMENT

Subject Code: BTA21 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I
History of Aviation, Types of Aircrafts, Airline Terminology
UNIT-II
Cabin Crew, Announcements, Airport Jobs
UNIT-III
Airport Codes, Airline Codes, Phonetic Alphabet
UNIT-IV
Airport Lounges, How airports work, Baggage Handling, Airport Security
UNIT-V
World Organizations (IATA, ICAO, DGCA)
Case Study Discussions:
Jet Airways, Kingfisher, Indian Airlines
British Airways, Fly Emirates, Singapore airlines.

BASICS OF COMPUTERS–II LAB.

Subject Code: BTA22 **L T P C** **Duration: 45 Hrs.**
0 0 2 1

MS-Word: Starting Word, new documents, entering text, changing text, aligning, underlining, and justifying text. Use of tabs. Tables – creation, adding rows and columns, splitting, and combining cells, Borders. Saving, closing, and operating documents. Adding headers and footers. Print preview, and printing a document.
Mail Merge: creating main document, letter, envelope and data source. Adding and removing fields from data source.
Power Point (Presentation Software): Basic concept of presentation software. Standard, formatting, and drawing toolbars in PowerPoint and their use. Creating and opening a presentation. Creating, deleting, opening, and copying slides. Closing and saving a presentation. Use of slide sorter, adding header/footer. Use of master slides and colour box.

Use of animation features. Inserting pictures, resizing pictures. Inserting organization chart. Use of auto content wizard**.**

Excel: Its structure and capabilities, drawing toolbars. Selection of cells, entering and editing data and text, entering formulae. Operating Excel: concept of workbook and worksheet, serial fill, formatting text in cells and on the worksheet. Entering and pasting formulas, creating a chart. Excel Functions: max, min, date, count.

Internet: A brief history of origin of internet. Various applications of Internet such as email, information gathering, searching, chatting, downloading etc. Use of search engines, internet explorer and e-mail messages. Netiquettes. Use of internet in various fields.

HOSPITALITY MANAGEMENT (F&B, HOUSEKEEPING)

Subject Code: BTA23 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

The Food & Beverage Service Industry: Introduction to the Food & Beverage Industry, Classification of Catering Establishments (Commercial & Non-Commercial), Introduction to Food & Beverage Operations (Types of F & B Outlets**).**

UNIT-II

Types of Food & Beverage Service -Table Service –English / Silver, American, French, Russian, Self Service – Buffet & Cafeteria, Specialized Service – Gueridon, Tray, Trolley, Lounge, Room etc., Single Point Service – Take Away, Vending Kiosks, Food Courts & Bars, Automats, Mis-en-place & Mis-en-scene.

UNIT-III

Food & Beverage Service Personnel- Food & Beverage Service Organization, Structure - Job Descriptions & Job Specifications, Attitudes & Attributes of Food & Beverage personnel, competencies, Basic Etiquettes, Interdepartmental relationship.

UNIT-IV

Organizing The Housekeeping Department

1. Housekeeping Personnel
2. Organizational structure of a large Hotel (Chart)
3. Importance of Job Description of Housekeeping Personnel
4. Job Description of:

Executive Housekeeper
Housekeeping Supervisor
Uniform/ Linen room supervisor
Night Supervisor, Room Attendant etc.

UNIT-V

Housekeeping terms, Importance & Functions of Housekeeping

House Keeping Areas – Front-of-the-house and Back-of-the-house areas, Guest Rooms, Public

Areas, Maids Room, Indoor and Outdoor Areas, Co-ordination with other Departments like Front Office, Engineering, F & B, Kitchen, Security, Purchase, HRD, Accounts.

ENGLISH–2

Subject Code: BTA24 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

Precis Writing, Letter writing, Essays.

RECOMMENDED BOOKS

C.M. Sharma, 'Twelve Short Stories', Oxford University Press.

Reading Comprehension

-Listening Skills

-Speaking-Extempo, Art of public speaking, Presentation, Group Discussions

- Inspirational Stories: Great Industry Personalities

TOURISM POLICY IN INDIA

Subject Code: BTA25 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Tourism Planning in India

Concept, Need, Objective of tourism planning

Five Key Steps in Tourism Planning Process

Three Level Tourism Planning

Product life cycle and their applicability in tourism planning

Urban and rural tourism planning

Eleventh Five Year Plan an Overview

Role of state and local tourism organizations in tourism planning

UNIT-II

Policy Formulation in India

Concept of Policy,

Formulating tourism policy

India's National Tourism Policy, 1982 and 2002

National Tourism Action Plan, 1992

Role of government, public and private sectors

UNIT-III

Tourism Scenario in India

Introduction to present scenario of tourism

Brief History of Tourism in India

Recognition of tourism as an Industry by Government

Investment opportunities and government policy for investment in hotel/tourism industry.

Sources of funding.

TFCI: Tourism Finance Corporation of India (TFCI)-Aims, Objectives, Organization and Functions

UNIT-IV

International Agreements:(An Introduction)

Chicago Convention, Warsaw Convention, Open Sky Policy, Bermuda Convention, Euro Agreement, Schengen Agreement

UNIT-V

CASE-STUDY:

Rajasthan Tourism Development Corporation Tourism Planning and Policy

Uttaranchal Tourism

Himachal Tourism

J&K Tourism

Kerala,

Madhya Pradesh

RESORT MANAGEMENT

Subject Code: BTA26 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Resort Concept: Characteristics of Resort Management as opposed to Hotel Management, Historical Perspective, Indian Scenario.

UNIT-II

Resort Planning: Preliminary Consideration in Resort Planning and Development and Phases of Resort Planning and Development. Trends and factors in Developed Tourist Markets leading to growth of Resort Concept.

UNIT-III

Factors Affecting Rate: Basic Elements of a Resort Complex: Loading facilities, landscaping, Dinning and drinking facilities, Family Oriented Services, shops and services, Entertainment; Use of Community Resources.

UNIT-IV

Resort Management: Resort Management and Sales Promotion: Research and Analysis: The environment, current market, properly analysis,

UNIT-V

Market segmentation and potential guest markets, Tools of marketing, Advertising, Promotion and Publicity.

DESTINATION MARKETING AND MANAGEMENT

Subject Code: BTA27 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Case Studies: Golden Triangle, Pilgrimage Tourism, Cultural Tourism

UNIT-II

Adventure Tourism, Incentive Travel, Health Tourism

UNIT-III

Wildlife Tourism, Educational Tourism, Agro-Tourism/Rural Tourism, Beach Tourism, Golf Tourism

UNIT-IV

Introduction to Destination marketing, Environment of Destination, Destination marketing plan, Consumer buying Behavior

UNIT-V

Destination Product, Destination Pricing, Distribution Channel, Promotion I, Promotion II

RESEARCH METHODOLOGY AND MANAGEMENT DECISIONS

Subject Code: BTA28 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

1. Introduction to Research Methodology
2. Defining the Research Problem
3. Research Design
4. Sampling Design
5. Methods and Techniques of Data Collection

6. Processing and Analysis of Data
7. Data Presentation and Analysis
8. Report Writing and Presentation
9. Role of Information Technology in Research

CONFERENCE AND EVENT MANAGEMENT

Subject Code: BTA29 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Event Management: Role of events for promotion of tourism, Types of Events- Cultural, festivals, religious, business etc. Need of event management, key factors for best event management.

UNIT-II

Event Planning, Event Marketing, Event Evaluation.

UNIT-III

Management of Conference at Site, Trade shows and exhibitions, principal purpose, types of shows, benefits, major participants, organization and membership, evaluation of attendees. Convention/exhibition facilities; Benefits of conventions facilities, Inter-related venues, Project planning and development.

UNIT-IV

Budgeting a Conference Exhibition: Use of Budget preparation, Estimating, fixed and variable costs, cash flow, sponsorship and subsidies. Registration, Seating Arrangements, Documentation, interpreting press relation, Computer Graphics, Teleconferencing, Recording and Publishing Proceedings; Interpretation and language.

UNIT-V

Role of travel Agency in the management of conferences. Hotel Convention Service Management: Human Resources Management Transportation, Group Fares, Airline Negotiation, Extra Services, Cargo Transportation. History and function of ICCA, Role of ICCA, Roles and function of ICIB.

INDUSTRIAL TRAINING & PROJECT

Subject Code: BTA30 **L T P C**
0 0 30 15

Industrial Training & Project with close monitoring by the ITFT.

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM3-101	Basics of Food Production - I	3	0	0	40	60	100	**3**
BHOM3-102	Basics of Food & Beverage Service – I	3	0	0	40	60	100	**3**
BHOM3-103	Basics of Front Office - I	3	0	0	40	60	100	**3**
BHOM3-104	Basics of House Keeping - I	3	0	0	40	60	100	**3**
BHOM3-105	Communication-I	2	0	0	40	60	100	**2**
BHOM3-106	Basics of Computers	2	0	0	40	60	100	**2**
BHOM3-107	Food Science & Nutrition	2	0	0	40	60	100	**2**
BHOM3-108	Basics of Food Production – I Lab.	0	0	2	60	40	100	**1**
BHOM3-109	Bakery-I Lab.	0	0	2	60	40	100	**1**
BHOM3-110	Basics of Food & Beverage Service – I Lab.	0	0	2	60	40	100	**1**
BHOM3-111	Basics of House Keeping – I Lab.	0	0	2	60	40	100	**1**
BHOM3-112	Fundamentals of Computers Lab.	0	0	2	60	40	100	**1**
Total		**18**	**0**	**10**	**580**	**620**	**1200**	**23**

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM3-213	Food Production-II	3	0	0	40	60	100	**3**
BHOM3-214	Food & Beverage Service-II	3	0	0	40	60	100	**3**
BHOM3-215	Front Office-I	3	0	0	40	60	100	**3**
BHOM3-216	House Keeping-II	3	0	0	40	60	100	**3**
BHOM3-217	Hotel Engineering	2	0	0	40	60	100	**2**
BHOM3-218	Communication-II	2	0	0	40	60	100	**2**
BHOM3-219	Human Values and Professional Ethics	3	0	0	40	60	100	**3**
BHOM3-220	Food Production-II Lab.	0	0	2	60	40	100	**1**
BHOM3-221	Bakery-II Lab.	0	0	2	60	40	100	**1**
BHOM3-222	Food & Beverage Service-II Lab.	0	0	2	60	40	100	**1**
BHOM3-223	Front Office-I Lab.	0	0	2	60	40	100	**1**
BHOM3-224	House Keeping-II Lab.	0	0	2	60	40	100	**1**
Total		**19**	**0**	**10**	**580**	**620**	**1200**	**24**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM3-325	Food Production-III	3	0	0	40	60	100	**3**
BHOM3-326	Food & Beverage Service-III	3	0	0	40	60	100	**3**
BHOM3-327	Front Office-II	3	0	0	40	60	100	**3**
BHOM3-328	Accommodation Operation-I	3	0	0	40	60	100	**3**
BHOM3-329	Food & Beverage Controls	3	0	0	40	60	100	**3**
BHOM3-330	Communication-III	2	0	0	40	60	100	**2**
BHOM3-331	Food Production-III Lab.	0	0	2	60	40	100	**1**
BHOM3-332	Food & Beverage Service-III Lab.	0	0	2	60	40	100	**1**
BHOM3-333	Front Office-II Lab.	0	0	2	60	40	100	**1**
BHOM3-334	Accommodation Operation- I Lab.	0	0	2	60	40	100	**1**
BHOM3-335	GD & Seminar Lab.	0	0	2	60	40	100	**1**
Total		**17**	**0**	**10**	**540**	**560**	**1100**	**22**

SEMESTER 4th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM3-436	Food Production-IV	3	0	0	40	60	100	**3**
BHOM3-437	Food & Beverage Service-IV	3	0	0	40	60	100	**3**
BHOM3-438	Front Office-III	3	0	0	40	60	100	**3**
BHOM3-439	Accommodation Operation-II	3	0	0	40	60	100	**3**
BHOM3-440	Facility Planning	2	0	0	40	60	100	**2**
BHOM3-441	Principles of Management-I	3	0	0	40	60	100	**3**
BHOM3-442	Food Production-IV Lab.	0	0	2	60	40	100	**1**
BHOM3-443	Food & Beverage Service-IV Lab.	0	0	2	60	40	100	**1**
BHOM3-444	Front Office-IV Lab.	0	0	2	60	40	100	**1**
BHOM3-445	Accommodation Operation-II	0	0	2	60	40	100	**1**
BHOM3-446	Computer and MIS Lab.	0	0	2	60	40	100	**1**
Total		**17**	**0**	**10**	**520**	**580**	**1100**	**22**

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM3-547	Food Production-V	3	0	0	40	60	100	**3**
BHOM3-548	Food & Beverage Service-V	3	0	0	40	60	100	**3**
BHOM3-549	Front Office-V	3	0	0	40	60	100	**3**
BHOM3-550	Accommodation Operation-III	3	0	0	40	60	100	**3**
BHOM3-551	Human Resource Management	2	0	0	40	60	100	**2**
BHOM3-552	Principles Of Management-II	2	0	0	40	60	100	**2**
BHOM3-553	Hotel Accountancy	2	0	0	40	60	100	**2**
BHOM3-554	F&B Management	2	0	0	60	40	100	**2**
BHOM3-555	Food Production-V Lab.	0	0	2	60	40	100	**1**
BHOM3-556	Bakery-III Lab.	0	0	2	60	40	100	**1**
BHOM3-557	Food & Beverage Service-V Lab.	0	0	2	60	40	100	**1**
BHOM3-558	Accommodation Operation-III Lab.	0	0	2	60	40	100	**1**
Total		**20**	**0**	**8**	**580**	**620**	**1200**	**24**

SEMESTER 6th		Marks					Credits
Subject Code	**Subject Name**	**External**			**Internal**	**Total**	
		50	**50**	**50**	**50**	**200**	
BHOM3-659	20 Weeks Industrial Exposure Training	Training Report	Training Report	Viva Voce	Log Book		20
Total		**50**	**50**	**50**	**50**	**200**	**20**

20 Weeks Industrial Training

Each candidate will have to prepare a log book and training report of the day to day activities of his 20 Weeks on the job training duly supported by charts, diagrams, photos and tables. The report will be submitted in duplicate copy to the head of department within one month of the completion of the training supported by the certificate of competent authority of the training institute for the evaluation by a panel of experts comprising of one internal and one external. The viva-voce of the 6th semester would be based on the training report as well as other applied assignments, the candidate has undertaken during on the job training.

BASICS OF FOOD PRODUCTION-I

Subject Code: BHOM3-101 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Objectives and Expected Outcomes

To develop knowledge and interest in the science and art of cuisine and food fundamentals in the hotel and Catering industry. To develop skills in meal planning, preparation of basic dishes using different types of ingredients. The student should be able to understand basic methods of cooking and ingredients used both in Indian and Continental Cookery

UNIT-I

Introduction to the Art of Cookery

a) Culinary History- Development of the Culinary Art from the middle ages to modern cookery.
b) Modern hotel kitchen
c) Nouvelle Cuisine,
d) Cuisine Minceur
e) Indian Regional Cuisine
f) Popular International Cuisine (An Introduction) of French, Italian and Chinese Cuisine.

UNIT-II

Aims & Objectives of Cooking Food

a) Classification – Cooking Materials and their uses.
b) Foundation ingredients – meaning, action of heat n carbohydrates, fats, proteins, minerals and vitamins.
c) Fats and oils – meaning & examples of fats & oils, quality for shortenings, commonly used fats and oils and their sources & uses.
d) Raising agent- functions of raising agents, chemical raising agents & yeast. Eggs- uses of eggs in cooking, characteristics of fresh eggs, deterioration of eggs, storage of eggs.
e) Salts - uses.
f) Liquid- water, stock, milk, fruit juices etc. Uses of liquid.
g) Flavouring & Seasoning – uses & example.
h) Sweetening agents - uses & examples.
i) Thickening agent.

Preparation of Ingredients

a) Washing, peeling scraping, paring,
b) Cutting – terms used in vegetables cutting, julienne, brunoise mecedoine, jardinière, paysanne- grating.
c) Grinding, Mashing, Sieving, Milling, Steeping, centrifuging, emulsification evaporation. Homogenization.
d) Methods of mixing foods.

UNIT-III

Equipment used in Kitchen

a) Types of Kitchen Equipment – Diagrams, Uses, Maintenance, Criteria for Selection.

Kitchen Organization

a) Main Kitchen & Satellite Kitchen
b) Duties & responsibilities of each staff.

c) Cooking fuels - uses & advantage of different types of cooking fuels.

Methods of Cooking Food

a) Transference of heat to food by radiation, conduction & convection- magnetrons waves meaning. Boiling, poaching, stewing, braising, steaming, baking, roasting, grilling, frying, paper bag, microwave, pot rousing- explanations with examples.

UNIT-VI

Stocks, Glazes, Sauces and Soups

a) Meaning uses and types of stocks, points observed while making stock. Recipes for I liter of white, brown and fish stock.
b) Glazes -meaning & uses.
c) Sauces -meaning, qualities of a good sauce, types of sauces -proprietary sauce and mother sauce. Recipe for I lit Béchamel, Veloute, Espagnole, Tomato & Hollandaise. Derivatives of mother sauces. (only name, no recipes). Recipes for known International Sauces & their uses.
d) Soups -classification of soups, meaning of each type with examples.

Basic Preparations

a) Mise-en-place for Bouquet Garni, mirepoix, duxelle paste, batters, marinades and gravies.

Recommended Books

1. Krishna Arora, 'Theory of Cookery'.
2. Thangam Philip, 'Modern Cookery'.
3. Montagne, 'Larousse Gastronomique'.
4. Arvind Saraswat, 'Professional Chef'.
5. Parvinder Bali, 'Food Production Operation'.

BASICS OF FOOD & BEVERAGE SERVICE-I

Subject Code: BHOM3-102 **L T P C** **Duration: 37 Hrs.**

3 0 0 3

Objective/s and Expected Outcomes

To develop knowledge of the students about hotel/
restaurants organization and an understanding of the auxiliary departments, different menus, principles of table laying. The student should imbibe the knowledge of Kitchen & restaurant brigade. They should have vital knowledge of auxiliary departments. They should be able to plan different menus, lay tables for different services.

UNIT-I

Introduction to the Food and Beverage Service Industry

a) The evolution of catering industry, scope for caterers in the industry
b) Relationship of the catering industry to other industries.
c) Types of Catering Establishments- Sectors
d) Introduction to the Food and Beverage operations.

Food and Beverage Service Areas in a Hotel

a) Restaurants and their subdivisions, Coffee Shop, Room Service, Bars, Banquets, Discotheques, Grill Room, Snack Bar, Executive Lounges, Business Centers and Night Club
b) **Back Areas:** Still Room, Wash-up, Hot-Plate, Plate Room, Kitchen Stewarding

UNIT-II

Food and Beverage Equipment

a) Operating equipment, Requirements, Criteria for selection quantity and types.
b) Classification of crockery/ cutlery/ glassware/ hollowware/ flatware/ special equipment upkeep and maintenance of equipment.
c) Furniture
d) Linen
e) Disposables

Food and Beverage Service Personnel

a) Staff organization- the principal staff of different types of restaurants.
b) Duties & responsibilities of the service staff.
c) Duties and responsibilities of service staff – Job Descriptions and Job Specifications.
d) Attitude and Attributes of Food and Beverage Service Personnel - personal hygiene, punctuality, personality attitude towards guests, appearance, salesmanship, sense of urgency, customer satisfaction.
e) Basic Etiquettes for catering staff.
f) Interdepartmental relationship.

UNIT-III

Menus and Covers

a) Introduction
b) Cover- definition; different layouts.
c) Menu Planning, considerations and constraints
d) Menu Terms
e) Menu Design
f) French Classical Menu
g) Classical Foods and its Accompaniments with cover
h) Indian Regional dishes, accompaniments and service.

Types of Meals

a) Breakfast – Introduction, Types, Service methods, a la carte, and TDH setups.
b) Brunch
c) Lunch
d) Hi- tea
e) Supper
f) Dinner

UNIT-IV

Food and Beverage Service Methods

a) Table Service – Silver/English, Family, American, Butler/ French, Russian
b) Self Service - Buffet and Cafeteria Service
c) Specialized Service – Gueridon, Tray, Trolley, Lounge, Room etc.
d) Single Point Service- Takeaway, Vending, Kiosks, Food Courts, Bars, Automats

Control Methods

a) Billing methods – Duplicate and Triplicate system, KOTs and BOTs, Computerized KOTs
b) Necessity and functions of a control system, F&B Control cycle and monitoring
c) Food and Beverage Terminology related to the course.

Recommended Books

1. Denis Lillicrap, ‘Food & Beverage Service’.

2. Vijay Dhawan, 'Food & Beverage Service'.
3. Rao J. Suhas, 'Food & Beverage Service'.

BASICS OF FRONT OFFICE –I

Subject Code: BHOM3-103 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Objectives and Expected Outcomes

To understand the general setup of front Office in small, medium and large hotels. Planning for layout of the front office, equipment, tools etc. Students should gain knowledge of various sections and functions of front office and their procedures. They should be able to Hand various tools and equipment of the front office.

UNIT-I

Tourism

a) Meaning – definition and measurement of tourism.
b) Classification – recreation, leisure, adventure, sports, health etc.
c) Socio – economic benefits of tourism.
d) Adverse effects of tourism.
e) Basic components and infrastructure.
f) Itinerary, passport and visa – Basic information.

The Hospitality Industry

a) History and development of lodging industry – International.
b) History and development of lodging industry – India.
c) Defining the term – Hotel.
d) Reasons for travel.

UNIT-II

Classification of Hotels

a) Based on Size, Location, and Length of Stay.
b) Levels of Service, Ownerships and Affiliations.
c) Referral Hotels, Franchise and management contracts.
d) Chain Hotels.
e) Target Markets.
f) Alternate Lodging facilities.

UNIT-III

Organizational Structure of Hotels

a) Small.
b) Medium.
c) Large.
d) Lobby Arrangements
e) Basic Layout and Design.
f) Handling VIPs.
g) Duty Rota and work schedules
h) Uniformed Service.

Front Office Personnel

a) Departmental Hierarchy.
b) Attitude and Attributes and Salesmanship.

c) Job Descriptions and Job Specifications of Front Office Personnel.

UNIT-IV

Front Office Operations

a) The Front Desk- Equipment in use
b) The Guest Room- Types and Status Terminology.
c) Key Controls.
d) Tariff plans.
e) Types of rates.

Front Office Responsibilities

a) Communication – internal and interdepartmental.
b) Guest services – basic information.
c) Guest history – maintenance and importance.
d) Relationship marketing.
e) Emergency situations.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual'.
2. Kasavana & Brooks, 'Managing Front Office Operations'.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry'.
5. Colin Dix & Chris Baird, 'Front Office Operations'.
6. Jatashankar R. Tewari, 'Hotel Front Office Operation and Management'.

BASICS OF HOUSE KEEPING-I

Subject Code: BHOM3-104 **L T P C** **3 0 0 3** **Duration: 37 Hrs.**

Objectives and Expected Outcomes

To emphasize the role of housekeeping as a department in the hotel and the importance of a clean, comfortable, attractive and safe atmosphere aiming at ultimate guest satisfaction. The student should be able to fix the position and the value of each housekeeping staff in the hotel organization. The Student should become familiar with the equipment and agents needed in the housekeeping department. He/She should also become through with all the practices and procedures.

UNIT-I

Introduction

a) Introduction to housekeeping department.
b) Meaning, Definition & Importance of Housekeeping Department
c) Role of Housekeeping in hospitality industry

Lay out & Organizational Structure

a) Layout of Housekeeping department
b) Organizational Structure of Housekeeping department (Small, Medium & large)
c) Interdepartmental relationship (emphasis on Front office & Maintenance)
d) Relevant sub section

UNIT-II

Staffing in Housekeeping Department

a) Role of key personnel in Housekeeping department

b) Job description & Job specification of Housekeeping staff (Executive Housekeeper, Deputy housekeeper, Floor supervisor, Public area supervisor, Night supervisor, Room attendant, House man, Head gardener.

Planning Work of Housekeeping Department

a) Identifying Housekeeping department
b) Briefing & Debriefing
c) Control desk (importance, role, coordination)
d) Role of Control Desk during emergency
e) Duty Rota & work schedule
f) Files with format used in Housekeeping department.

UNIT-III

Hotel Guest Room

a) Types of room-definition
b) Standard layout (single, double, twin, suit)
c) Difference between Smoking & Non Smoking room's
d) Barrier free room's
e) Furniture / Fixture / Fitting / Soft Furnishing /Accessories / Guest Supplies /Amenities in a guest room
f) Layout corridor& floor Pantry

UNIT-IV

Cleaning Science

a) Characteristics of good cleaning agent
b) Application of cleaning agent
c) Types of cleaning agent
d) Cleaning products
e) Cleaning equipment
b) Classification and types of equipment with Diagram's (Mops, dusters, pushers, mechanical squeeze, vacuum cleaner, shampooing machine) with their care and uses.

Recommended Books

1. Sudhir Andrews, 'Hotel Housekeeping Training Manual'.
2. Grace Brigham, 'Housekeeping for Hotels, Hostels and Hospitals'.
3. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELST.
4. Margaret Kappa & Aleta Nitschke, 'Managing Housekeeping Operations'.
5. Sudhir Andrews, 'Hotel House Keeping', Tata McGraw Hill.
6. Tucker Schneider, 'The Professional Housekeeper', VNR.
7. G. Raghubalan, 'Hotel House Keeping Operation & Management'.

COMMUNICATION-I

Subject Code: BHOM3-105 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

Objectives and Expected Outcomes

This course is designed to improve the grammar,
correct their pronunciations and improve communication skills for proper conversation.
Students are expected to learn the basics of the language and refine their pronunciation and communication skills.

UNIT-I

Grammar

a) Voice
b) Narration
c) Tenses
d) Correction of sentences
e) Singular, Pleural, Genders
f) Do as directed involving 'neither, nor' 'no sooner than', transformation of sentences.

UNIT-II

Essay writing (up to 500 words.)

a) Topics to be given from current events, social issues.
b) Topics related to the hotel industry.

UNIT-III

Comprehension of an Unseen Passage

Paragraph Writing:

a) Expansion of a given idea.
b) Expansion up to 250 words

UNIT-IV

Rapid Reading

a) Newspaper Reading
b) Magazine Reading
c) Hotel Journal Reading

Recommended Books

1. Wren & Martin, 'English Grammar'.
2. Hotel Journals
3. Magazines

BASICS OF COMPUTERS

Subject Code: BHOM3-106 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

Objectives and Expected Outcomes

The basic objective of the course is to introduce the students to the world of computers and computer technology. Introduce students to the basic concepts of operating systems, World Processing, Database, presentations & Networking. The student will be able to understand the basics of computers and use the windows application.

UNIT-I

Computer Fundamentals –Theory

a) Information concepts and processing
b) Definition
c) Need, Quality and value of Information
d) Data processing concepts

Elements of a Computer System

a) Definitions
b) Characteristics of Computers
c) Classification of Computers

d) Limitations.

UNIT-II

Hardware Features and Uses

a) Components of Computer
b) Generation of Computers
c) Primary and secondary storage concepts
d) Data entry devices.
e) Data output devices

UNIT-III

Software Concepts

a) System Software
b) Application Software
c) Language Classification
d) Compliers and interpreters

UNIT-IV

Operating System / Environment – Theory

a) Basics of MS-DOS
b) Internal Commands
c) External Commands

Introduction to Windows

a) GUI/Features
b) What are Windows and Windows 95
c) Parts of a typical window and their functions

Recommended Books

1. 'Fundamental of Computers', Prentice Hall India.
2. Lonnie. E. Moseley, 'Mastering Microsoft Office', BPB Publications

FOOD SCIENCE & NUTRITION

Subject Code: BHOM3-107 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

Carbohydrates

a) Introduction
b) Effect of cooking (gelatinization and retro-gradation)
c) Factors affecting texture of carbohydrates (oufflés of cho gel & dextrinization
d) Uses of carbohydrates in food preparation

Fats & Oils

a) Classification (based on the origin and degree of saturation0
b) Autoxidation (factors and prevention measures)
c) Flavour reversion
d) Refining, hydrogenation & winterization
e) Effect of heating on fats & oils with respect to smoke point
f) Commercial uses of fats (with oufflés on shoryening value of different fats)

UNIT-II

Proteins

a) Basic structure and properties
b) Type of proteins based on their origin (plant/animal)
c) Effect of heat on proteins (denaturation, coagulation)
d) Functional oufflés s of proteins (gelation, emulsification, formability, viscosity)
e) Commercial uses of proteins in different food preparations (like egg gels, oufflés gels, cakes, confectionary items, meringues, oufflés, custard, soups, curries etc.)

Basic Aspects

a) Definition of the terms health, nutrition and nutrients
b) Importance of food – (physiological, psychological and social function of food) in maintaining good health
a) Classification of nutrients

Energy

a) Definition of energy and units of its measurements (kcal)
b) Energy contribution from macronutrients (carbohydrates proteins and fats)
c) Factors affecting energy requirements
d) Concept of bmr, sda, thermodynamic action of food
e) Dietary sources of energy
f) Concept of energy balance and the health hazards associated with underweight, overweight

UNIT-III

Macro Nutrients

a) Carbohydrates

i) Definition
ii) Classification (mono, di and polysaccharides)
iii) Dietary sources
iv) Functions
v) Significance of dietary fibre (prevention/treatment of diseases)

b) **Lipids**

i) Definition
ii) Classifications saturated and unsaturated fats
iii) Dietary sources
iv) Functions
v) Significance of fatty acids (pufas, mufas, sfas, efa) in maintaining health
vi) Cholesterol-dietary sources and the concept of dietary and blood cholesterol

c) Proteins

i) Definition
ii) Classification based upon amino acid composition
iii) Dietary sources
iv) Functions
(ii) Methods of improving quality of protein in food (special emphasis on soya proteins and whey proteins)

UNIT-IV

Micro Nutrients

a) Vitamins

i) Definitions and classification (water and fats soluble vitamins)

ii) Food sources, function and significance of
iii) Fat soluble vitamin (vitamin a, d, e, k)
iv) Water soluble vitamins (vitamins c, thiamine, riboflavin, niacin, cyahocobalamin, folic acid

b) Minerals

i) Definition and classification (major and minor)
ii) Food sources, functions and significance of calcium, iron, sodium, iodine & fluorine

d) Water

i) Definition
ii) Dietary sources (visible, invisible)
iii) Functions of water
iv) Role of water in maintaining health (water balance)

Recommended Books

1. Roday Sunetra, 'Food Science & Nutrition'.

BASICS OF FOOD PRODUCTION-I LAB.

Subject Code: BHOM3-108 **L T P C**
0 0 2 1

(Demonstration by instructor and applications by students)

1.
a) Equipment - Identification, Description, Uses & handling
b) Hygiene - Kitchen etiquettes, Practices & knife handling
c) Safety and security in kitchen

2.
a) Vegetables - classification
b) Cuts - julienne, jardinière, macedoines, brunoise, payssane, mignonnete, dices, cubes, shred, mirepoix
c) Preparation of salad dressings

3.
a) Basic Cooking methods and pre-preparations
b) Blanching of Tomatoes and Capsicum
c) Preparation of concasse
d) Boiling (potatoes, Beans, Cauliflower, etc.)
e) Frying - (deep frying, shallow frying, sautéing)
f) Aubergines, Potatoes, etc.
g) Braising - Onions, Leeks, Cabbage
h) Starch cooking (Rice, Pasta, Potatoes)

4.
a) Stocks - Types of stocks (White and Brown stock)
b) Fish stock
c) Emergency stock
d) Fungi stock

5. Sauces - Basic Mother Sauces
a) Béchamel
b) Espagnole

c) Veloute
d) Hollandaise
e) Mayonnaise
f) Tomato

6. Egg cookery - Preparation of Variety of Egg Dishes

a) Boiled (Soft & Hard)
b) Fried (Sunny side up, Single fried, Bull's Eye, Double fried)
c) Poaches
d) Scrambled
e) Omlette (Plain, Stuffed, Spanish)
f) En cocotte (eggs benedict)

7. Simple Salads & Soups

a) Cole slaw,
b) Potato salad,
c) Beet root salad,
d) Green salad,
e) Fruit salad,

8. Simple Egg Preparations

a) Scotch egg,
b) Assorted omelletes,
c) Oeuf Floretine
d) Oeuf Benedict
e) Oeuf Farci
f) Oeuf Portugese
g) Oeuf Deur Mayonnaise

9. Simple Potato Preparations

a) Baked potatoes
b) Mashed potatoes
c) French fries
d) Roasted potatoes
e) Boiled potatoes
f) Lyonnaise potatoes
g) Allumettes

10. Vegetable Preparations

a) Boiled vegetables
b) Glazed vegetables
c) Fried vegetables
d) Stewed vegetables.

BAKERY-I LAB.

Subject Code: BHOM3-109 **L T P C**
0 0 2 1

(Demonstration by instructor and applications by students)

1. Equipment

a) Identification

b) Uses and handling
c) Ingredients - Qualitative and quantitative measures

2. Bread Making

a) Demonstration & Preparation of Simple and enriched bread recipes
b) Bread Loaf (White and Brown)
c) Bread Rolls (Various shapes)
d) French Bread
e) Brioche

3. Simple Cakes

a) Demonstration & Preparation of Simple and enriched Cakes, recipes
b) Sponge, Genoise, Fatless, Swiss roll
c) Fruit Cake
d) Rich Cakes
e) Dundee
f) Madeira

4. Simple Cookies

a) Demonstration and Preparation of simple cookies like
b) Nan Khatai
c) Golden Goodies
d) Melting moments
e) Swiss tart
f) Tri colour biscuits
g) Chocolate chip
h) Cookies
i) Chocolate Cream Fingers
j) Bachelor Buttons.

5. Hot/Cold desserts

a) Caramel Custard,
b) Bread and Butter Pudding
c) Queen of Pudding
d) Soufflé – Lemon / Pineapple
e) Mousse (Chocolate Coffee)
f) Bavaroise
g) Diplomat Pudding
h) Apricot Pudding
i) Steamed Pudding - Albert Pudding, Cabinet Pudding.

BASICS OF FOOD & BEVERAGE SERVICE-I LAB.

Subject Code: BHOM3-110 **L T P C**
0 0 2 1

1. Food Service areas – Induction & Profile of the areas
2. Ancillary F&B Service areas – Induction & Profile of the area
3. Familiarization of F&B Service equipment
4. Care & Maintenance of F&B Service equipment

5. Cleaning/polishing of EPNS items by
a) Plate Powder method
b) Polivit method
c) Silver Dip method
d) Burnishing Machine

6. Basic Technical Skills
a) Task-01: Holding Service Spoon & Fork
b) Task-02: Carrying a Tray / Salver
c) Task-03: Laying a Table Cloth
d) Task-04: Changing a Table Cloth during service
e) Task-05: Placing meal plates & Clearing soiled plates
f) Task-06: Stocking Sideboard
g) Task-07: Service of Water
h) Task-08: Using Service Plate & Crumbing Down
i) Task-09: Napkin Folds
j) Task-10: Changing dirty ashtray
k) Task-11: Cleaning & polishing glassware

7. Tea – Preparation & Service
8. Coffee - Preparation & Service
9. Juices & Soft Drinks - Preparation & Service
a) Mocktails- Juices, Soft drinks, Mineral water, Tonic water
10. Cocoa & Malted Beverages – Preparation & Service

BASICS OF HOUSE KEEPING-I LAB.

Subject Code: BHOM3-111 **L T P C**
0 0 2 1

1. Sample Layout of Guest Rooms
a) Single room
b) Double room
c) Twin room
d) Suite

2. Guest Room Supplies and Position
a) Standard room
b) Suite
c) VIP room special amenities

3. Cleaning Equipment (Manual and Mechanical)
a) Familiarization
b) Different parts
c) Function
d) Care and maintenance

4. Public Area Cleaning (Cleaning Different Surface)
Wood
a) polished
b) painted
c) Laminated

Silver/EPNS
a) Plate powder method
b) Polivit method
c) Proprietary solution (Silvo)

Brass
a) Traditional/ domestic 1 Method
b) Proprietary solution 1 (brasso)

Glass
a) Glass cleanser
b) Economical method (newspaper)

Floor - Cleaning and Polishing of Different Types
a) Wooden
b) Marble
c) Terrazzo/ mosaic etc.

Wall - Care and Maintenance of different Types and Parts
a) Skirting
b) Dado
c) Different types of paints (distemper Emulsion, oil paint etc.)

Maid's Trolley
a) Contents
b) Trolley setup

Familiarizing with different Types of Rooms, Facilities and Surfaces
a) Twin/ double
b) Suite
c) Conference etc.

FUNDAMENTALS OF COMPUTERS-I LAB.

Subject Code: BHOM3-112 **L T P C**
0 0 2 1

1. **Windows Operations**
   a) Creating Folders
   b) Creating Shortcuts
   c) Copying Files/Folders
   d) Renaming Files/Folders
   e) Deleting Files
   f) Exploring Windows
   g) Quick Menus
2. **MS-OFFICE 2007/MS-WORD**
   Creating a Document
   a) Entering Text
   b) Saving the Document
   c) Editing a Document already saved to Disk
   d) Getting around the Document
   e) Find and Replace Operations
   f) Printing the Document

Formatting a Document

a) Justifying Paragraphs
b) Changing Paragraph Indents
c) Setting Tabs and Margins
d) Formatting Pages and Documents
e) Using Bullets and Numbering
f) Headers/Footers
g) Pagination

Special Effects

a) Print Special Effects, E.g. Bold, Underline, Superscripts, Subscript
b) Changing Fonts
c) Changing Case

Cut, Copy and Paste Operation

a) Marking Blocks
b) Copying and Pasting a Block
c) Cutting and Pasting a Block
d) Deleting a Block
e) Formatting a Block
f) Using Find and Replace in a Block

Using MS-Word Tools

a) Spelling and Grammar
b) Mail Merge
c) Printing Envelops and Labels

Tables

a) Create
b) Delete
c) Format

Graphics

a) Inserting Clip arts
b) Symbols (Border/Shading)
c) Word Art

Print Options

a) Previewing the Document
b) Printing a whole Document
c) Printing a Specific Page
d) Printing a selected set
e) Printing Several Documents
f) Printing More than one Copies

3. MS Office 2007/MS-Excel

a) How to use Excel
b) Starting Excel
c) Parts of the Excel Screen
d) Parts of the Worksheet
e) Navigating in a Worksheet
f) Getting to know mouse pointer shapes

Creating a Spreadsheet

a) Starting a new worksheet
b) Entering the three different types of data in a worksheet
c) Creating simple formulas
d) Formatting data for decimal points
e) Editing data in a worksheet
f) Using AutoFill
g) Blocking data
h) Saving a worksheet
i) Exiting excel

Making the Worksheet Look Pretty

a) Selecting cells to format
b) Trimming tables with Auto Format
c) Formatting cells for:
    i) Currency
    ii) Comma
    iii) Percent
    iv) Decimal
    v) Date
d) Changing columns width and row height
e) Aligning text
    i) Top to bottom
    ii) Text wrap
    iii) Re ordering Orientation
    iv) F Using Borders

Going Through Changes

a) Opening workbook files for editing
b) Undoing the mistakes
c) Moving and copying with drag and drop
d) Copying formulas
e) Moving and Copying with Cut, Copy and Paste
f) Deleting cell entries
g) Deleting columns and rows from worksheet
h) Inserting columns and rows in a worksheet
i) Spell checking the worksheet

Printing the Worksheet

a) Previewing pages before printing
b) Printing from the Standard toolbar
c) Printing a part of a worksheet
d) Changing the orientation of the printing
e) Printing the whole worksheet in a single page
f) Adding a header and footer to a report
g) Inserting page breaks in a report
h) Printing the formulas in the worksheet

Additional Features of a Worksheet

a) Splitting worksheet window into two four panes

b) Freezing columns and rows on-screen for worksheet title
c) Attaching comments to cells
d) Finding and replacing data in the worksheet
e) Protecting a worksheet
f) Function commands

Maintaining Multiple Worksheet

a) Moving from sheet in a worksheet
b) Adding more sheets to a workbook
c) Deleting sheets from a workbook
d) Naming sheet tabs other than sheet 1, sheet 2 and so on
e) Copying or moving sheets from one worksheet to another

Creating Graphics/Charts

a) Using Chart wizard
b) Changing the Chart with the Chart Toolbar
c) Formatting the chart's axes
d) Adding a text box to a chart
e) Changing the orientation of a 3-D chart
f) Using drawing tools to add graphics to chart and worksheet
g) Printing a chart with printing the rest of the worksheet data

Excel's Database Facilities

a) Setting up a database
b) Sorting records in the database

Internet & E-mail – PRACTICAL

FOOD PRODUCTION-II

Subject Code: BHOM3-213 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Objectives and Expected Outcomes

To develop knowledge and interest in the science and art of Indian cuisine with emphasis on different regional cuisine, Indian spices, masalas, ethnic eating traditions and Indian Cooking. The students should have full knowledge of regional cuisine of India. They should be able to prepare menus for various food outlets.

UNIT-I

Food Commodities

a) Classification with examples and uses in Cookery
b) Game- meaning- types with examples
c) Fruits- kinds with examples.
d) Nuts- names of nuts commonly used in cooking.
e) Cream- types, description and their uses.
f) Yogurt- types
g) Cereals- types and uses.
h) Pulses used in Indian cooking
i) Herbs- uses of herbs
j) Spices & condiments- uses of different spices and condiments
k) Coloring and Flavoring Agents: Name, Types and Uses.

UNIT-II

Basic Indian Masalas & Gravies

a) Garam masala, pulao masala, curry powder, sambhar powder, rasam powder, chaat masala, tandoori marination white, red, green and yellow gravies.

Indian Regional Cuisine

a) A detailed study on North and South Indian Regional Cuisine: Goa, Kashmir, Andhra Pradesh, Karnataka, Tamil Nadu, Bengal, Assam, Gujarat, Punjab, Rajasthan etc., as regarding ingredients used, traditional preparation methods, utensils and accompaniments.

UNIT-III

Meat Cookery

a) Fish -classification with examples selection & cuts of fish, cooking of fish.
b) Poultry- selection of poultry classification bases on size, uses of each type.
c) Butchery -selection, cuts size and uses of lamb, mutton, beef, veal & pork
d) Bacon, Ham, Gammon and Steaks -Description of steaks from sirloin & fillet.

UNIT-IV

Vegetable Cookery

a) Vegetables -classification of vegetables, importance of vegetables in diet, cooking of vegetables.
b) Retention of color, flavor, and nutrients while cooking.
c) Potatoes - Styles of presenting potatoes and their description.
d) Storage -Principles of Vegetable Storage.

Quantity Food Production

a) Introduction to Large scale commercial cooking.
b) Layout of a large kitchen, staff hierarchy and production workflows

Recommended Books

1. Krishna Arora, 'Theory of Cookery'.
2. Thangam Philip, 'Modern Cookery'.
3. Montagne, 'Larousse Gastronomique'.
4. Arvind Saraswat, 'Professional Chef'.
5. Parvinder Bali, 'Food Production Operation'.

FOOD AND BEVERAGE SERVICE-II

Subject Code: BHOM3-214 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

MEALS & MENU PLANNING:

a) Origin of Menu
b) Objectives of Menu Planning
c) Types of Menu
d) Courses of French Classical Menu
   i) Sequence
   ii) Examples from each course
   iii) Cover of each course
   iv) Accompaniments
e) French Names of dishes

f) Types of Meals
   i) Early Morning Tea
   ii) Breakfast (English, American Continental, Indian)
   iii) Brunch
   iv) Lunch
   v) Afternoon/High Tea
   vi) Dinner
   vii) Supper

UNIT-II

PREPARATION FOR SERVICE

a) Organizing Mise-en-scene
b) Organizing Mise en place

TYPES OF FOOD SERVICE

a) Silver service
b) Pre-plated service
c) Cafeteria service
d) Room service
e) Buffet service
f) Gueridon service
g) Lounge service

UNIT-III

SALE CONTROL SYSTEM

a) KOT/Bill Control System (Manual)
   i) Triplicate Checking System
   ii) Duplicate Checking System
   iii) Single Order Sheet
   iv) Quick Service Menu & Customer Bill
b) Making bill
c) Cash handling equipment
d) Record keeping (Restaurant Cashier)

UNIT-IV

NON-ALCOHOLIC BEVERAGES

Classification (Nourishing, Stimulating and Refreshing Beverages)

a) Tea
   i) Origin & Manufacture
   ii) Types & Brands

b) Coffee
   i) Origin &Manufacture
   ii) Types &Brands

c) Juices and Soft Drinks
   i) Service of Juices & Soft Drinks
   ii) Brand Names of Juices, Soft Drinks, Mineral Water, Tonic Water
   iii) Cocoa &Malted Beverages
   iv) Origin & Manufacture

d) Tobacco
   i) History

ii) Processing for Cigarettes, Pipe Tobacco & Cigars
iii) Cigars –Shapes /Sizes/Colours
iv) Storage of Cigarettes & Cigars

e) Table Cheeses

i) Introduction
ii) Types
iii) Production
iv) Brands and Service
v) Storage

Recommended Books

1. Denis Lillicrap, 'Food & Beverage Service'.
2. Vijay Dhawan, 'Food & Beverage Service'.
3. Rao J. Suhas, 'Food & beverage Service'.

FRONT OFFICE -I

Subject Code: BHOM3-215 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Tariff Structure

a) Basis of charging
b) Plans, competition, customer's profile, standards of service & amenities
c) Hubbart formula
d) Different types of tariffs
i) Rack Rate
ii) Discounted Rates for Corporates, Airlines, Groups & Travel Agents

Front Office and Guest Handling

a) Introduction to guest cycle
b) Pre arrival
c) Arrival
d) During guest stay
e) Departure
f) After departure

UNIT-II

Reservations

a) Importance of reservation
b) Modes of reservation
c) Channels and sources (FITs, Travel Agents, Airlines, GITs)
d) Types of reservations (Tentative, confirmed, guaranteed etc.)
e) Systems (non-automatic, semi-automatic fully automatic)
f) Cancellation
g) Amendments
h) Overbooking

UNIT-III

Room Selling Techniques

a) Up selling

b) Discounts

Arrivals

a) Preparing for guest arrivals at Reservation and Front Office
b) Receiving of guests
c) Pre-registration
d) Registration (non-automatic, semi-automatic and automatic)
e) Relevant records for FITs, Groups, Air crews & VIPs

UNIT-IV

During the Stay Activities

a) Information services
b) Message and Mail Handling
c) Key Handling
d) Guest special Requests
e) Hospitality desk
f) Complaints handling
g) Guest handling
h) Guest history

Front Office Co-ordination

c) With other departments of hotel

Recommended Books

1. Sudhir, Andrews, 'Front Office Training Manual'.
2. Kasavana & Brooks, 'Managing Front Office Operations'.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry'.
5. Colin Dix & Chris Baird, 'Front Office Operations'.
6. Jatashankar R. Tewari, 'Hotel Front Office Operation and Management'.

HOUSE KEEPING-II

Subject Code: BHOM3-216 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Housekeeping Supervision

a) Importance of Inspection
b) Checklist for Inspection
c) Typical Areas usually neglected where special attention is required.
d) Self-Supervision Techniques for Cleaning Staff
e) Degree of Discretion / Delegation to Cleaning Staff

UNIT-II

Linen/Uniform/Tailor Room

a) Layout
b) Types of Linen, Sizes, and Linen Exchange Procedure
c) Selection of Linen
d) Storage Facilities and Conditions
e) Par Stock: Factors affecting Par Stock, Calculation of Par Stock
f) Discard Management

g) Linen Inventory System
h) Uniform Designing: Importance, Types, Characteristics, Selection, Par Stock
i) Function of Tailor Room
j) Managing Inventory
k) Par level of linen, uniform, guest loan items, machines & equipment, cleaning supplies & guest supplies
l) Indenting from stores.

UNIT-III

Cleaning Procedure & Frequency Schedules

a) Guest Room

i) Prepare to clean
ii) Clean the guest room (bed making)
iii) Replenishment of Supplies & linen
iv) Inspection
v) Deep cleaning
vi) Second service
vii) Turn down service

b) Public Area

i) Lobby, Lounge, Corridors, Pool area, Elevators, Health club, F&B outlet, Office areas.
ii) V.I.P. Handling

Special Cleaning Programme

a) Daily, Weekly, Fortnightly and Monthly Cleaning
b) Routine cleaning, spring cleaning, deep Cleaning.

UNIT-IV

Floor Operations

a) Rules on the Guest Floor
b) Key Handling Procedure - types of keys (grand master, floor master, sub master or section or pass key, emergency key, room keys, offices and store keys), computerized key cards, key control register- issuing, return, changing of lock, key belts, unusual occurrences.
a) Cleaning of Different Types of Floor Surfaces
b) Special Services - babysitting, second service, freshen up service, valet service.

Care and Cleaning of Metals

a) Brass, Copper, Silver, EPNS, Bronze, Gun Metal, Chromium pewter, Stainless Steel, Types of tarnish, cleaning agents and methods used.

Recommended Books

1. Sudhir Andrews, 'Hotel Housekeeping Training Manual'.
2. Grace Brigham, 'Housekeeping for Hotels, Hostels and Hospitals'.
3. Joan C Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELST.
4. Margaret Kappa & Aleta Nitschke, 'Managing Housekeeping Operations'.
5. Sudhir Andrews, 'Hotel House Keeping', Tata McGraw Hill.
6. Tucker Schneider, 'The Professional Housekeeper', VNR.
7. G. Raghubalan, 'Hotel House Keeping Operation & Management'.

HOTEL ENGINEERING

Subject Code: BHOM3-217 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

Hotel Maintenance Management

a) Introduction & Scope in Hotels
b) Classification and Types
c) Maintenance Programmes.

Engineering Department

a) Organization & Setup of the Department
b) The Staff – Duties and Responsibilities
c) Requirement of Engineering Workshops.

UNIT-II

Fuels

a) Types of Fuels available
b) Gases
c) Precautions while using them - Heat Parts, BTU, Thermal & Calorific values
d) Calculation of heat requirements, Fuel Requirement
e) Principle of Bunsen burner
f) Construction of an Industrial Gas Range: Parts & Functions, striking back, causes and remedies of problems.

Electricity

a) Meaning and use,
b) Advantage as a type of energy, conductors and nonconductors,
c) Meaning of ampere, volt, ohm and their relationship, ohm's law,
d) AC & DC- their differences, advantages and disadvantages, signs and signals, closed and open circuits, causes and dangers, importance of earthing.
b) General layout of circuits including service entrance, distribution panel boards, calculation of power requirements, meter reading

UNIT-III

Water Management System

a) Sources of water and its quality
b) Methods of removal of hardness, description of cold water
b) Supply from mains and wells, calculations of water requirements and capacity of storage, systems.

Sanitary Systems

a) Sinks, basins
b) Water closet, bidets and their fittings
c) Use of water traps and water seals, water pipes and soil pipes

UNIT-IV

Transport Systems

a) Passenger elevators, freight elevators
b) Dumb waiters
c) Escalators and sidewalks - their operation and maintenance.

Fire Prevention & Protection.

a) Different types of fires
b) Fire alarms
c) Different types of extinguishers
d) Fire hazards.

Recommended Books

1. N.C. Goyal & K.C. Goyal, 'Textbook of Hotel Maintenance'.
2. Sujit Ghosal, 'Hotel Engineering'.

COMMUNICATION–II

Subject Code: BHOM3-218 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

Business Communication

a) Need
b) Purpose
c) Nature
d) Models
e) Barriers to communication
f) Overcoming the barriers

Listening on the Job

a) Definition
b) Levels and types of listening
c) Listening barriers
d) Guidelines for effective listening
e) Listening computerization and note taking

UNIT-II

Effective Speaking

a) Restaurant and hotel English
b) Polite and effective enquiries and responses
c) Addressing a group
d) Essential qualities of a good speaker
e) Audience analysis
f) Defining the purpose of a speech, organizing the ideas and delivering the speech

UNIT-III

Non Verbal Communication

a) Definition, its importance and its inevitability
b) Kinesics: Body movements, facial expressions, posture, eye contact etc.
c) Protemies: The communication use of space
d) Paralanguage: Vocal behaviour and its impact on verbal communication
e) Communicative use of artifacts – furniture, plants, colours, architects etc.

UNIT-IV

Speech Improvement

a) Pronunciation, stress, accent
b) Important of speech in hotels

c) Common phonetic difficulties
d) Connective drills exercises
e) Introduction to frequently used foreign sounds

Using the Telephone

a) The nature of telephone activity in the hotel industry
b) The need for developing telephone skills
c) Developing telephone skills

Recommended Books

1. Wren & Martin, 'English Grammar'.
2. Hotel Journals
3. Magazines

HUMAN VALUES & PROFESSIONAL ETHICS

Subject Code: BHOM3-219 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Course Objectives

To help the students to discriminate between valuable and superficial in the life. To help develop the critical ability to distinguish between essence and form, or between what is of value and what is superficial, in life - this ability is to be developed not for a narrow area or field of study, but for everyday situations in life, covering the widest possible canvas. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability, it is important to act on such discrimination in a given situation.

Expected Outcomes

Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing) - it concentrates on providing to its students the skills to do things. In other words, it concentrates on providing "How to do" things. The aspects of understanding "What to do" or "Why something should be done" is assumed. No significant cogent material on understanding is included as a part of the curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course is an effort to fulfill our responsibility to provide our students this significant input about understanding. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. It has been experimented at IIITH, IITK and UPTU on a large scale with significant results.

UNIT-I

1. Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

a) Understanding the need, basic guidelines, content and process for Value Education.
b) Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
c) Continuous Happiness and Prosperity- A look at basic Human Aspirations
d) Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority

e) Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
f) Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

UNIT-II

2. Understanding Harmony in the Human Being - Harmony in Myself!

a) Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
b) Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
c) Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
d) Understanding the characteristics and activities of 'I' and harmony in 'I'
e) Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
f) Programs to ensure *Sanyam* and *Swasthya*

UNIT-III

3. Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

a) Understanding harmony in the Family- the basic unit of human interaction
b) Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
c) Understanding the meaning of *Vishwas;* Difference between intention and competence
d) Understanding the meaning of *Samman,* Difference between respect and differentiation; the other salient values in relationship
e) Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
f) Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

a) Understanding the harmony in the Nature
b) Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
c) Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all pervasive space
d) Holistic perception of harmony at all levels of existence

UNIT-IV

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics

a) Natural acceptance of human values
b) Definitiveness of Ethical Human Conduct
c) Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
d) Competence in professional ethics:
   i) Ability to utilize the professional competence for augmenting universal human order
   ii) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems
   iii) Ability to identify and develop appropriate technologies and management patterns for above production systems.
e) Case studies of typical holistic technologies, management models and production systems

f) Strategy for transition from the present state to Universal Human Order:
   i) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
   ii) At the level of society: as mutually enriching institutions and organizations

Recommended Books

1. R.R. Gaur, R. Sangal, G.P. Bagaria, 'A Foundation Course in Value Education', **2009**.
2. Ivan Illich, 'Energy & Equity', The Trinity Press, Worcester, and HarperCollins, USA, **1974**.
3. E.F. Schumacher, 'Small is Beautiful: a study of economics as if people mattered', Blond & Briggs, Britain, **1973**,
4. A. Nagraj, 'Jeevan Vidya ek Paricha', Divya Path Sansthan, Amarkantak, **1998**.
5. Sussan George, 'How the Other Half Dies', Penguin Press, **1976, Reprinted 1986, 1991.**
6. P.L. Dhar, R.R. Gaur, 'Science and Humanism', Commonwealth Publishers, **1990**.
7. A.N. Tripathy, 'Human Values', New Age International Publishers, **2003**.
8. Subhas Palekar, 'How to Practice Natural Farming', Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, **2000**.
9. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 'Limits to Growth – Club of Rome's Report', Universe Books, **1972**.
10. E.G. Seebauer & Robert L. Berry, 'Fundamentals of Ethics for Scientists & Engineers', Oxford University Press, **2000**.
11. M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, 'Engineering Ethics (including Human Values)', Eastern Economy Edn., Prentice Hall of India Ltd.
12. B.P. Banerjee, 'Foundations of Ethics and Management', Excel Books, **2005**.
13. B.L. Bajpai, 'Indian Ethos and Modern Management', New Royal Book Co., Lucknow, **2004,** Reprinted **2008**.

FOOD PRODUCTION-II LAB.

Subject Code: BHOM3-220 **L T P C**
0 0 2 1

1.

a) Meat – Identification of various cuts, Carcass demonstration
b) Preparation of basic Cuts-Lamb and Pork Chops, Tornado, Fillet, Steaks and Escalope
c) Fish-Identification & Classification
d) Cuts and Folds of fish
e) Identification, Selection and processing of Meat, Fish and poultry.
f) Slaughtering and dressing

2. Preparation of Menu

a) **Salads & soups**- waldrof salad, Fruit salad, Russian salad, salade nicoise,
b) Cream (Spinach, Vegetable, Tomato),
c) Puree (Lentil, Peas Carrot)
d) International soups

3. Chicken, Mutton and Fish Preparations-

a) Fish orly**,** a la anglaise, colbert, meuniere, poached, baked
b) Entrée-Lamb stew, hot pot, shepherd's pie, grilled steaks & lamb/Pork chops, Roast chicken, grilled chicken, Leg of Lamb, Beef

4. Simple Potato Preparations- Basic potato dishes

5. Vegetable Preparations- Basic vegetable dishes
6. Indian Cookery: Rice dishes, Breads, Main course, Basic Vegetables, Paneer Preparations.

BAKERY-II LAB.

Subject Code: BHOM3-221 **L T P C**
0 0 2 1

1. PASTRY: Demonstration and Preparation of dishes using varieties of Pastry
a) Short Crust – Jam tarts, Turnovers
b) Laminated – Palmiers, Khara Biscuits, Danish Pastry, Cream Horns
c) Choux Paste – Eclairs, Profiteroles
2. COLD SWEET
a) Honeycomb mould
b) Butterscotch sponge
c) Coffee mousse
d) Lemon sponge
e) Trifle
f) Blancmange
g) Chocolate mousse
h) Lemon soufflé
3. HOT SWEET
a) Bread & butter pudding
b) Caramel custard
c) Albert pudding
d) Christmas pudding
4. INDIAN SWEETS
Simple ones such as gajjar halwa, kheer

FOOD & BEVERAGE SERVICE-II LAB.

Subject Code: BHOM3-222 **L T P C**
0 0 2 1

1. TABLE LAY-UP & SERVICE
a) Task-01: A La Carte Cover
b) Task-02: Table d‟ Hote Cover
c) Task-03: English Breakfast Cover
d) Task-04: American Breakfast Cover
e) Task-05: Continental Breakfast Cover
f) Task-06: Indian Breakfast Cover
g) Task-07: Afternoon Tea Cover
h) Task-08: High Tea Cover
2. TRAY/TROLLEY SET-UP & SERVICE
a) Task-01: Room Service Tray Setup
b) Task-02: Room Service Trolley Setup
3. **PREPARATION FOR SERVICE (RESTAURANT)**
a) Organizing Mise-en-scene

b) Organizing Mise-en-Place
c) Opening, Operating & Closing duties

4. PROCEDURE FOR SERVICE OF A MEAL

a) Task-01: Taking Guest Reservations
b) Task-02: Receiving & Seating of Guests
c) Task-03: Order taking & Recording
d) Task-04: Order processing (passing orders to the kitchen)
e) Task-05: Sequence of service
f) Task-06: Presentation & Enchasing the Bill
g) Task-07: Presenting & collecting Guest comment cards
h) Task-08: Seeing off the Guest

5. SOCIAL SKILLS

a) Task-01: Handling Guest Complaints
b) Task-02: Telephone manners
c) Task-03: Dining & Service etiquettes

6. SERVICE OF TOBACCO

a) Cigarettes & Cigars

FRONT OFFICE-I LAB.

Subject Code: BHOM3-223 **L T P C**
0 0 2 1

a) Basic Manners and Attributes for Front Office Operations.
b) Communication Skills – verbal and non-verbal.
b) Preparation and study of Countries – Capitals & Currency, Airlines & Flag charts, Credit Cards, Travel Agencies etc.
a) Telecommunication Skills.
b) Forms & formats related to Front office.
c) Hotel visits – WTO sheets.
d) Identification of equipment, work structure and stationery.
e) Procedure of taking reservations – in person and on telephones.
f) Converting enquiry into valid reservations.
g) Role play – Check-in / Check – out / Walk-in / FIT / GIT / etc.; VIP / CIP / H.G etc.
h) Suggestive selling.

HOUSE KEEPING-II LAB.

Subject Code: BHOM3-224 **L T P C**
0 0 2 1

Servicing guest room (checkout/ occupied and vacant)
ROOM

a) Task 1- open curtain and adjust lighting
b) Task 2-clean ash and remove trays if any
c) Task 3- strip and make bed
d) Task 4- dust and clean drawers and replenish supplies
e) Task 5-dust and clean furniture, clockwise or anticlockwise

f) Task 6- clean mirror
g) Task 7- replenish all supplies
h) Task 8-clean and replenish minibar
i) Task 9-vaccum clean carpet
j) Task 10- check for stains and spot cleaning

BATHROOM

a) Task 1-disposed soiled linen
b) Task 2-clean ashtray
c) Task 3-clean WC
d) Task 4-clean bath and bath area
e) Task 5-wipe and clean shower curtain
f) Task 6- clean mirror
g) Task 7-clean tooth glass
h) Task 8-clean vanitory unit
i) Task 9- replenish bath supplies
j) Task 10- mop the floor

BED MAKING SUPPLIES (DAY BED/NIGHT BED)

a) Step 1-spread the first sheet (from one side)
b) Step 2-make miter corner (on both corner of your side)
c) Step 3- spread second sheet (upside down)
d) Step 4-spread blanket
e) Step 5- Spread crinkle sheet
f) Step 6- make two folds on head side with all three (second sheet, blanket and crinkle sheet)
g) Step 7- tuck the folds on your side
h) Step 8- make miter corner with all three on your side
i) Step 9- change side and finish the bed in the same way
j) Step 10- spread the bed spread and place pillow

RECORDS

a) Room occupancy report
b) Checklist
c) Floor register
d) Work/maintenance order
e) Lost and found
f) Maid's report
g) Housekeeper's report
h) Log book
i) Guest special request register
j) Record of special cleaning
k) Call register
l) VIP list
m) Floor linen book/ register

MINIBAR MANAGEMENT

a) Issue
b) stock taking
c) checking expiry date

HANDLING ROOM LINEN/GUEST SUPPLIES

a) Maintaining register/ record
b) Replenishing floor pantry
c) stock taking

GUEST HANDLING

a) Guest request
b) Guest complaints

FOOD PRODUCTION-III

Subject Code: BHOM3-325 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

QUANTITY FOOD PRODUCTION

UNIT-I

Equipment

a) Equipment required for mass/volume feeding
b) Heating and Cooling equipment
c) Care and maintenance of this equipment
d) Modern developments in equipment manufacture

UNIT-II

Menu Planning

a) Basic principles of menu planning – recapitulation
b) Points to consider in menu planning for various volume feeding outlets such as Industrial, Institutional, Mobile Catering Units.
c) Planning menus for School/college students, Industrial workers, Hospitals, Outdoor parties, Theme dinners, Transport facilities, cruise lines, airlines, railway
d) Nutritional factors for the above

UNIT-III

Indenting

a) Principles of Indenting for volume feeding
b) Portion sizes of various items for different types of volume feeding
   i) Modifying recipes for indenting for large scale catering
   ii) Practical difficulties while indenting for volume feeding

Planning

Principles of planning for quantity food production with regard to

a) Space allocation
b) Equipment selection
c) Staffing

UNIT-IV

Volume Feeding

a) **Institutional and Industrial Catering**
   i) Types of Institutional & Industrial Catering
   ii) Problems associated with this type of catering
   iii) Scope for development and growth
b) **Hospital Catering**
   i) Highlights of Hospital Catering for patients, staff, visitors

ii) Diet menus and nutritional requirements

c) **Off Premises Catering**
   i) Reasons for growth and development
   ii) Menu Planning and Theme Parties
   iii) Concept of a Central Production Unit
   iv) Problems associated with off-premises catering

d) **Mobile Catering**
   i) Characteristics of Rail, Airline (Flight Kitchens and Sea Catering), Branches of Mobile Catering

e) Quantity Purchase & Storage
   i) Introduction to purchasing
   ii) Purchasing system
   iii) Purchase specifications
   iv) Purchasing techniques
   v) Storage

Recommended Books

1. Quantity Food Production
2. Taste of India
3. Flavours of India
4. Heritage of India
5. Prashad
6. Cooking Delights of the Maharajas
7. Parvinder Bali, 'Food Production Operation'.

FOOD & BEVERAGE SERVICE-III

Subject Code: BHOM3-326 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

ALCOHOLIC BEVERAGES

Wines

a) Introduction & definition wines
b) Classification
   i) Table Wines
   ii) Sparkling Wines
   iii) Fortified Wines
   iv) Aromatized Wines
c) Structure & Parts of Grape
d) How to read a Wine label?
e) Terminology of wine
f) Types of soil suitable for wine production
g) Wine making steps of:
   i) Still/Table Wines
   ii) Sparkling Wines
h) Types and examples of fortified & aromatized wines.
i) Wine diseases

j) Wines in Detail – (France, Germany, Italy, Australia)
   i) Regions
   ii) Sub Regions (only of France)
   iii) Grape variety used for both Red & White wines
   iv) Wine Laws
   v) Brand names of Wines from each region & sub region
   vi) Brand names of:
      1. Spain,
      2. Portugal,
      3. South Africa
      4. India
      5. California
      6. U.S.A
      7. Chile
      8. New Zealand

k) Food and Wine Harmony
l) Wine Glasses and Equipment
m)Storage and Service of Wine

Beers

a) Introduction
b) Ingredients used
c) Production
d) Types and Brands, Indian and international
e) Service of bottled, canned and draught beers

Other Fermented and Brewed Beverages (In Brief)

a) Sake
b) Cider
c) Perry
d) Alcohol free wines

Recommended Books

1. Denis Lillicrap, 'Food & Beverage Service'.
2. Vijay Dhawan, 'Food & Beverage Service'.
3. Rao J. Suha, 'Food & Beverage Service'.

FRONT OFFICE-III

Subject Code: BHOM3-327 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Computer Application in Front Office Operation

a) Fidelio
b) Amadeus

Front office (Accounting)

a) Accounting fundamentals
b) Guest and non-guest accounts
c) Accounting system

(Non-automated, semi-automated and fully automated)

UNIT-II

Check out Procedures

a) Guest accounts settlement
b) Cash and credit
c) Indian currency and foreign currency
d) Transfer of guest accounts
e) Express check out

UNIT-III

Control of Cash and Credit Night Auditing

a) Functions
b) Audit procedures (Non automated, semi-automated and fully automated

UNIT-IV

Front office and guest safety and security

a) Importance of security systems
b) Safe deposit
c) Key control
d) Emergency situations (Accident, illness, theft, fire, bomb)

French

a) Expressions de politesse et les commander et Expressions d'encouragement
b) Basic conversation related to Front Office activities such as
   i) Reservations (personal and telephonic)
   ii) Reception (Doorman, Bell Boys, Receptionist etc.)
   iii) Cleaning of Room & change of Room etc.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual'.
2. Kasavana & Brooks, 'Managing Front Office Operations'.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry'.
5. Colin Dix & Chris Baird, 'Front Office Operations'.
6. Jatashankar R. Tewari, 'Hotel Front Office Operation and Management'.

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ACCOMMODATION OPERATION-I

Subject Code: BHOM3-328 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Laundry

a) Commercial and On-site Laundry
b) Flow process of Industrial Laundering-OPL
c) Stages in the Wash Cycle
d) Laundry Equipment and Machines
e) Layout of the Laundry
f) Laundry Agents
g) Dry Cleaning
h) Guest Laundry/Valet service

i) Stain removal

UNIT-II

Flower Arrangement

a) Flower arrangement in Hotels
b) Equipment and material required for flower arrangement
c) Conditioning of plant material
d) Styles of flower arrangements
e) Principles of design as applied to flower arrangement

Indoor Plants

a) Selection and care

UNIT-III

Routine Systems and Records of Housekeeping Department

a) Reporting Staff placement
b) Room Occupancy Report
c) Guest Room Inspection
d) Entering Checklists, Floor Register, Work Orders, Log Sheet.
e) Lost and Found Register and Enquiry File
f) Maid's Report and Housekeeper's Report
g) Handover Records
h) Guest's Special Requests Register
i) Record of Special Cleaning
j) Call Register
k) VIP Lists

UNIT-IV

Inter Departmental Relationship

a) With Front Office
b) With Maintenance
c) With Security
d) With Stores
e) With Accounts
f) With Personnel
g) Use of Computers in House Keeping department

Recommended Books

1. Sudhir Andrews, 'Hotel Housekeeping Training Manual'.
2. Grace Brigham, 'Housekeeping for Hotels, Hostels and Hospitals'.
3. Joan C Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELST.
4. Margaret Kappa & Aleta Nitschke, 'Managing Housekeeping Operations'.
5. Sudhir Andrews, 'Hotel House Keeping', Tata McGraw Hill.
6. Tucker Schneider, 'The Professional Housekeeper', VNR.
7. G. Raghubalan, 'Hotel House Keeping Operation & Management'.

FOOD & BEVERAGE CONTROLS

Subject Code: BHOM3-329 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

Food Cost Control

a) Introduction to Cost Control
b) Define Cost Control
c) The Objectives and Advantages of Cost Control
d) Basic costing
e) Food costing

UNIT-II

Food Control Cycle

a) Purchasing Control
b) Aims of Purchasing Policy
c) Job Description of Purchase Manager/Personnel
d) Types of Food Purchase
e) Quality Purchasing
f) Food Quality Factors for different commodities
g) Definition of Yield
h) Tests to arrive at standard yield
i) Definition of Standard Purchase Specification
j) Advantages of Standard Yield and Standard Purchase Specification
k) Purchasing Procedure
l) Different Methods of Food Purchasing
m) Sources of Supply
n) Purchasing by Contract
o) Periodical Purchasing
p) Open Market Purchasing
q) Standing Order Purchasing
r) Centralized Purchasing
s) Methods of Purchasing in Hotels
t) Purchase Order Forms
u) Ordering Cost
v) Carrying Cost
w) Economic Order Quantity
x) Practical Problems

Receiving Control

a) Aims of Receiving
b) Job Description of Receiving Clerk/Personnel
c) Equipment required for receiving
d) Documents by the Supplier (including format)
e) Delivery Notes
f) Bills/Invoices

g) Credit Notes
h) Statements
i) Records maintained in the Receiving Department
j) Goods Received Book
k) Daily Receiving Report
l) Meat Tags
m)Receiving Procedure
n) Blind Receiving
o) Assessing the performance and efficiency of receiving department
p) Frauds in the Receiving Department
q) Hygiene and cleanliness of area

UNIT-III

Storing & Issuing Control

a) Storing Control
b) Aims of Store Control
c) Job Description of Food Store Room Clerk/personnel
d) Storing Control
e) Conditions of facilities and equipment
f) Arrangements of Food
g) Location of Storage Facilities
h) Security
i) Stock Control
j) Two types of foods received – direct stores (Perishables/nonperishables)
k) Stock Records Maintained Bin Cards (Stock Record Cards/Books)
l) Issuing Control
m)Requisitions
n) Transfer Notes
o) Perpetual Inventory Method
p) Monthly Inventory/Stock Taking
q) Pricing of Commodities
r) Stock taking and comparison of actual physical inventory and Book
s) Value
t) Stock levels
u) Practical Problems
v) Hygiene & Cleanliness of area

UNIT-IV

Production Control

a) Aims and Objectives
b) Forecasting
c) Fixing of Standards
   i) Definition of standards (Quality & Quantity)
   ii) Standard Recipe (Definition, Objectives and various tests)
   iii) Standard Portion Size (Definition, Objectives and equipment used)
   iv) Standard Portion Cost (Objectives & Cost Cards)
d) Computation of staff meals

Sales Control

a) Sales – ways of expressing selling, determining sales price, Calculation of selling price, factors to be considered while fixing selling price
b) Matching costs with sales
c) Billing procedure – cash and credit sales
d) Cashier's Sales summary sheet

COMMUNICATION-III

Subject Code: BHOM3-330 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

Non-verbal Communication

a) Definition, its importance and its inevitability
b) **Kinesics:** Body movements, facial expression, posture, eye contact etc.
c) **Protemies:** The communication use of space
d) **Paralanguage:** Vocal behaviour and its impact on verbal communication
e) Communicative use of artifacts-furniture, plants, colours, architects etc.

Speech Improvement

a) Pronunciation, stress accent
b) Importance of speech in hotels
c) Common phonetic difficulties
d) Connective drill exercises
e) Introduction to frequently used foreign sounds

Using the Telephone

a) The nature of telephone activity in the hotel industry
b) The need for developing telephone skills
c) Developing telephone skills

FOOD PRODUCTION-III LAB.

Subject Code: BHOM3-331 **L T P C**
0 0 2 1

Regional Cuisine----Quantity Food Kitchen

a) Awadh
b) Bengal
c) Goa
d) Gujrat
e) Hyderabad
f) Kashmiri
g) Maharashtra
h) Punjabi
i) Rajasthan
j) South India (Tamil Nadu, Karnataka, Kerala)

FOOD & BEVERAGE SERVICE-III LAB.

Subject Code: BHOM3-332 **L T P C**
0 0 2 1

Service of Wines, Beer

Regional Cuisine – Practical

a) Menu Writing of Regional dishes
b) Table Laying of Regional dishes
c) Service of Regional dishes

FRONT OFFICE-III LAB.

Subject Code: BHOM3-333 **L T P C**
0 0 2 1

Suggested Tasks on Fidelio:

a) Hotel function keys
b) Create and update guest profiles
c) Make FIT reservation
d) Send confirmation letters
e) Printing registration cards
f) Make an Add-on reservation
g) Amend a reservation
h) Cancel a reservation-with deposit and without deposit
i) Log onto cashier code
j) Process a reservation deposit
k) Pre-register a guest
l) Put message and locator for a guest
m) Put trace for guest
n) Check in a reserved guest
o) Check in day use
p) Check –in a walk-in guest
q) Maintain guest history
r) Issue a new key
s) Verify a key
t) Cancel a key
u) Issue a duplicate key
v) Extend a key
w) Programme keys continuously
x) Re-programme keys
y) Programme one key for two rooms

Suggestive List of Tasks for Front Office Operation System

a) How to make a reservation?
b) How to create and update guest profiles?
c) How to update guest folio?
d) How to print guest folio?

e) How to make sharer reservation?
f) How to feed remarks in guest history?
g) How to add a sharer?
h) How to make add on reservation?
i) How to amend a reservation?
j) How to cancel a reservation?
k) How to make group reservation?
l) How to make a room change on the system?
m) How to log on cashier code?
n) How to close a bank at the end of each shift?
o) How to put a routing instruction?
p) How to process charges in?
q) How to process a guest check out?
r) How to check out a folio
s) How to process deposit for arriving guest?
t) How to process deposit for in house guest?
u) How to check room rate variance report?
v) How to process part settlements?
w) How to tally allowance for the day at night?
x) How to tally paid outs for the day at night?
y) How to tally fore?

ACCOMMODATION OPERATION-I LAB.

Subject Code: BHOM3-334 **L T P C**
0 0 2 1

1. Layout of Linen and Uniform Room/Laundry
2. Laundry Machinery and Equipment
3. Stain Removal
4. Flower Arrangement
5. Selection and Designing of Uniforms

GD & SEMINAR LAB.

Subject Code: BHOM3-335 **L T P C**
0 0 2 1

Each student is required to participate in the seminar and group discussions session. The topics of the seminars would be based on the theory subjects of the programme as well as condition of the market for the hospitality students as well as other problems related to travel and tourism operation. Forever at the time of examination each student would be given a topic of seminar and group discussion well in advance on the basis of seminar presentation and active participation in group discussion. Internal and external examiner will award marks separately and average marks will be finally awarded to each student.

FOOD PRODUCTION-IV

Subject Code: BHOM3-436 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

LARDER

1. LAYOUT & EQUIPMENT

a) Introduction of Larder Work
b) Definition
c) Equipment found in the larder
d) Layout of a typical larder with equipment and various sections

2. TERMS & LARDER CONTROL

a) Common terms used in the Larder and Larder control
b) Essentials of Larder Control
c) Importance of Larder Control
d) Devising Larder Control Systems
e) Leasing with other Departments
f) Yield Testing

3. DUTIES AND RESPONSIBILITIES OF THE LARDER CHEF

A. Functions of the Larder
B. Hierarchy of Larder Staff
C. Sections of the Larder
D. Duties & Responsibilities of larder Chef

UNIT-II

CHARCUTIERIE

1. SAUSAGE

a) Introduction to charcutierie
b) Sausage - Types & Varieties
c) Casings - Types & Varieties
d) Fillings - Types & Varieties
e) Additives & Preservatives

2. FORCEMEATS

a) Types of forcemeats
b) Preparation of forcemeats
c) Uses of forcemeats

3. BRINES, CURES & MARINADE

a) Types of Brines
b) Preparation of Brines
c) Methods of Curing
d) Types of Marinades
e) Uses of Marinades
f) Difference between Brines, Cures & Marinades

4. HAM, BACON & GAMMON

a) Cuts of Ham, Bacon & Gammon.
b) Differences between Ham, Bacon & Gammon

c) Processing of Ham & Bacon
d) Green Bacon
e) Uses of different cuts

5. GALANTINES

a) Making of galantines
b) Types of Galantine
c) Ballotines

6. PATES

a) Types of Pate
b) Pate de foie gras
c) Making of Pate
d) Commerical pate and Pate Maison
e) Truffle - sources, Cultivation and uses and Types of truffle

7. MOUSE & MOUSSELINE

a) Types of mousse
b) Preparation of mousse
c) Preparation of mousseline
d) Difference between mousse and mousseline

8. CHAUD FROID

a) Meaning of Chaud froid
b) Making of chaud frod & Precautions
c) Types of chaud froid
d) Uses of chaud froid

9. ASPIC & GELEE

a) Definition of Aspic and Gelee
b) Difference between the two
c) Making of Aspic and Gelee
d) Uses of Aspic and Gelee

10. QUENELLES, PARFAITS, ROULADES

a) Preparation of Quenelles, Parfaits and Roulades

11. NON EDIBLE DISPLAYS

a) Ice carvings
b) Tallow sculpture
c) Fruit & vegetable Displays
d) Salt dough
e) Pastillage
f) Jelly Logo
g) Thermacol work

UNIT-III

APPETIZERS & GARNISHES

a) Classification of Appetizers B. Examples of Appetizers
b) Historic importance of culinary Garnishes D. Explanation of different Garnishes

UNIT-IV

SANDWICHES

a) Parts of Sandwiches B. Types of Bread
b) Types of filling - classification D. Spreads and Garnishes

c) Types of Sandwiches
d) Making of Sandwiches
e) Storing of Sandwiches

Recommended Books

1. Quantity Food Production
2. Taste of India
3. Flavours of India
4. Heritage of India
5. Prashad
6. Cooking Delights of the Maharajas
7. Parvinder Bali, 'Food Production Operation'.

FOOD & BEVERAGE SERVICE-IV

Subject Code: BHOM3-437 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

SPIRITS

a) Introduction & definition
b) Production of spirit
c) Pot still method
d) Patent still method
e) Types and production of spirits
   i) Whiskey
   ii) Rum
   iii) Gin
   iv) Brandy
   v) Vodka
   vi) Tequila
(f) Different proof spirits
   i) Proof scales
   ii) American proof
   iii) Gay-Lussac
(g) Service of spirits

UNIT-II

Aperitifs

a) Introduction and definition Different types of aperitifs.

Liqueurs

a) Definition, classification & History
b) Production of Liqueurs.
c) Name of Liqueurs and country of origin & predominant flavour
d) Service of liqueurs.

Cocktails

a) Definition & Classification
b) Cocktail bar equipment
c) Preparation & service of cocktails/mock tails

Service of Special Coffee

UNIT-III

GUERIDON SERVICE

a) History of gueridon
b) Definition
c) General consideration of operations
d) Advantages, Disadvantages
e) Types of trolleys
f) Factor to create impulse, Buying - Trolley, open kitchen
g) Gueridon equipment
h) Gueridon ingredients

UNIT-IV

BAR OPERATIONS

a) Types of Bar, Cocktail, Dispense B. Area of Bar
b) Front Bar D. Back Bar
c) E. Under Bar (Speed Rack, Garnish Container, Ice well etc.)
d) F. Bar Stock G. Bar Control
e) H. Bar Staffing I. Opening and closing duties

Recommended Books

1. Denis Lillicrap, 'Food & Beverage Service'.
2. Vijay Dhawan, 'Food & Beverage Service'.
3. Rao J. Suhas, 'Food & Beverage Service'.

FRONT OFFICE-IV

Subject Code: BHOM3-438 **L T P C** **3 0 0 3** **Duration: 37 Hrs.**

PLANNING & EVALUATING FRONT OFFICE OPERATIONS

a) Forecasting techniques
b) Forecasting Room availability
c) Useful forecasting data
   i) % of walking
   ii) % of overstaying
   iii) % of under stay
d) Forecast formula
e) Sample forecast forms

BUDGETING

a) Making of front office budget B. Factors affecting budget planning
b) Capital operation budget for front office D. Refining budgets
c) E. Forecasting room revenue Customer Relationship

FRENCH

Conversation with guests, providing information to guest about the hotel, city, sight-seeing, car rentals, historical places, banks, airlines, travel agents, shopping centers and worship places etc. Departure (Cashier, Bills Section and Bell Desk)

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual'.

2. Kasavana & Brooks, 'Managing Front Office Operations'.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry'.
5. Colin Dix & Chris Baird, 'Front Office Operations'.
6. Jatashankar R. Tewari, 'Hotel Front Office Operation and Management'.

ACCOMMODATION OPERATION-II

Subject Code: BHOM3-439 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

PLANNING AND ORGANISING THE HOUSE KEEPING DEPARTMENT

a) Area inventory list
b) Frequency schedules
c) Performance and Productivity standards
d) Time and Motion study in House Keeping operations
e) Standard Operating manuals - Job procedures
f) Job allocation and work schedules
g) Calculating staff strengths & Planning duty rosters, teamwork and leadership in House Keeping
h) Training in HKD, devising training programmes for HK staff
i) Inventory level for non recycled items
j) Budget and budgetary controls
k) The budget process
l) Planning capital budget
m) Planning operation budget
n) Operating budget - controlling expenses - income statement
o) Purchasing systems - methods of buying
p) Stock records - issuing and control

HOUSEKEEPING IN INSTITUTIONS & FACILITIES OTHER THAN HOTELS

CONTRACT SERVICES

a) Types of contract services
b) Guidelines for hiring contract services
c) Advantages & disadvantages of contract services SAFETY AND SECURITY
d) Safety awareness and accident prevention
e) Fire safety and fire fighting
f) Crime prevention and dealing with emergency situation

ENERGY AND WATER CONSERVATION IN HOUSEKEEPING OPERATIONS

RECOMMENDED BOOKS

1. Sudhir Andrews, 'Hotel Housekeeping Training Manual'.
2. Grace Brigham, 'Housekeeping for Hotels, Hostels and Hospitals'.
3. Joan C Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELST.
4. Margaret Kappa & Aleta Nitschke, 'Managing Housekeeping Operations'.
5. Sudhir Andrews, 'Hotel House Keeping', Tata McGraw Hill.
6. Tucker Schneider, 'The Professional Housekeeper', VNR.
7. G. Raghubalan, 'Hotel House Keeping Operation & Management'.

FACILITY PLANNING

Subject Code: BHOM3-440 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

HOTEL DESIGN

a) Design Consideration
b) Attractive Appearance
c) Efficient Plan
d) Good location
e) Suitable material
f) Good workmanship
g) Sound financing
h) Competent Management

UNIT-II

FACILITIES PLANNING

The systematic layout planning pattern (SLP)

Planning Consideration

a) Flow process & Flow diagram
b) Procedure for determining space considering the guiding factors for guest room/ public facilities, support facilities & services, hotel administration, internal roads/budget hotel/5 star hotel.

Architectural Consideration

a) Difference between carpet area plinth area and super built area, their relationships, reading of blue print (plumbing, electrical, AC, ventilation, FSI, FAR, public Areas)
b) Approximate cost of construction estimation
c) Approximate operating areas in budget type/5-star type hotel approximate other operating areas per guest room
d) Approximate requirement and Estimation of water/electrical load gas, ventilation.

UNIT-III

STAR CLASSIFICATION OF HOTEL

Criteria for star classification of hotel (Five, four, three, two, one & heritage)

KITCHEN

a) Equipment requirement for commercial kitchen Heating - gas/electrical Cooling (for various catering establishment)
b) Developing Specification for various Kitchen equipment
c) Planning of various support services (pot wash, wet grinding, chef room, larder, store & other staff facilities)

UNIT-IV

KITCHEN LAY OUT & DESIGN

Principles of kitchen layout and design

a) Areas of the various kitchens with recommended dimension
b) Factors that affect kitchen design
c) Placement of equipment
d) Flow of work

e) Space allocation
f) Kitchen equipment, manufacturers and selection
g) Layout of commercial kitchen (types, drawing a layout of Commercial kitchen)
h) Budgeting for kitchen equipment

PRINCIPLES OF MANAGEMENT-I

Subject Code: BHOM3-441 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

INTRODUCTION TO MAMANGEMENT
a) Meaning, definition and concept
b) Characteristics of Management
c) Importance of Management

UNIT-II

MANAGEMENT-A SCIENCE OR AN ART
a) Management as profession
b) Management Styles

MANAGEMENT PROCESSES AND SKILLS
a) Managerial Roles
b) Managerial skills
c) Functions of Management
d) Levels of Management

UNIT-III

EVOLUTION OF MANAGEMENT
Management Theories: Scientific Management, Administrative Management
Human Relations Movement
a) Behavioral Approach
b) Quantitative Approach
c) Systems Approach
d) Contingency Approach

UNIT-IV

PLANNING
a) Nature and Purpose
b) Planning premises
c) Types of Plans

DECISION MAKING
a) Meaning and definition
b) Types of decisions
c) Decision making process

FOOD PRODUCTION-IV LAB.

Subject Code: BHOM3-442 **L T P C**
0 0 2 1

Three course menus to be formulated featuring International Cuisines

1. FRENCH

2. ORIENTAL

a) Chinese
b) Thai

SUGGESTED MENUS FRENCH

MENU 01

Consommé Carmen Poulet Sauté Chasseur Pommes Loretta Haricots Verts
Salade de Betterave Brioche
Baba au Rhum

MENU 02

Bisque D'écrevisse Escalope De Veau viennoise Pommes Batailles
Courge Provencale Epinards au Gratin

MENU 03

Crème Du Barry
Darne De Saumon Grille Sauce paloise
Pommes Fondant
Petits Pois A La Flamande French Bread
Tarte Tartin

MENU 04

Veloute Dame Blanche
Cote De Porc Charcuterie Pommes De Terre A La Crème Carottes Glace Au Gingembre Salade Verte
Harlequin Bread Chocolate Cream Puffs

MENU 05

Cabbage Chowder Poulet A La Rex Pommes Marguises Ratatouille
Salade De Carottées Et Céleris Clover Leaf Bread
Savarin Des Fruits

MENU 06

Barquettes Assortis Stroganoff De Boeuf Pommes Persilles Salade De Chou-Cru Garlic Rolls
Crêpe Suzette

MENU 07

Duchesse Nantua Poulet Maryland Croquette Potatoes Salade Niçoise Brown Bread
Pâte Des Pommes

MENU 08

Kromeskies
Filet De Sols Walweska Pommes Lyonnaise Funghi Marirati
Bread Sticks Souffle Milanaise

MENU 09

Vol-Au-Vent De Volaille Et Jambon Homard Thermidor
Salade Waldorf Vienna Rolls Mousse Au Chocolat

MENU 10
Crabe En Coquille Quiche Lorraine Salade de Viande Pommes Parisienne Foccacia
Crème Brûlée
SUGGESTED MENUS CHINESE
MENU 01
Prawn Ball Soup Fried Wantons Sweet & Sour Pork Hakka Noodles
MENU 02
Hot & Sour soup Beans Sichwan
Stir Fried Chicken & Peppers Chinese Fried Rice
MENU 03
Sweet Corn Soup Shao Mai
Tung-Po Mutton Yangchow Fried Rice
MENU 04
Wanton Soup Spring Rolls
Stir Fried Beef & Celery Chow Mein
MENU 05
Prawns in Garlic Sauce Fish Szechwan
Hot & Sour Cabbage Steamed Noodles

FOOD & BEVERAGE SERVICE-IV LAB.

Subject Code: BHOM3-443 **L T P C**
0 0 2 1

SERVICE OF SPIRITS
a) WHISKY
b) BRANDY
c) GIN
d) VODKA
e) TEQUILA
f) RUM
SERVICE OF
a) APERTIFS
b) LIQUEURS
MAKING & SERVICE OF COMMON COCKTAILS PREPARING ITEMS ON GUERIDON TROLLEY
Crêpe Suzette Banana au Rhum Peach Flambé Rum Omlette Steak Diane Pepper Steak

FRONT OFFICE-IV LAB.

Subject Code: BHOM3-444 **L T P C**
0 0 2 1

Hands on practice of computer application (Hotel Management System) related to front office procedures such as (night audit, income audit,

SUGGESTIVE LIST OF TASKS FOR FRONT OFFICE OPERATION SYSTEM

S.N. Topic

1. HMS Training - Hot Function keys
2. How to put message
3. How to put a locator?
4. How to check in a first time guest
5. How to check in an existing reservation
6. How to check in a day use
7. How to issue a new key?
8. How to verify key?
9. How to cancel a key?
10. How to issue a duplicate key?
11. How to extend a key?
12. How to print and prepare registration cards for arrivals
13. How to programme keys continuously
14. How to programme one key for two rooms
15. How to re-programme a key
16. How to make a reservation?
17. How to create and update guest profiles
18. How to update guest folio?
19. How to print guest folio?
20. How to make sharer reservation?
21. How to feed remarks in guest history?
22. How to add a sharer?
23. How to make add on reservation
24. How to amend a reservation?
25. How to cancel a reservation?
26. How to make group reservation?
27. How to make a room change on the system?

ACCOMMODATION OPERATION-2 LAB.

Subject Code: BHOM3-445 **L T P C**
0 0 2 1

a) First Aid
   i) First aid kit
   ii) Dealing with emergency situation 02 Special Decorations
b) Layout of a guest room 04 Team cleaning
c) Devising training modules/standard operating procedures/inspection check lists

COMPUTER & MIS LAB.

Subject Code: BHOM3-446 **L T P C**
0 0 2 1

Fox Pro 2.6
Introduction, working with data: creating modifying and deleting Sorting, Indexing and Expressions,
Rushmore technology Working with multiple database file, Using the view Window, Generating reports and labels Relational Query by examples.

MS OFFICE 2007/MS-POWER POINT

a) Making a simple presentation
b) Using Auto Content Wizards and Templates
c) Power Points five views
d) Slides
   i) Creating Slides, re-arranging, modifying
   ii) Inserting pictures, objects
   iii) Setting up a Slide Show
e) E Creating an Organizational Chart

FOOD PRODUCTION-V

Subject Code: BHOM3-547 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

UNIT-I

INTERNATIONAL CUISINE

a) Geographic location B. Historical background
b) Staple food with regional Influences
c) Specialties
d) Recipes
e) Equipment in relation to: Great Britain, France, Italy, Spain & Portugal, Scandinavia, Germany, Middle East, Oriental, Mexican, Arabic.

UNIT-II

CHINESE

a) Introduction to Chinese foods
b) Historical background
c) Regional cooking styles
d) Methods of cooking
e) Equipment & utensils

UNIT-III

BAKERY & CONFECTIONERY

I. ICINGS & TOPPINGS

a) Varieties of icings
b) Using of Icings
c) Difference between icings & Toppings
d) Recipes

II. FROZEN DESSERTS

a) Types and classification of frozen desserts
b) Ice-creams - Definitions
c) Methods of preparation
d) Additives and preservatives used in Ice-cream manufacture

III. MERINGUES

a) Making of Meringues
b) Factors affecting the stability
c) Cooking Meringues
d) Types of Meringues
e) Uses of Meringues

IV. BREAD MAKING

a) Role of ingredients in bread Making
b) Bread Faults
c) Bread Improvers

V. CHOCOLATE

a) History
b) Sources
c) Manufacture & Processing of Chocolate
d) Types of chocolate
e) Tempering of chocolate
f) Cocoa butter, white chocolate and its applications

UNIT-IV

PRODUCTION MANAGEMENT

a) Kitchen Organization
b) Allocation of Work-Job Description, Duty Rosters
c) Production Planning
d) Production Scheduling
e) Production Quality & Quantity Control
f) Forecasting Budgeting
g) Yield Management

PRODUCT & RESEARCH DEVELOPMENT

a) Testing new equipment,
b) Developing new recipes
c) Food Trails
d) Organoleptic & Sensory Evaluation

FRENCH

a) Culinary French
b) Classical recipes (recettes classique)
c) Historical Background of Classical Garnishes
d) Offals/Game
e) Larder terminology and vocabulary

Note: Should be taught along with the relevant topics

FOOD & BEVERAGE SERVICE-V

Subject Code: BHOM3-548 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

PLANNING & OPERATING VARIOUS F&B OUTLET

a) Physical layout of functional and ancillary areas
b) Objective of a good layout
c) Steps in planning
d) Factors to be considered while planning
e) Calculating space requirement
f) Various set ups for seating
g) Planning staff requirement
h) Menu planning
i) Constraints of menu planning
j) Selecting and planning of heavy duty and light equipment
k) Requirement of quantities of equipment required like crockery, Glassware, steel or silver etc.
l) Suppliers & manufacturers
m) Approximate cost
n) Planning Décor, furnishing fixture etc.

F & B STAFF ORGANISATION

a) Categories of staff
b) Hierarchy
c) Job description and specification
d) Duty roaster

MANAGING F&B OUTLET

a) Supervisory skills
b) Developing efficiency
c) Standard Operating Procedure

FUNCTION CATERING

1. BANQUETS

a) History
b) Types
c) Organization of Banquet Department
d) Duties & responsibilities
e) Sales
f) Booking procedure
g) Banquet menus

2. BANQUET PROTOCOL

a) Space Area Requirement
b) Table plans/arrangement
c) Misc-en-place
d) Service
e) Toasting

3. INFORMAL BANQUET

a) Reception

b) Cocktail parties
c) Convention
d) Seminar
e) Exhibition
f) Fashion shows
g) Trade Fair
h) Wedding
i) Outdoor catering

FUNCTION CATERING BUFFETS

a) Introduction
b) Factors to plan buffets
c) Area requirement
d) Planning and organization
e) Sequence of food
f) Menu planning
g) Types of Buffet
h) Display
i) Sit down
j) Fork, Finger, Cold Buffet
k) Breakfast Buffets
l) Equipment
m) Supplies
n) Check list

FRONT OFFICE-V

Subject Code: BHOM3-549 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

YIELD MANAGEMENT

a) Concept and importance
b) Applicability to rooms division
c) Capacity management
d) Discount allocation
e) Duration control
f) Measurement yield
g) Potential high and low demand tactics
h) Yield management software
i) Yield management team

ACCOMODATION OPERATION-III

Subject Code: BHOM3-550 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

INTERIOR DECORATION

a) Elements of design
b) Colour and its role in décor -types of colour schemes

c) Windows and window treatment
d) Lighting and lighting fixtures
e) Floor finishes
f) Carpets
g) Furniture and fittings
h) Accessories

LAYOUT OF GUEST ROOMS

a) Sizes of rooms, sizes of furniture, furniture arrangement
b) Principles of design
c) Refurbishing and redecoration

NEW PROPERTY COUNTDOWN

HUMAN RESORCE MANAGEMENT

Subject Code: BHOM3-551 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

Introduction to Human Resource Management-
Definitions, Functions of Personnel Management, Objectives of Personnel Management, Qualities of a Good Personnel Manager

Human Resource/Man Power Planning
Definitions, Need of Manpower Planning, Objectives of Hr Planning, Advantages Disadvantages of Manpower Planning, Process/Steps.

UNIT-II

Recruitment
Definition, Sources of Recruitment, Internal Sources of Recruitment & (Advantages, Disadvantages), External Sources (Advantages, Disadvantages)

Selection
Definition, Steps in Selection Process (Application Blank, Initial Interview of the Candidates, Employment Tests, Interviews, Checking Reference, Physical or Medical Examination, Final Interview & Induction)

UNIT-III

Training and Development
Training Definition, Importance of Training, The Training Process, Training Methods
(On The Job- Job Instruction Training, Job Rotation, Special Assignments)
Off The Job (Vestibule Training, Lecture Method, Conference Method, Seminar or Team Discussion, Case Study Method
Development-Definition, Need, Methods
-On The Job
-Off The Job

Performance Appraisal
Definition, Objectives, Process, Methods-
-Past Oriented
-Future Oriented

UNIT-IV

Job Evaluation-
Definition, Objectives, Principles, Methods-Non Analytical, Analytical
Employee Remuneration-
Definition, Components, Factors Influencing Employee Remuneration, Concept of Wages

PRINCIPLES OF MANAGEMENT-II

Subject Code: BHOM3-552 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

FUNDAMENTAL OF ORGANISING
a) Concept of organization and organizing
b) Concept of organization structure
c) Forms of organization structure
DEPARTMENTATION
a) Bases of departmentation
b) choice of bases of departmentation

UNIT-II

SPAN OF MANAGEMENT
DELEGATION OF AUTHORITY
Blocks to effective delegation
Measures for effective delegation
Centralization and Decentralization

UNIT-III

COMMUNICATION
a) Communication concept
b) communication symbols
c) oral, written and non-verbal
d) communication network
e) formal, informal, rumour and computer based communication
f) Barriers to communication
g) Communication process
h) How to make communication effective?
STAFFING
a) Concept of staffing
b) Factors affecting staffing
c) Manpower Planning
d) Manpower Planning process

UNIT-IV

COORDINATION
a) Co-ordination: Meaning, definition
b) Types of coordination
c) Techniques of effective co-ordination
CONTROL
a) Control: Definition

b) Steps in controlling
c) Types of control
d) Control Areas
e) Control techniques

HOTEL ACCOUNTANCY

Subject Code: BHOM3-553 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

TRIAL BALANCE
a) Meaning
b) Methods
c) Advantages
d) Limitations
e) Practicals

FINAL ACCOUNTS
a) Meaning
b) Procedure for preparation of Final Accounts
c) Difference between Trading Accounts, Profit & Loss Accounts and
d) Balance Sheet
e) Adjustments (Only four)
f) Closing Stock
g) Pre-paid Expenses
h) Outstanding Expenses
i) Depreciation

UNIT-II

UNIFORM SYSTEM OF ACCOUNTS FOR HOTELS
a) Introduction to Uniform system of accounts
b) Contents of the Income Statement C:\WINDOWS\hinhem.scr
c) Practical Problems
d) Contents of the Balance Sheet (under uniform system)
e) Practical problems
f) Departmental Income Statements and Expense statements (Schedules 1to 16)
g) Practical problems

UNIT-III

INTERNAL CONTROL
a) Definition and objectives of Internal Control
b) Characteristics of Internal Control
c) Implementation and Review of Internal Control

INTERNAL AUDIT AND STATUTORY AUDIT
a) An introduction to Internal and Statutory Audit
b) Distinction between Internal Audit and Statutory Audit
c) Implementation and Review of internal audit

UNIT-IV

DEPARTMENTAL ACCOUNTING

a) An introduction to departmental accounting
b) Allocation and apportionment of expenses
c) Advantages of allocation
d) Draw-backs of allocation
e) Basis of allocation
f) Practical problems

F&B MANAGEMENT

Subject Code: BHOM3-554 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

UNIT-I

COST DYNAMICS

a) Elements of Cost
b) Classification of Cost

SALES CONCEPTS

a) Various Sales Concept
b) Uses of Sales Concept

INVENTORY CONTROL

a) Importance
b) Objective
c) Method
d) Levels and Technique
e) Perpetual Inventory
f) Monthly Inventory
g) Pricing of Commodities
h) Comparison of Physical and Perpetual Inventory

UNIT-II

BEVERAGE CONTROL

a) Purchasing
b) Receiving
c) Storing
d) Issuing
e) Production Control
f) Standard Recipe
g) Standard Portion Size
h) Bar Frauds
i) Books maintained
j) Beverage Control

SALES CONTROL

a) Procedure of Cash Control
b) Machine System
c) ECR
d) NCR

e) Preset Machines
f) POS
g) Reports
h) Thefts
i) Cash Handling

UNIT-III

BUDGETARY CONTROL

a) Define Budget
b) Define Budgetary Control
c) Objectives
d) Frame Work
e) Key Factors
f) Types of Budget
g) Budgetary Control

VARIANCE ANALYSIS

a) Standard Cost
b) Standard Costing
c) Cost Variances
d) Material Variances
e) Labor Variances
f) Overhead Variance
g) Fixed Overhead Variance
h) Sales Variance
i) Profit Variance

BREAKEVEN ANALYSIS

a) Breakeven Chart
b) P V Ratio
c) Contribution
d) Marginal Cost
e) Graphs

UNIT-IV

MENU MERCHANDISING

a) Menu Control
b) Menu Structure
c) Planning
d) Pricing of Menus
e) Types of Menus
f) Menu as Marketing Tool
g) Layout
h) Constraints of Menu Planning

MENU ENGINEERING

a) Definition and Objectives
b) Methods
c) Advantages

MIS

a) Reports

b) Calculation of actual cost
c) Daily Food Cost
d) Monthly Food Cost
e) Statistical Revenue Reports
f) Cumulative and non-cumulative

FOOD PRODUCTION-V LAB.

Subject Code: BHOM3-555 **L T P C**
0 0 2 1

Three course menus to be formulated featuring International Cuisines

INTERNATIONAL

a) SPAIN
i) Gazpacho
ii) Pollo En Pepitoria
iii) Paella
iv) Fritata De Patata
v) Pastel De Mazaana

b) ITALY
i) Minestrone
ii) Ravioli Arabeata
iii) Fettocine Carbonara
iv) Pollo Alla Cacciatore
v) Medanzane Parmigiane
vi) Grissini
vii) Tiramisu

c) GERMANY
i) Linsensuppe
ii) Sauerbaaten
iii) Spatzale
iv) German Potato Salad
v) Pumpernicklr
vi) Apfel Strudel

d) U.K.
i) Scotch Broth
ii) Roast Beef
iii) Yorkshire Pudding
iv) Glazed Carrots & Turnips
v) Roast Potato
vi) Yorkshire Curd Tart
vii) Crusty Bread

e) GREECE
i) Soupe Avogolemeno
ii) Moussaka A La Greque
iii) Dolmas
iv) Tzaziki

v) Baklava
vi) Harlequin Bread

BAKERY-III LAB.

Subject Code: BHOM3-556 **L T P C**
0 0 2 1

DEMONSTRATION OF

a) Charcuterie
b) Galantines
c) Pate
d) Terrines
e) Mousselines
f) Decorated Cakes
g) Gateaux
h) International Breads
i) Sorbets, Parfaits
j) Hot/Cold Desserts

FOOD & BEVERAGE SERVICE-V LAB.

Subject Code: BHOM3-557 **L T P C**
0 0 2 1

a) Making of Duty Roster and writing job description & specification
b) Supervising F&B outlets
c) Calculation of Space for Banquets, Banquet Menu & Service.

ACCOMODATION OPERATION-III LAB.

Subject Code: BHOM3-558 **L T P C**
0 0 2 1

a) Team cleaning
b) Devising training modules/standard operating procedures/inspection check lists

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C**
0 0 2 1

Course Objectives
The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes
At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

SOFT SKILLS-II

Subject Code: **BHUM0-F92** **L T P C**
0 0 2 1

Course Objectives
The course aims to address various challenges of communication as well as behavioural skills faced by individual at work place and organisations. Also, it aims to enhance the employability of the students.

Course Outcomes
At the end of the course the student will be able to understand the importance of goal setting. They will also be able to handle stress in their lives and future in a better way.

UNIT-1

DEVELOPING POSITIVE ATTITUDE- Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.
IMPROVING PERCEPTION- Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

CAREER PLANNING-Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

ART OF READING-Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

STRESS MANAGEMENT - Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C**
0 0 2 1

Course Objectives
The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organisations.

Course Outcomes
At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, ‘Business Correspondence and Report Writing’, TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, ‘Creative English for Communication’, Macmillan.
4. Penrose, John M., et al., ‘Business Communication for Managers’, Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, ‘Corporate Conversations’, PHI, New Delhi, **2007**.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C**
0 0 2 1

Course Objectives

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organisation.

Course Outcomes

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

UG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

UG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
BFOT0-F91	Plant Utilities & Control	B.Tech. Food Technology
BBAD0-F91	Fundamentals of Management	BBA
BBAD0-F92	Personnel & Industrial Management	
BBAD0-F93	Corporate Governance & Ethics	
BECE0-F91	Optical Communication	B.Tech. Electronics & Comm. Engg., B.Tech. Electronics & Telecomm. Engg., B.Tech. Electronics & Instrumentation Engg.
BECE0-F92	Cellular and Mobile Communication	
BECE0-F93	Biomedical Electronics and Instrumentation	
BEEE0-F91	Power Plant Engineering	EEE
BEEE0-F92	Analog & Digital Circuit Analysis	
BEEE0-F93	Digital Signal Processing	
BMEE0-F91	Industrial Safety and Environment	B.Tech. Mechanical Engg.
BCIE0-F91	Environmental Pollution	B.Tech. Civil Engg.
BCIE0-F92	Traffic Engineering	

PLANT UTILITIES & CONTROL

Subject Code: BFOT0-F91 **L T P C** **Duration: 40 Hrs**
3 0 0 3

UNIT-I

Properties of Steam: Introduction – steam formation – Thermodynamic properties of steam – Sensible heat, latent heat, dryness fraction, wet fraction – superheated steam – steam table, expansion of steam

Steam Generators: Introduction, Classification & Boilers, Water tube, Fire tube type, Vertical tabular boilers, types of fire and water tube boilers, boiler mounting & accessories, Performance of steam generator, Evaporation rate. Performance, boiler efficiency, Factors influencing Boiler efficiency problems.

UNIT-II

Fuels & Combustion: Introduction, solid, liquid & gaseous fuel, Calorific value of fuel, flue gases per kg. of fuel, Minimum Air required per kg. of fuel, Excess Air Problems.

Condensers The function of a condenser in a Steam Power Plant, Vacuum, Classification, Comparison of Jet & Surface Condensers, Advantages/Disadvantages Mass of Circulating Water required in a condenser, Air Removal.

Fitting, Safety & Maintenance: Selection of size of steam pipes – layout of pipe lines – Energy audit of steam boilers – economy of heat utilization – boiler codes – Indian boiler regulation act – safety in steam plant maintenance

UNIT-III

Gears: Introduction, Classification of Gears, Parallel Shafts, Spur Gears Spur Rack & Pinion, Helical Gears, Intersecting Shafts, Straight Bevel Gears, Spiral Bevel Gears, Skew Shafts, Crossed Helical Gears, Worm Gear, Hypoid Gears, Gear Terminology, Pitch Circle, Pitch dia, Pitch, Circular Pitch.

UNIT-IV

Lubrication: Introduction, Physical & Chemical Test of Lubricants, Methods of Applying Lubrication, Hand oiling, drop feed cup, ring type of lubrication etc.

Corrosion Corrosion & its control, General Corrosion, Localized Corrosion, Pitting Corrosion etc. Factors influencing Corrosion, Combating Corrosion, Selection of material.

Recommended Books

1. Antonio López-Gómez Gustavo V. Barbosa-Cánovas, 'Food Plant Design', CRC Press, Boca Raton, **2005**.
2. C.P. Mallet, 'Frozen Food Technology', Blackie Academic & Professional an imprint of Chapman & Hall, **1993**.
3. J. Lal & Prof. J.M. Shah, 'Theory of Machine', Publishers Metropolitan Book & Co. Pvt. Ltd, Delhi-6.
4. S.S. Rattan, 'Theory of Machine', Tata McGraw Hill Publishing Co. Ltd, New Delhi, **2009**.
5. P.L. Ballaney, 'Thermal Engineering', Khanna Publishers, New Delhi, **1995**.

FUNDAMENTALS OF MANAGEMENT

Subject Code: BBAD0-F91 **L T P C** **Duration: 40 Hrs**
3 0 0 3

Learning Objectives: This course aims to provide a thorough and systematic coverage of management theory and practice. The course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management. It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals.

UNIT-I (10 Hrs)

Introduction to Management: Definition, Nature, Significance and Scope. Functions of Manager, An Overview of Management Functions. Is managing a science or art? Evolution of Management Thought: Classical Approach, Scientific Management

UNIT-II (10 Hrs)

Planning and Decision Making: Types of Plans and Process of Planning, Nature of Objectives, Setting Objectives. Importance and Steps in Decision Making, Types of Decision and Decision Making Under Different Conditions. Group Decision Making. Decision Making Styles

Organizing: Nature and Significance, Process of Organizing, Bases of Departmentation, Delegation and Decentralization, Line & Staff relationship

UNIT-III (10 Hrs)

Delegation: Concept and Elements. Authority, Responsibility, Accountability

Coordination: Concept and Importance, Factors which Make Coordination Difficult, Techniques or Methods to Ensure Effective Coordination.

UNIT-IV (10 Hrs)

Control: Concept, Planning-Control Relationship, Process of Control, Traditional & Modern Techniques of Control

Management by Objectives: Concept, Benefits and Weaknesses

Course Outcomes: After completing the course student will be able to understand and explain the concept of management and its managerial perspective. It will equip students to map complex managerial aspect arise due to ground realities of an organization. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

Recommended Books

1. Heinz Weihrich, Cannice & Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Weihrich, 'Essentials of Management: An international Perspective', Tata McGraw Hill.
3. Stephen Robbins & Mary coulter, 'Management', Pearson Education.
4. VSP Rao & VH Krishna, 'Managemen't', Excel Books.
5. P. Subba Rao, 'Principles of Management', Himalaya Publishing.

PERSONNEL & INDUSTRIAL MANAGEMENT

Subject Code: BBAD0-F92 **L T P C** **Duration: 45 Hrs**
3 0 0 3

Course Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

UNIT-I (10 Hrs)

Human Resources Management: Meaning, Scope, Objective, Functions, Roles and Importance. Interaction with other functional areas. HRM & HRD a comparative analysis, Human Resource Planning: Meaning, Process & Methods of Human Resources Planning, Job Analysis: Job Description, Job Specification.

UNIT-II (10 Hrs)

Recruitment & Selection: Concept, Process & Methods. Concept of Induction & Placement, Training & Development: Concept & Methods, Difference Between Training & Development, Internal Mobility: Promotion, Transfer, Demotion, Separation.

UNIT-III (10 Hrs)

Performance Appraisal: Concept, methods & Process. Compensation Management- Wage & Salary Administration, Elements & Methods of Wage & Salary, Incentive Plans & Fringe Benefits

UNIT IV (10 Hrs)

Industrial Relations: Meaning and importance. Collective Bargaining, Participative Management, Employee Grievances and their Resolution, Quality Circles.

Course Outcome: After completing this course the students should be able to understand the concepts, principles and processes of HRM, understand the crucial role that HRM plays in helping organizations all over the world adapt to the endless change today.

Recommended Books

1. Edwin B. Flippo, 'Personal Management', Tata McGraw Hill.
2. Bohlander, Snell &Vohra, 'Human Resource Management', Cengage Learning.
3. Gary Dessler, Human Resource Management, McMillan.
4. V.S.P. Rao, 'Human Resource Management', Excel Books.
5. C.B. Mamoria, 'Personal Management', Himalaya Publications.
6. T.N. Chabbra, 'Human Resource Management', Dhanpat Rai & Sons.
7. C.B. Gupta, 'Human Resource Management', Sultan Chand and Sons.
8. R.S. Dwivedi, 'HRD in India Companies', Himalaya Publications.

CORPORATE GOVERNANCE & ETHICS

Subject Code: BBAD0- F93 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

UNIT-I (10 Hrs.)

Introduction to Ethics and Values and their importance in business: Ethical issues in Capitalism and Market System, Ethical and Social System. The Social Responsibility of Business, Ethical Conflict, Whistle Blowing.

UNIT-II (10 Hrs.)

Ethics and Organization, Ethics in Human Resource Management and Organizational Culture, Ethics in Marketing, Ethics in Finance, Ethical Codes and Incentives in Corporate Sector.

UNIT-III (10 Hrs)

Broader Ethical issues in Society – Corruption, Ecological Concern, Discrimination on the Basis of Gender, Caste or Race, Ethics and Information Technology.

UNIT-IV (10 Hrs)

Impact of Group Policies and Laws of Ethics, Resolving Ethical dilemma.

Corporate Governance: Issues, Need, Transparency & Disclosure, Role of Auditors, Board of Directors and Shareholders, Corporate Social Responsibility.

Recommended Books

1. R.C. Shekhar, 'Ethical Choices in Business', Response Book, New Delhi.
2. S.C. Chakraborty, 'Managerial Transformation by Value', Sage Publications, New Delhi, **1993.**
3. Ananta K. Giri, 'Values, Ethics and Business: Challenges for Education and Management', Rawat Publication, Jaipur.

OPTICAL COMMUNICATION

Subject Code: BECE0-F91 **L T P C** **Duration: 38 Hrs.**

3 0 0 3

Learning Objectives

1. To facilitate the knowledge about optical fiber sources and transmission techniques
2. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical
3. CDMA.
4. To explore the trends of optical fiber measurement systems.

Learning Outcomes:

Upon completion of the Course, students will be able to:

1. Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
2. Explain the various optical sources and optical detectors and their use in the optical communication system.
3. Analyze the digital transmission and its associated parameters on system performance.

UNIT-I

Overview: The Electromagnetic Spectrum, Properties of Light, Dual Nature of Light Concept of a photon, Wave Model, Characteristics of light waves. Concepts of information, general communication systems, evolution of Basic fiber Optic Communication System, Benefits and disadvantages of fiber Optics. Transmission Windows. Transmission Through Optical fiber, The Laws of Reflection and Refraction, Light rays and light waves, Reflection of light from optical surfaces, Refraction of light from optical interfaces, Numerical Aperture (NA).

UNIT-II

Losses in Optical Fiber: Attenuation, Material absorption losses, linear and nonlinear scattering losses, fiber bend loss, dispersion viz. inter modal dispersion and intra modal dispersion, overall fiber dispersion and polarization, attenuation and dispersion limits in fibers, self-phase modulation, combined effect of dispersion and self-phase modulation.

Fiber Material, Couplers and Connectors: Preparation of optical fiber: liquid-phase techniques, vapor phase deposition techniques, Connector Principles, fiber End Preparation, splices, connectors.

UNIT-III

Optical Sources and Detectors: Sources: Basic principle of surface emitter LED and edge emitter LED- material used, structure, internal quantum efficiency and characteristics, LASER Diode - material used, structure, internal quantum efficiency and characteristics, working Principle and characteristics of Distributed feedback (DFB) laser. Detectors: PIN photodiode - material used, working principle & characteristics, Avalanche Photodiode: - material used, working principle and characteristics

UNIT-IV

Advanced Topics: Optical TDM, SCM, WDM and Hybrid multiplexing methods, Fiber Optic Networks, Transreceivers for Fiber-Optic Networks, Semiconductor Optical Amplifiers, Erbium Doped Fiber Amplifiers (EDFAs).

Optical Networks: Elements and Architecture of Fiber-Optic Network, SONET/SDH, ATM, IP, Optical Line Terminals (OLT), Optical Add-Drop Multiplexers, Optical Cross Connects.

Recommended Books

1. John M. Senior, 'Optical Fiber Communication Principles & Practice', PHI Publication.
2. John Gowar, 'Optical Communication Systems', PHI Publications.
3. Gerd Keiser, 'Optical Fiber Communication', McGraw Hill International Publications.
4. BishnuP. Pal, 'Fundamentals of Fibre Optics in Telecommunication and Sensor Systems', New Age International (P) Ltd.
5. Rajiv Ramaswami, Kumar N. Sivarajan, 'Optical Networks Practical Perspective', Elsevier.

CELLULAR AND MOBILE COMMUNICATION

Subject Code: BECE0-F92 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Learning Objectives

The student should be made to:

1. Know the characteristic of cellular mobile systems
2. Learn the various elements of cellular radio systems design and interference
3. Understand the concepts behind various digital signaling schemes for fading channels
4. Be familiar the various multipath mitigation techniques.
5. Understand the various handoff techniques.

Learning Outcomes

At the end of the Course, the student should be able to

1. Understand cellular wireless communication systems.
2. Learn about elements of cellular radio systems.
3. Compare multipath mitigation techniques and analyze their performance.
4. Describe about hand offs and call drops.

UNIT-I

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, Uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface - specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features, 3G systems: UMTS & CDMA 2000 standards and specifications.

UNIT-II

Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co-channel interference, real time co-channel interference, cochannel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

UNIT-III

Cell Coverage for Signal & Traffic: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

UNIT-IV

Hand Off, Dropped Calls: Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Operational Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Books:

1. C.Y. Lee William, 'Mobile Cellular Telecommunications', McGraw Hill.
2. Kamilo Feher, 'Wireless and Digital Communications', PHI.
3. T.S. Rappaport, 'Wireless Communication, Principles & Practice', PHI.

BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

Subject Code: BECE0-F93 **L T P C** **Duration: 38 Hrs.**

3 0 0 3

Learning Objectives

This Course introduces general biological concepts

1. It helps students to understand importance of biological concepts in engineering fields.
2. To understand application of engineering concepts in medical instrumentation.

Learning Outcomes

Upon successful completion of the Course, students will be able to

1. Use bioinstrumentation, required in cellular or molecular biology investigations
2. Apply the concepts of engineering in different streams of biomedical field.

UNIT-I

Biomedical Signals: Origins of Bioelectric Signals, Human body, Heart and Circulatory System, Electrodes, Transducers, ECG, EMG.

UNIT-II

Recording & Monitoring Instruments: Recording Electrodes, Physiological Transducers, Biomedical Recorders, Biomedical Recorders, Heart rate measurement, Temperature measurement, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Foetal Monitoring System, Biomedical Telemetry.

UNIT-III

Imaging System: Working with X-Rays, CT scanner, NMR, NMR, Ultrasonic System, Ultrasonic System, Ultrasonic System.

UNIT-IV

Therapeutic & Physiotherapy Equipment's: Cardiac Pacemakers, Cardiac defibrillator, SW Diathermy & MW Diathermy.

Patient Safety: Electric Shock Hazards, Test Instruments, Biomedical Equipment's, Biomedical Equipment's.

Recommended Books

1. R.S. Khandpur, 'Handbook of Biomedical Instrumentation'.
2. Leslie Cromwell, 'Biomedical Instrumentation and Measurements', PHI.
3. T.K. Attuwood, 'Introduction to bioinformatics', Pearson Education.
4. Joseph J. Carr & John M Brown, 'Introduction to biomedical equipment Technology', Pearson Education.

INDUSTRIAL SAFETY AND ENVIOREMENT

Subject Code: BMEE0 –F91 **L T P C** **Duration: 38 Hrs.**
3 0 0 3

UNIT-I

Meaning & Need for Safety: Relationship of safety with plant design, equipment design and work environment. Industrial accidents, their nature, types and causes. Assessment of accident costs; prevention of accidents. Industrial hazards, Hazard identification techniques, Accident investigation, reporting and analysis.

UNIT-II

Planning for Safety & its Measures: Definition, purpose, nature, scope and procedure. Range of planning, variety of plans. Policy formulation and implementation of safety policies. Safety measures in a manufacturing organization, safety and economics, safety and productivity. Employees participation in safety. Safety standards and legislation.

UNIT-III

Meaning of Environment and Need for Environmental Control: Environmental factors in industry. Effect of temperature, Illumination, humidity noise and vibrations on human body and mind. Measurement and mitigation of physical and mental "fatigue" Basics of environment design for improved efficiency and accuracy at work. Environment Standards: Introduction to ISO 14000; Environment standards for representative industries.

UNIT-IV

Ventilation and heat Control Purpose of ventilation, Lighting, Noise & Vibrations: Physiology of heat regulation. Thermal environment and its measurement. Thermal comfort. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning Process ventilation. Control of heat exposures: control at source, insulation, and local exhaust ventilation. Control of radiant heat, dilution ventilation. Local relief. Industrial Lighting: Purpose of lighting, benefits of good

illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Design of lighting installation. Maintenance standards relating to lighting and colour. Noise & Vibrations: Continuous and impulse noise. The effect of noise on man. Noise measurement and evaluation of noise. Noise isolation. Noise absorption techniques. Silencers vibrations: Effect, measurement and control measures.

Learning Outcomes

1. Understand importance of safety at work
2. Understand various safety measures and how it leads to increasing plant productivity.
3. Understand basics of environmental design
4. Understand the control of Ventilation and heat etc.

Recommended Books

1. H.W. Heinrich, 'Industrial Accident Prevention', McGraw Hill.
2. Beranek, 'Noise Reduction', McGraw Hill.
3. D.C. Reamer, 'Modern Safety and Health Technology', R. Wiley.

ENVIRONMENTAL POLLUTION

Subject Code: BCIE0-F91 **L T P C** **Contact Hrs. 36**

3 0 0 3

UNIT -I

Introduction: Environment. Pollution, Pollution control

Air Pollution: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.

Air pollution Control: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.

UNIT -II

Noise Pollution: Definition; Sound Pressure, Power and Intensity; Noise Measurement, Power and Intensity, Levels, Frequency Band, Effects; Control.

Water pollution: Pollution Characteristics of Typical Industries, Suggested Treatments.

UNIT -III

Global Environmental Issues: Ozone Depletion, Acid Rain, Global Warming-Green House Effects.

UNIT -IV

Administrative Control on Environment: Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects

Recommended Books

1. G. Masters, W. Ela, 'Introduction to Environmental Engineering and Science', PHI.
2. A. Sincero, G. Sincero 'Environmental Engineering: A Design Approach', PHI.
3. P.V. Rowe 'Environmental Engineering', TMH.
4. S.K. Garg, 'Environmental Engineering', Khanna Publishers.
5. Rao and Rao, 'Air Pollution', TMH.
6. A.K. Chatterjee, 'Water Supply, Waste Disposal and Environmental Pollution Engineering', Khanna Publishers.

7. P. N. Modi, Environmental Engineering, Vol.-II.
8. Rajagopalan, 'Environmental Modelling', Oxford University Press.

TRAFFIC ENGINEERING

Subject Code: BCIE0-F92 **L T P C** **Contact Hrs. 36**
3 0 0 3

Unit-I

Introduction: Elements of Traffic Engineering, Components of traffic system – road users, vehicles, highways and control devices.

Vehicle Characteristics: IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations.

Unit-II

Traffic Stream Characteristics: Traffic stream parameters, characteristics of interrupted and uninterrupted flows.

Traffic Studies: Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies.

Unit-III

Traffic Regulation and Control: Signs and markings, Traffic System Management, At-grade intersections, Channelization, Roundabouts.

Traffic Signals: Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination.

Unit-IV

Grade Separated Intersections: Geometric elements for divided and access controlled highways and expressways.

Traffic Safety: Principles and practices, Road safety audit.

Intelligent Transportation System: Applications in Traffic Engineering.

Recommended Books

1. R.M. William and P.R. Roger, 'Traffic Engineering', Prentice Hall.
2. C.J. Khisty and B.L. Kent, 'Transportation Engineering – An Introduction', Prentice Hall of India Pvt. Ltd.
3. L.R. Kadiyali, 'Traffic Engineering & Transport'.

UG OPEN ELECTIVES-II 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

UG OPEN ELECTIVES-II 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
BFOT0-F92	Data Process Analysis	B.Tech. Food Technology
BBAD0-F94	Engineering Economics & Management	BBA
BBAD0-F95	Entrepreneurship	
BBAD0-F96	Finance for Engineers	
BEEE0-F94	Non-Conventional Energy Resources	B.Tech. EEE
BEEE0-F95	High Volatge Engineering	
BEEE0-F96	Nano Science and Nano Technology	
BECE0-F94	Communication Systems	B.Tech. ECE
BECE0-F95	Robotics and Automation	
BECE0-F96	Electronic System Design	
BCIE0-F93	Building Maintenance	B.Tech. Civil Engineering
BCIE0-F94	Civil Engineering Materials	

DATA PROCESS ANALYSIS

Subject Code: BFOT0-F92 **L T P C** **Contact Hrs.**
3 0 0 3

UNIT-I

Introduction: The meaning of quality and quality improvement, Statistical methods for quality control and improvement.
Food Quality System: The link between quality and productivity, Quality costs, Legal aspects of quality, implementing quality improvement.
Control Charts for Variables: Statistical basis of the charts, Development and use of x and R, Charts based on standard values, Interpretation of x and R charts, The effect of non-normality on x and R charts.

UNIT-II

Sampling: Population and sampling distributions, Sampling and non-sampling errors, Mean and standard deviation of x, Shape of the sampling distribution of x, Applications of the sampling distribution of x, Population and sample proportions, Mean, standard deviation.
Test Methods: Hypothesis tests, Estimation and hypothesis testing: two populations, Chi-square tests, Analysis of Variance, Simple linear regression, Non-parametric methods.

UNIT-III

Statistical Process Control (SPC) Techniques: SPC for short production runs, Modified and acceptance control charts, SPC with auto correlated process data, Economic design of control charts.
Multivariate Process Monitoring and Control: Description of multivariate data, The Hoteling T2 control chart, The multivariate EWMA (Exponentially Weighted Moving Average) control chart, Latent structure methods.

UNIT-IV

Process Capability Analysis (PCA): PCA using probability plot, Process capability ratios, PCA using a control chart, PCA using designed experiments.
Design of Experiments and Process Optimization: Guidelines for designing experiments, Factorial experiments, the 2k factorial design, Fractional replication of the 2k design, Response surface methods and designs
Six Sigma: Introduction, Six-sigma control chart, Six-sigma quality performance.
Recommended Books:

1. Jerome D. Braverman, 'Fundamentals of Statistical Quality Control', Brady and Prentice Hall, **1981**.
2. P.S. Mann, 'Introductory Statistics', John Wiley and Sons, **2010**.
3. D.C. Montgomery, 'Statistical Quality Control', 7th Edn., John Wiley & Sons, **2012**.
4. M. Jaya Chandra, 'Statistical Quality Control', CRC Publisher, **2001**.

ENGINEERING ECONOMICS & MANAGEMENT

Subject Code: BBAD0-F94 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Objectives: To run an organization, Finance and Human resources are the key factors. Their proper utilization decides its success. This course will give the basic understanding of both these resources.

UNIT-I (8 Hrs)

Introduction: Scope of economics for engineers; Concept of: Goods, Utility, Value, Price, Capital, Money, Income; Law of Demand & Supply, Basic Management Principles

UNIT-II (11 Hrs)

Cost Analysis: Cost classification: Prime cost, Overhead cost, Selling and Distribution Cost, Fixed cost, Variable cost, Implicit cost, Explicit cost, Replacement cost, Opportunity cost, Marginal cost and Sunk cost; Break Even Analysis; Economic order quantity.

Depreciation: Causes and Methods: Straight line method, Reducing balance method, Repair provision method, Annuity method, Sinking fund method, Revaluation method, Sum of the digit method.

UNIT-III (10 Hrs)

Replacement Analysis: Reasons and factors for replacement; Determination of economic life of an asset.

Inventory Management: Introduction, Factors & Techniques.

UNIT-IV (11 Hrs)

Human Resource Management: Definition; Functions of HRM; Process of Human Resource Planning**;** Methods of Recruitment; Meaning of Placement and Induction, Difference between Training and Development; Methods of Training and Development.

Recommended Books

1. T.R. Jain, 'Micro Economics', V.K. Publication.
2. P. Khanna, 'Industrial Engineering and Management', Dhanpat Rai Publication (P) Ltd.
3. M.S. Mahajan, 'Industrial Engineering and Production Management', Dhanpat Rai & Co. Pvt. Ltd.
4. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
5. P.L. Mehta, 'Managerial Economics', Sultan Chand & Sons.

ENTERPRENEURSHIP

Subject Code: BBAD0-F95 **L T P C** **Duration: 40 Hrs.**

3 0 0 3

Objectives: The purpose of this paper is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. In particular, the paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship.

UNIT-I

Foundations of Entrepreneurship: Concept, Need, Definition & Role of Entrepreneurship, Definition, Characteristics & Scope of Entrepreneur, Concepts of Entrepreneur, Intrapreneur, Entrepreneurial Culture, Reasons for The Failure of Entrepreneurial Ventures, Various Case Studies, Successful, Failed and Turnaround Ventures.

UNIT-II

Women Entrepreneurs & Entrepreneurship Development: Meaning, Role, Problems & Reasons for Less Women Entrepreneurs, Role of The Following Agencies in The Entrepreneurship Development DIC, SISI, EDII & NIESBUD.

UNIT-III

Small& Medium Enterprises - Small & Medium Industry: Meaning and Importance, Role & importance of SME in India Economy, Search for a Business Idea, Source of Ideas, Idea

Processing, Selection Idea, Input Requirements, Nature and Components of SME Environment, SME Funding.

UNIT-IV

Financial Schemes Offered by Various Financial Institutions like Commercial Banks, IDBI, ICICI, SIDBI, SFCs, Role of Central Government and State Government in Promoting Entrepreneurship Relevant case studies related to the topics should be discussed.

Recommended Books

1. Vasant Desai, 'Management of Small Scale Industries', Himalaya Publishing.
2. Angadi, Cheema, Das, 'Entrepreneurship, Growth, and Economic Integration', Himalaya Publication.
3. Rizwana and Janakiran, 'Entrepreneurship Development', Excel Books.
4. Murthy, 'Small Scale Industry and Entrepreneurial Development', Himalaya Publishing.

FINANCE FOR ENGINEERS

Subject Code: BBAD0-F96 **L T P C** **Duration – 40 Hrs**

3 0 0 3

Course Objective: To provide an understanding of the function, the roles, the goals and the Processes of corporate financial management, covering the sourcing of finances and their issues in investment and operations. Problem-solving methodology will be used to illustrate the theories and tools in financial decision making.

Unit-I (10 Hrs.)

Nature, Scope and Objectives of Financial Management, Profit Maximization Vs Wealth Maximization, Financial Planning, Forms of Business Organization, Role of Financial Manager.

Unit-II (10 Hrs.)

Capital Structure – Introduction, Factors Affecting Capital Structure, Liquidity Ratios

Capital Structure Theories: Net Income Approach, Net Operating Income Approach, Traditional Approach, Modigliani-Miller Model (MM), Criticisms of MM Models, Financial Distress & Agency Cost, Asymmetric Information Theory.

Unit-III (10 Hrs.)

Working Capital Decision: Meaning, Nature and Scope of Working Capital - Component of Working Capital – Factors affecting Working Capital, Working Capital Strategies,

Capital Budgeting Techniques: Discounted and Non-Discounted Methods (Pay Back, ARR, NPV, IRR, Benefit Cost Ratio), Long Term and Short Term Sources of Funds

Unit-IV (10 Hrs.)

Long Term Sources of Funds: Equity share, Preference shares, Debentures, Bonds, Warrants, Venture capital and Ploughing back of profits

Short Term Sources of Funds: Commercial Paper, Certificate of Deposit, Treasury Bills

Financial Markets: Nature and Significance of Primary and Secondary Markets, Objectives and Functions

Course Outcome: After completing this course the students should be able to make optimum decisions pertaining to raising funds, making investments & managing the assets of a corporation, big or small, with an ultimate goal of creating value.

Recommended Books

1. Brigham, 'Financial Management: Text & Cases', Cengage Learning.
2. Brealy & Myres, 'Principles of Corporate Finance', Tata McGraw Hill.

3. Ambrish Gupta. 'Financial Accounting for Management', 2nd Edn., Pearson Education.
4. I.M. Pandey, 'Financial Management', Vikas Publishers.
5. S.P. Jain and K.L. Narang, 'Principles of Accounting', Kalyani Publishers, New Delhi, **2004**

COMMUNICATION SYSTEMS

Subject Code: BECE0-F94 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Learning Objectives

1. To understand the basic concept of communication and amplitude modulation.
2. To understand the concept of angle modulation.
3. To understand theory of digital modulation.
4. To understand working of radio receivers.

Learning Outcomes

At the end of the Course the student shall be able to:

1. Understand the fundamentals of communication systems and to perform amplitude and angle modulation and demodulation of analog signals
2. Perform and analyze PAM, PCM and PWM
3. Analyze FDM and TDM systems.
4. Design and conduct experiments, using modern communication tools necessary for various engineering applications.

UNIT-I

Introduction: Basic elements of communications. Noise Modulation and frequency translation, Need for modulation.

Amplitude Modulation (AM): Expression for AM, modulation index for AM, amplitude waveform and bandwidth of amplitude modulated signal, power distribution in amplitude modulated signal. Double sideband suppressed carrier (DSB-SC), single sideband (SSB), and vestigial sideband (VSB) AMs.

AM Modulators: Introduction. Circuit diagrams and operational principles of square law modulator, switching modulator, balanced modulator, ring modulator.

AM Demodulators: Introduction. Circuit diagrams and explanations of envelope detector and square law detector.]

UNIT-II

Angle Modulation: Introduction to Phase modulation (PM) and frequency modulation (FM). Relationship between PM and FM. Phase and frequency deviation. Power distribution in angle modulated signal. Spectral characteristics of angle modulated signals. Effect of noise on angle modulation, role of limiter, pre-emphasis and de-emphasis in FM. Comparison of FM with AM in communication systems.

UNIT-III

Introduction to Digital Signals: Comparison of Analog and Digital Signals; Advantages and disadvantages of Digital Communications, Elements of Digital Communication Systems. Pulse Amplitude Modulation, Pulse Code Modulation (PCM); Quantization Noise, Commanding Sampling Theorem, Concept of aliasing & flat top sampling, PCM bandwidth, Differential PCM, Delta Modulation(DM), Pulse width Modulation(PWM), Adaptive Delta Modulation(ADM).

UNIT-IV

Line Coding Schemes: Introduction, properties, general methods for derivation of power spectral density of a broad class of line coding scheme: ON-OFF signalling, polar signalling, bipolar and comparison among them. Pulse shaping, introduction to equalizer and eye diagram.

Recommended Books

1. Taub and Schilling, 'Principles of Communication Systems', McGraw Hill.
2. G. Kennedy, 'Electronic Communication System', PHI.
3. Roddy and Coolen, 'Electronic Communications', PHI
4. Thiagrajan Vishwanathan, 'Communication Switching Systems and Networks', PHI Pub.
5. Proakis, 'Communication System Engineering', Pearson.

ROBOTICS AND AUTOMATION

Subject Code: BECE0-F95 **L T P C** **Duration: 36 Hrs.**

3 0 0 3

Learning Objectives

The student should be made to:

1. Learn the fundamentals of robotics and robot kinematics
2. Be familiar with robot dynamic analysis and forces
3. Learn about the concepts of actuators and sensors.
4. Learn robot programing and applications.

Learning Outcomes

Upon completion of the Ciourse, the student should be able to:

1. Apply various robot kinematics.
2. Analyse the robot dynamic, differential motions and inverse manipulator kinematics.
3. Understand methods of trajectory planning, actuators and sensors.
4. Understand the lead through programming methods.

UNIT-I

Fundamentals: historical information, robot components, Robot characteristics, Robot anatomy, Basic structure of robots, Resolution, Accuracy and repeatability

Robot Kinematics: Position Analysis forward and inverse kinematics of robots, Including frame representations, Transformations, position and orientation analysis and the Denavit Hartenberg representation of robot kinematics, The manipulators, The wrist motion and grippers.

UNIT-II

Differential motions, Inverse Manipulator Kinematics: Differential motions and velocity analysis of robots and frames.

Robot Dynamic Analysis and Forces: Analysis of robot dynamics and forces, Lagrangian mechanics is used as the primary method of analysis and development.

UNIT-III

Trajectory Planning: Methods of path and trajectory planning, both in joint space and in Cartesian space.

Actuators and Sensors: Actuators, including hydraulic devices, Electric motors such as DC servomotors and stepper motors, Pneumatic devices, as well as many other novel actuators, It also covers microprocessor control of these actuators, Mechatronics, Tactile sensors, Proximity and range sensors, Force and torque sensors, Uses of sensors in robotics.

UNIT-IV

Robot Programming, Systems and Applications: Robot languages, Method of robots programming, Lead through programming methods, A robot programs as a path in space, Motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and limitation of lead through methods and robotic applications.

Recommended Books

1. Stauguard A.C. & Eagle wood clif, 'Robotic & AI', Prentice Hall.
2. Lee C.S.G., Fu K.S., Gonzalez R.C, 'Robotic control, Sensing and Intelligence', Mcgraw Hill.
3. Parent M. and Laugreau C, 'Robot Technology, Logic 7 Programming', Kogan Page, London.

ELECTRONIC SYSTEM DESIGN

Subject Code: BECE0-F96 **L T P C** **Duration: 38 Hrs.**

3 0 0 3

Learning Objectives

1. To understand the stages of product (hardware/ software) design and development.
2. To learn the different considerations of analog, digital and mixed circuit design.
3. To understand the importance of sinusoidal oscillators. `
4. To understand the constant current sources.

Learning Outcomes

1. After successfully completing the Course students will be able to:
2. Understand various stages of hardware, software in electronic system design.
3. Designing of Class A, AB, Audio power amplifier.
4. Special design considerations of filters.

UNIT-I

Design of Power supply system: Unregulated D.C. power supply system with rectifiers and filters. Design of emitter follower regulator, series regulators, overload protection circuits for regulators. Design of SMPS: Step up and step down.

UNIT-II

Design of Class A Small Signal Amplifiers: Emitter follower, Darlington pair amplifiers with and without Bootstrapping, Two stage direct coupled amplifier. Design of class A, Class AB audio power amplifier with drivers.

UNIT-III

Design of sinusoidal oscillators: OPAMP based Wein bridge and Phase Shift oscillators with AGC circuits, Transistor based Hartley, Colpits and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits.

UNIT-IV

Design of constant current sources, Design of function generators, Design of tuned amplifiers. Design of Butterworth, Chebyshev filters up to sixth order with VCVS and IGMF configuration.

Recommended Books

1. Anielo. 'Electronics: BJT's, FETS and Microcircuits'.
2. Goyal & Khetan, 'Monograph on Electronic Circuit Design'.
3. 'Regulated Power Supply Handbook', Texas Instruments.

BUILDING MAINTENANCE

Subject Code: BCIE0-853 **L T P C** **Contact Hrs. 36**
3 0 0 3

UNIT-I

Importance of Maintenance, Deterioration and Durability: Factors affecting decision to carryout maintenance, agencies causing deterioration, effect of deterioration agencies on materials. Factors to reduce maintenance at design stage, consideration of maintenance aspects in preparing tender document and specifications, sources of error in design which enhances maintenance, importance of working drawings and schedules, provision of access for maintenance and its importance at design stage. Economic consideration in maintenance: physical life, functional life, economic life of different types of buildings, discounting technique for assessment of economic life.

UNIT-II

Maintenance Management: Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance.

Materials for Maintenance: Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance.

UNIT-III

Investigation and Diagnosis for Repair of Structures: Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis and repair steps. Maintenance Problems and Root Causes:

Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.

UNIT-IV

Remedial Measures for Building Defects: Preventive maintenance and special precautions - considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair.

1. Repair of existing damp proofing systems in roofs, floors and wet areas.
2. Protection, repair and maintenance of RCC elements.
3. Repair, maintenance of foundations, basements and DPC
4. Repair of finishes.
5. Repair of building joints.
6. Repair of water supply and sanitary systems, underground and overhead tanks.
7. Common strengthening techniques
8. Maintenance of Industrial Floors

Maintenance of Multi-Storey Buildings: Specials features for maintenance of multi-storey buildings, including fire protection system, elevators booster pumps, generator sets.

Recommended Books

1. A.C. Panchdari, ‘Maintenance of Buildings’, New Age International (P) Limited Publishers.

CIVIL ENGINEERING MATERIALS

Subject Code: BCIE0-854 **L T P C** **Contact Hrs. 36**
3 0 0 3

UNIT-I

STONES – BRICKS – CONCRETE BLOCKS: Stone as building material – Criteria for selection Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Cement, Concrete blocks – Light, weight concrete blocks.

UNIT-II

LIME – CEMENT – AGGREGATES – MORTAR: Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Industrial byproducts – Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

UNIT-III

CONCRETE: Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

UNIT-IV

TIMBER AND OTHER MATERIALS: Timber – Market forms – Industrial timber– Plywood – Veneer – Thermacole – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Uses – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.

MODERN MATERIALS: Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

Recommended Books

1. P.C. Varghese, 'Building Materials', PHI Learning Pvt. Ltd, New Delhi, **2012**.
2. R.K. Rajput, 'Engineering Materials', S. Chand and Company Ltd., **2008**.
3. M.S. Shetty, 'Concrete Technology (Theory and Practice)', S. Chand and Company Ltd., **2008**.
4. M.L. Gambhir, 'Concrete Technology', 3rd Edn., Tata McGraw Hill Education, **2004.**
5. S.K. Duggal, 'Building Materials', 4th Edn., New Age International, **2008**.

Reference Books

1. K.S. Jagadish, 'Alternative Building Materials Technology', New Age International, **2007**.
2. M.L. Gambhir & Neha Jamwal, 'Building Materials, Products, Properties and Systems', Tata McGraw Hill Educations Pvt. Ltd, New Delhi, **2012**.
3. IS456 – 2000: Indian Standard Specification for Plain and Reinforced Concrete, **2011.**
4. IS4926–2003: Indian Standard Specification for Ready–Mixed Concrete, **2012.**
5. IS383–1970: Indian Standard Specification for Coarse and Fine Aggregate from Natural Sources for Concrete, 2011 6. IS1542–1992: Indian Standard Specification for Sand for Plaster, **2009.**

UG OPEN ELECTIVES-III 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

UG OPEN ELECTIVES-III 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
BECE0-F97	Advance Process Control	ECE
BECE0-F98	Digital Signal Processing	
BECE0-F99	Antenna and Wave Propagation	

ADVANCE PROCESS CONTROL

Subject Code: BECE0-F97 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Learning Objectives
1. To outline the review& limitations of single loop control, need for multi-loop systems
2. To introduce the concept of advanced process control techniques.
3. To illustrate the concept of programmable logic controls.

Learning Outcomes
Students will be able to:
1. Represent and read the instrumentation scheme using P / I diagrams.
2. Analyze and implement selective & auctioneering control system.
3. Design of control systems for multivariable process.

UNIT-I

Introduction: Review& limitations of single loop control, need for multi-loop systems P/ I diagrams, standard instrumentation symbols for devices, signal types, representation & reading of instrumentation scheme using P / I diagrams.

UNIT-II

Advanced Process Control Techniques: principle, analysis & applications of cascade, ratio, feed forward, override, split range, selective & auctioneering control system with multiple loops, dead time compensation, adaptive control, inferential control.

UNIT-III

Design of Control Systems for Multivariable Process: multivariable control system, interaction in multiple loops, RGA method for minimizing interactions, Distillation column, absorbers, heat exchangers, furnaces and reactors.

UNIT-IV

Introduction to Computer Control Systems in Process Control: DCS configuration, control console equipment, communication between components, local control units, DCS flow sheet symbols, DCS I/O hardware & set point stations. Supervisory control& data acquisition system
Programmable logic controls: Introduction, relative merits over DCS & relay, programming languages, hardware & system sizing, PLC installation, maintenance & troubleshooting.

Recommended Books
1. C.D. Johnson, 'Process Control Instrumentation Technology', PHI.
2. Krishan Kant, 'Computer based Industrial Control', PHI.
3. Andrew Parr, 'Pneumatic & Hydraulic', PHI.
4. D. Considine, 'Process Industrial Instruments & Control Handbook', McGraw Hill.
5. B.G liptak, 'Instrument Engineers Handbook', CRC Press.

DIGITAL SIGNAL PROCESSING

Subject Code: BECE0-F98 **L T P C** **Duration: 37 Hrs.**
3 0 0 3

Learning Objectives
1. To study the concept of digital signal processing and its characteristics.
2. To learn discrete Fourier transform and its properties

3. To know the characteristics of IIR and FIR filters and learn the design of infinite and finite impulse response filters for filtering undesired signals
4. To understand Discrete Time Fourier Transform and Fast Time Fourier Transform

Learning Outcomes

Upon completion of the Course, students will be able to

1. Apply DFT for the analysis of digital signals & systems.
2. Design IIR and FIR filters.
3. Design the Multi rate Filters.
4. Apply Adaptive Filters to equalization.

UNIT-I

Introduction to DSP, Time and Frequency domain description of different type of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems.

UNIT-II

Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, Sampling of continuous time signal, Reconstruction of continuous time signal from sequences, Z-Transform and its properties, complex Z-plane, ROC. Relationship between Fourier Transform and Z-Transform, Inverse Z-Transform.

UNIT-III

Discrete Time Fourier Transform and its properties, Linear convolution, Circular convolution, convolution from DFT, FFT, Inverse Fast Fourier Transform, Decimation in time and frequency algorithm.

UNIT-IV

Filter categories, Finite impulse response filters, various design techniques of FIR filters, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window, Kaiser window. Design of IIR by Approximation of derivatives, Impulse invariant method and Bilinear Transformation method. Steps in Filter Design of Butter worth, Elliptic filter, Chebyshev filters, Frequency Transformation, Applications of DSP.

Recommended Books

1. Oppenhavm & Scheffer, 'Discrete time Processing', PHI.
2. Proakis & D.G. Monolakis, 'Digital Signal Processing', PHI.
3. S.K. Mitra, 'Digital Signal Processing', PHI.
4. E.C. Ifeacher, B.W. Jervis, 'Digital Signal Processing', Addison Wesely.

ANTENNA AND WAVE PROPAGATION

Subject Code: BECE0-F99 **L T P C** **Duration: 38 Hrs.**

3 0 0 3

Learning Objectives

1. To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
2. Study of physical concept of radiation patterns and all the important Fundamental Parameters of antennas with antenna Arrays in the antenna terminology

Learning Outcome

1. An ability and development of skill of students to design highly effective communication system.

2. After completion of the Course, students will be aware with the various performance parameters of the antenna system design and antenna arrays.
3. Understand various types of antennas such as microstrip and Yagi-uda antennas.
4. To understand Ground wave propagation.

UNIT-I

Antenna Basics Directional properties of antennas, Radiation patterns, antenna gain and aperture, antenna terminal impedance, self and mutual impedance, front to back ratio, antenna beam width and bandwidth, antenna efficiency, antenna beam area, polarization, antenna temperature and Reciprocity properties of antennas.

UNIT-II

Antenna Arrays: Classification of arrays, linear arrays of two point sources, linear arrays of n-point sources, pattern multiplication, array factor, linear arrays of equal amplitude and spacing (Broadside and end fire arrays) of n-point sources, directivity and beam width, non-uniform arrays excitation using Binomial series.

UNIT-III

Special Antennas: VLF and LF antennas (Hertz and Marconi antennas), effects of antenna height and effect of ground on performance of antenna, Rhombic antennas, Loop antennas, receiving antenna and radio direction finders. Folded dipole antennas, Yagi-uda antenna, horn antennas, microwave dish, helical antennas, frequency independent antennas, microstrip antennas, fractal antennas.

UNIT-IV

Ground Wave Propagation: Characteristics for ground wave propagation, reflection at the surface of a finitely conducting plane and on earth, Attenuation Calculation of field strength at a distance.

Ionosphere Propagation: The ionosphere, formation of the various layers, their effective characteristics, reflection and refraction of waves by ionosphere, virtual height, maximum frequency, skip distance, regular and irregular variation of ionosphere, Fading and Diversity reception, ordinary and extraordinary waves.

Space Wave Propagation: Space wave, range and effect of earth, Troposphere waves-reflection, refraction, duct propagation, Troposphere scatter propagation link

Recommended Books

1. J.D. Kraus, 'Antennas', McGraw Hill.
2. C.A. Balanis, 'Antennas Theory and Design', Willey.
3. K.D. Prasad, 'Antenna & Wave Propagation', Satya Parkashan, New Delhi.
4. E.C. Jorden & B.C. Balmann, 'Electromagnetic waves & radiating System', P.H.I.
5. R.E. Collins, 'Antennas and Radio Propagation', McGraw Hill.

Semester 1st		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-101	Foundation Course in Food Production	3	0	0	40	60	100	3
BHOM2-102	Foundation Course in Food & Beverage Service	3	0	0	40	60	100	3
BHOM2-103	Foundation Course in Front Office	3	0	0	40	60	100	3
BHOM2-104	Foundation Course in Accommodation Operations	3	0	0	40	60	100	3
BHOM2-105	Foundation Course in Food Production Lab.	0	0	6	60	40	100	3
BHOM2-106	Foundation Course in Food & Beverage Service Lab.	0	0	4	60	40	100	2
BHOM2-107	Foundation Course in Front Office Lab.	0	0	2	60	40	100	1
BHOM2-108	Foundation Course in Accommodation Operations Lab.	0	0	2	60	40	100	1
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BHOM2-156	Principles of Food Science							
BHOM2-157	Application of Computers							
BHOM2-158	Executive communication							
BHOM2-159	Introduction to Event Management							
Total		**15**	**0**	**14**	**440**	**460**	**900**	**22**

Semester 2nd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-209	Foundation Course in Food Production-II	3	0	0	40	60	100	3
BHOM2-210	Foundation Course in Food & Beverage Service-II	3	0	0	40	60	100	3
BHOM2-211	Foundation Course in Front Office	3	0	0	40	60	100	3
BHOM2-212	Foundation Course in Accommodation Operations-II	3	0	0	40	60	100	3
BESE0-101	Environment Science	2	0	0	40	60	100	2
BHOM2-213	Foundation Course in Food Production Lab.-II	0	0	6	60	40	100	3
BHOM2-214	Foundation Course in Food & Beverage Service Lab.-II	0	0	4	60	40	100	2
BHOM2-215	Foundation Course in Front Office - Lab	0	0	2	60	40	100	1
BHOM2-216	Foundation Course in Accommodation Operations Lab.-II	0	0	2	60	40	100	1
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BHOM2-260	Nutrition							
BHOM2-261	Basics of Tourism							
BHOM2-262	Accounting for Managers							
Total		**17**	**0**	**14**	**480**	**520**	**1000**	**24**

Semester 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-317	Food Production Operations	3	0	0	40	60	100	3
BHOM2-318	Food & Beverage Service Operations	3	0	0	40	60	100	3
BHOM2-319	Front Office Operations	3	0	0	40	60	100	3
BHOM2-320	Accommodation Operations	3	0	0	40	60	100	3
BHOM2-321	Food Production Operations Lab.	0	0	6	60	40	100	3
BHOM2-322	Food & Beverage Service Operations Lab.	0	0	2	60	40	100	1
BHOM2-323	Front Office Operations Lab.	0	0	2	60	40	100	1
BHOM2-324	Accommodation Operations Lab.	0	0	2	60	40	100	1
BHOM2-325	Workshop on Research Methodology	1	0	0	Non Evaluative			0
Departmental Elective-III (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-363	Food & Beverage Controls							
BHOM2-364	Food Safety & Quality							
Departmental Elective-IV (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-365	Management in Tourism							
BHUM0-101	Communication Skills In English							
Total		**19**	**0**	**12**	**480**	**520**	**1000**	**24**

Semester 4th		Marks					Credits
Subject Code	**Subject Name**	**External**			**Internal**	**Total**	
BHOM2-426	20-Weeks Industrial Exposure Training	50 Training Report	50 Training Report	50 Viva Voce	50 Log Book	200	20
Total		**50**	**50**	**50**	**50**	**200**	**20**

Semester 5th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-527	Advanced Food Production Operations	3	0	0	40	60	100	3
BHOM2-528	Advanced Food & Beverage Operation	3	0	0	40	60	100	3
BHOM2-529	Room Division Operations	3	0	0	40	60	100	3
BHOM2-530	Food & Beverage Management	3	0	0	40	60	100	3
BHOM2-531	Principles of Management	3	0	0	40	60	100	3
BHOM2-532	Advanced Food Production Operations Lab.	0	0	4	60	40	100	2
BHOM2-533	Advanced Food & Beverage Operation Lab.	0	0	4	60	40	100	2
BHOM2-534	Room Division Operation Lab.	0	0	2	60	40	100	1
Departmental Elective-V (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-566	Financial Management							
BHOM2-567	Bar and Beverage Operations							
BHOM2-568	Business Ethics							
Total		**18**	**0**	**10**	**420**	**480**	**900**	**23**

Semester 6th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHOM2-635	International Cuisines	3	0	0	40	60	100	3
BHOM2-636	Restaurant Planning & Management	3	0	0	40	60	100	3
BHOM2-637	Room Division Management	3	0	0	40	60	100	3
BHOM2-638	Entrepreneurship Development	3	0	0	40	60	100	3
BHOM2-639	Principles of Marketing	3	0	0	40	60	100	3
BHOM2-640	International Cuisines Lab.	0	0	6	60	40	100	3
BHOM2-641	Restaurant Planning & Management Lab.	0	0	4	60	40	100	2
BHOM2-642	Room Division Management Lab.	0	0	2	60	40	100	1
BHOM2-643	Research Project Viva Voce	0	0	0	60	40	100	2
Departmental Elective-VI (Choose any one subject)		3	0	0	40	60	100	3
BHOM2-669	Aviation and Cruise Line Management							
BHOM2-670	Personality Development and Soft Skills							
BHOM2-671	Gastronomic Tourism							
Total		**18**	**0**	**12**	**480**	**520**	**1000**	**26**

Semester 7th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
Specialization 1: Food and Beverage Division								
BHOM2-744	Advanced Culinary Operations	3	0	0	40	60	100	3
BHOM2-745	Advanced Food & Beverage Skills	3	0	0	40	60	100	3
BHOM2-746	Advanced Culinary Operations Lab.	0	0	8	60	40	100	4
BHOM2-747	Advanced Food & Beverage Operation Lab.	0	0	4	60	40	100	2
Specialization 2: Rooms Division								
BHOM2-748	Advanced Front Office Management	3	0	0	40	60	100	3
BHOM2-749	Advanced Accommodation Management	3	0	0	40	60	100	3
BHOM2-750	Advanced Front Office Management Lab.	0	0	8	60	40	100	4
BHOM2-751	Advanced Accommodation Management Lab.	0	0	4	60	40	100	2
Compulsory Subjects for both Specializations								
BHOM2-752	Project Report :Market Feasibility And Finicality Viability of proposed hotels/restaurant	0	0	4	0	100	100	2
BHOM2-753	Strategic Management	3	0	0	40	60	100	3
BHOM2-754	Human Resource Management	3	0	0	40	60	100	3
BHOM2-755	Facility Planning	3	0	0	40	60	100	3
Total		**15**	**0**	**16**	**320**	**480**	**800**	**23**

Semester 8th		Marks			Credits
Subject Code	**Subject Name**	**Int.**	**Ext.**	**Total**	
BHOM2-856	16 weeks Specialized Hospitality Training	0	100	100	12
BHOM2-857	5 Lectures on Project Report on emerging trends in hospitality Industry	0	100	100	6
Total		**0**	**200**	**200**	**18**

1. Each candidate will have to prepare a log book and training report of the day to day activities of his 16 Weeks on the job training duly supported by charts, diagrams, photos and tables. The report will be submitted in duplicate copy to the head of department.
2. After the completion of the training students will come back to the Institute for one week to attend 5 lectures to know how to make specialized project report in consultation with the allocated guide/supervisor

Total Credits = 22 + 24 + 24 + 20 + 23 + 26 + 23 + 18 = 180

FOUNDATION COURSE IN FOOD PRODUCTION

Subject Code: BHOM2-101 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: This paper will give the basic knowledge of cooking to the beginners. They will get versed with meaning, aims, objectives, kitchen organisation structure, different kinds of ingredients, techniques of pre-preparation and cooking, knowledge of various stocks, sauces and soups, various cuts of vegetables.

UNIT-I (12 Hrs.)

Introduction to Cookery: Levels of skills and experiences, Attitudes and behaviour in the kitchen, Personal hygiene, Uniforms & protective clothing, Safety procedure in handling equipment.
Culinary History: Origin of modern cookery Classical and New World Cuisine, Different styles cookery: oriental, European, Continental, Pan American.
Hierarchy Area of Department and Kitchen: Classical Brigade, Modern staffing in various category hotels, Roles of executive chef, Duties and responsibilities of various chefs, Co-operation with other departments General Layout of the kitchen in organisations, layout of receiving areas, layout of service & wash up.
Culinary Terms: List of culinary (common and basic) terms, Explanation with examples.
Aims & Objects of Cooking Food: Aims and objectives of cooking food, Various textures, Various consistencies, Techniques used in pre-preparation, Techniques used in preparation.
HACCP - Practices in food handling & storage.
Conversion Tables: American, British measures and its equivalents.

UNIT-II (10 Hrs.)

Fuels Used In Catering Industry: Types of fuel used in catering industry; calorific value; comparative study of different fuels, Calculation of amount of fuel required and cost.
Gas: Method of transfer, LPG and its properties; principles of Bunsen burner, precautions to be taken while handling gas; low and high-pressure burners, Gas bank, location, different types of manifolds
Fire Prevention and Fire Fighting System: Classes of fire, methods of extinguishing fires (Demonstration), Fire extinguishers, portable and stationery, Fire detectors and alarm, Automatic fire detectors cum extinguishing devices, Structural protection, Legal requirements
Methods of Cooking Food: Roasting, Grilling, Frying, Baking, Broiling, Poaching, boiling: Principles of each of the above, Care and precautions to be taken, Selection of food for each type of cooking.

UNIT-III (12 Hrs.)

Basic Principles of Food Production
Vegetable and Fruit Cookery: Introduction – classification of vegetables, Pigments and colour changes, Effects of heat on vegetables, Cuts of vegetables, Classification of fruits, Uses of fruit in cookery.
Stocks: Definition of stock, Types of stock, Preparation of stock, Recipes, Storage of stocks, Uses of stocks, Care and precautions.
Sauces: Classification of sauces, Recipes for mother sauces, Storage & precautions.
Soups: Classification with examples, Basic recipes of Consommé with 10 Garnishes and other soups.
Egg Cookery: Introduction to egg cookery, Structure of an egg, Selection of egg, Uses of egg in cookery.
Salads and Sandwiches: Salads & its compositions Types of Lettuce, Types of Dressing, Emerging trends in salad making, Sandwiches History origin and its Different types.

UNIT-IV (11 Hrs.)

Commodities:
a) **Shortenings** (Fats & Oils): Role of Shortenings, Varieties of Shortenings.
b) Advantages and Disadvantages of using various Shortenings, Fats & Oil – Types, varieties.

c) **Raising Agents:** Classification of Raising Agents, Role of Raising Agents, Actions and Reactions.
d) **Thickening Agents:** Classification of thickening agents, Role of Thickening agents.
e) **Herbs & Spices**: Uses its Importance & it's different types.
f) **Kitchen Organisation and Layout:** General layout of Kitchen in various organisations, layout of receiving areas, layout of service and wash-up areas.

Recommended Books

1. Le Rol A.Polsom, 'The Professional Chef', 4th Edn.
2. Bo Friberg, 'The Professional Pastry Chef', 4th Edn. Wiley & Sons INC.
3. Kinton & Cessarani, 'Theory of Catering'.
4. K. Arora, 'Theory of Cookery', Frank Brothers.
5. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.
6. Philip E. Thangam, 'Modern Cooker' (Vol-I), Orient Longman.
7. Kinton & Cessarani, 'Practical Cookery'.

FOUNDATION COURSE IN FOOD & BEVERAGE SERVICE

Subject Code: BHOM2–102 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, procedures among trainees.

UNIT-I (10 Hrs.)

Introduction to Food and Beverage Industry - Introduction to Food & Beverage Service Industry, Types of catering operations– commercial, welfare, transport, others. Role of catering establishment in the hospitality industry.

UNIT-II (11 Hrs.)

Food Service Areas (F & B Outlets) - Restaurants, Coffee Shop, Bar, Banquet, Cafeteria, Fast Food (Quick Service Restaurants), Grill Room, Vending Machines, Discothèque.
Ancillary Departments: - Pantry, Food pick-up area, Store, Linen room, Kitchen stewarding.

UNIT-III (12 Hrs.)

Departmental Organisation & Staffing: Organization of F&B department of hotel, Principal staff of various types of F&B operations, Job Descriptions & Job Specifications of F& B Service Staff, French terms related to F&B staff, Attributes of F&B Personnel, Inter and Intra departmental relationship.

UNIT-IV (12 Hrs.)

F & B Service Equipment: Familiarization & Selection factors of: - Cutlery, Crockery, Glassware, Flatware, Hollowware, all other equipment used in F&B Service, French terms related to the above.
Preparation for Service: Organising Mise-en-scene, Organising Mise- en- place.
Non-Alcoholic Beverages: Classification (Nourishing, Stimulating and Refreshing), Tea- Origin, Manufacture, Types & Brands, Coffee- Origin, Manufacture, Types & Brands, Juices and Soft Drinks, Cocoa & Malted Beverages - Origin & Manufacture.

Recommended Books

1. Bobby George &Sandeep Chatterjee, 'Food & Beverage Service', Jaico Publishing House.
2. R. Singaravelavan, 'Food & Beverage Service', Oxford University Press, New Delhi.
3. Dennis R. Lillicrap. & John.A. Cousins, 'Food & Beverage Service ', ELBS.
4. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.
5. Grahm Brown, 'The Waiter Handbook', Global Books & Subscription Services New Delhi.

FOUNDATION COURSE IN FRONT OFFICE

Subject Code: BHOM2-103 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at familiarising the students with various functions of front office and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills

UNIT-I (11 Hrs.)

Introduction to Hospitality Industry: Hospitality and its origin, Tourism and hotel Industry, its importance, and scope, Evolution of Tourism and Hotel Industry, Introduction of World's leading Hotel Operators and their brands, Introduction to Indian leading and emerging Hotel Operators and their brands, Role of Tourism industry in Indian economy with a special emphasis on Hotel Industry.

UNIT-II (12 Hrs.)

Classification of Hotels

A brief introduction to hotel core areas.

Classification of Hotels on the basis of Size, Location, Type of guest, Length of stay of guest.

Ownership basis: Independent Hotels, Chain Hotels, Franchise and Management Contracts Hotels, Marketing/Retailing/Consumer's Co-operatives/Referral Groups with examples, Vacation ownership/Time share and Condominium Hotels with examples of hotel groups involved in this business concept.

Star Classification of Hotels

Government's Classification Committee, Star ratings and Heritage Classifications adopted in India, Basis on which Star ratings are granted along with the Performa of Star Classification.

Overview of Other Concepts

Spa, Boutique hotels, All Suite, Budget Hotels, Green Hotels, Ecotels etc., Supplementary/Alternative Accommodations, examples of National and International Hotels with its type, category and classification.

UNIT-III (11 Hrs.)

Front Office Organization

Introduction to Front Office in Hotels, Types of Rooms, Sub-sections/Function areas in Front Office Department and their functions in Front Office and hotel in details, Layout of Front Office Department.

Front Office Personnel

Personality traits, Duties and Responsibilities, Hierarchy/ Organizational chart of Front Office Department – Large, Medium and Small Hotels/Resorts/Spa.

UNIT-IV (10 Hrs.)

Vacation Ownership and Condominiums

Vacation Ownership/Timeshare, Condominium, how are they different from Hotel business? Deeded ownership and Right to use ownership Types of timeshares/Vacation ownerships, Examples with list of hotel operating companies offering vacation ownerships and Condominium concepts.

Front Office Equipment: automated, semi-automated, non-automated.

Bell Desk: Functions Procedures and Formats.

French: To be taught by professional French language teacher, Understanding and uses of accents, orthographic signs and punctuation, knowledge of cardinaux and ordinaux (Ordinal and cardinal), Days, Dates, Time, Months and Seasons.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual'.
2. Jatashankar R. Tewari, 'Front office Operations and Management'.
3. Colin Dix, Chris Baird, 'Front Office Operations'.
4. Anutosh Bhakta, 'Professional Hotel Front Office Management '.

5. James. A. Bardi, 'Hotel Front Office Management'.
6. S.K. Bhatnagar, 'Front Office Operation Management'.
7. Micheal Kasavana and Brooks, 'Managing Front Office Operations'.
8. Sue Baker & Jermy Huyton, 'Principles of Front Office Operations'.

FOUNDATION COURSE IN ACCOMMODATION OPERATIONS

Subject Code: BHOM2–104 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organization of housekeeping, its systems and functions. A blend of theory and practical will be used to develop sensitivity and high work ethics towards guest care and cleanliness.

UNIT-I (11 Hrs.)

The Role of Housekeeping in Hospitality Operation: Role of Housekeeping in Guest Satisfaction and Repeat Business, Personality Traits of housekeeping Management Personnel, Layout of the Housekeeping Department overview of sub section of housekeeping department, Role of housekeeping in other institutes. (from 2nd unit to 1st).

UNIT-II (10 Hrs.)

Organization Chart of the Housekeeping Department: Hierarchy in small, medium, large and chain hotels, (from 1st to 2nd) Identifying Housekeeping Responsibilities, Duties and Responsibilities of Housekeeping staff, Different types of room in a hotel along with their status, standard supplies & amenities of a guest room. (New).

UNIT-III (12 Hrs.)

Cleaning Organisation: Principles of cleaning, hygiene and safety factors in cleaning, Methods of organizing cleaning, Frequency of cleaning daily, periodic, special, Design features that simplify cleaning, Use and care of Equipment.
Cleaning of Guest Room: type of soil, nature of soil, standard of cleaning, Cleaning of public area,
Housekeeping Inventories: equipment, agents, supplies, linen, uniform (new).

UNIT-IV (12 Hrs.)

Pest Control: Areas of infestation, Preventive measures and Control measure (Sem. 2 to Sem. 1)
Waste Disposal and Pollution Control: Solid and liquid waste, sullage and sewage, disposal of solid waste, Sewage treatment, Pollution related to hotel industry, Water pollution, sewage pollution, Air pollution, noise pollution, thermal pollution, Legal Requirements
Inter Departmental Relationship: With Front Office, With Maintenance, With Security, With Stores, With Accounts, With Personnel, Use of Computers in House Keeping department.

Recommended Books

1. Joan C. Branson & Margaret, 'Hotel Hostel and Hospital Housekeeping'.
2. 'Lennox', ELBS with Hodder & Stoughten Ltd.
3. Sudhir Andrews, 'Hotel House Keeping a Training Manual', Tata McGraw Hill.
4. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
5. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)', CRC Publisher.
6. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations', John Wiley Publications.
7. Tucker Schneider, 'The Professional Housekeeper', Wiley Publications.
8. Manoj Madhukar, 'Professional Management of Housekeeping', Rajat Publications.

FOUNDATION COURSE IN FOOD PRODUCTION LAB.

Subject Code: BHOM2-105 **L T P C**
0 0 6 3

EXPERIMENTS
PART–A

S. NO.	TOPICS	METHODS
1	i) Equipment - Identification, Description, Uses & handling ii) Hygiene - Kitchen etiquettes, Practices & knife handling iii) Safety and security in kitchen	Demonstrations & simple applications
2	i) Vegetables - classification ii) Cuts - julienne, jardinière, macedoines, brunoise, payssane, mignonette, dices, cubes, shred, mirepoix iii) Preparation of salad dressings	Demonstrations & simple applications by students
3	Identification and Selection of Ingredients - Qualitative and quantitative measures.	Market survey/tour
4	i) Basic Cooking methods and pre-preparations ii) Blanching of Tomatoes and Capsicum iii) Preparation of concasse iv) Boiling (potatoes, Beans, Cauliflower, etc) v) Frying - (deep frying, shallow frying, sautéing) Aubergines, Potatoes, etc. vi) Braising - Onions, Leeks, Cabbage vii) Starch cooking (Rice, Pasta, Potatoes)	Demonstrations & simple applications by students
5	i) Stocks - Types of stocks (White and Brown stock) ii) Fish stock iii) Emergency stock iv) Fungi stock	Demonstrations & simple applications by students
6	Sauces - Basic mother sauces Béchamel Espagnole Volute Hollandaise Mayonnaise Tomato	Demonstrations & simple applications
7.	Egg cookery - Preparation of variety of egg dishes Boiled (Soft & Hard) Fried (Sunny side up, Single fried, Bull's Eye, Double fried) Poaches Scrambled Omelette (Plain, Stuffed, Spanish) En cocotte (eggs Benedict)	Demonstrations & simple applications by students
8.	Simple Salads:	Demonstration by instructor and

	Cole slaw, Potato salad, Beet root salad, Green salad, Fruit salad, Consommé Simple Egg preparations: Scotch egg, Assorted omelettes, Oeuf Florentine Oeuf Benedict Oeuf Farci Oeuf Portuguese Oeuf Deur Mayonnaise Soups Preparations: Cream Soups Puree Soups Consomme Simple potato preparations Baked potatoes Mashed potatoes French fries Roasted potatoes Boiled potatoes Lyonnais potatoes Allumettes Vegetable preparations Boiled vegetables Glazed vegetables Fried vegetables Stewed vegetables. Sandwiches Open Club Closed Canapé Zukuskis Pin wheel Checkers board	applications by students
9.	Demonstration & Preparation of simple menu	Demonstrations & simple applications by students

PART-B

S. NO.	TOPICS	METHOD
10	Equipment Identification Uses and handling Ingredients - Qualitative and quantitative measures	Demonstration by instructor and applications by students
11	**BREAD MAKING** Demonstration & Preparation of Simple and enriched bread recipes Bread Loaf (White and Brown) Bread Rolls (Various shapes) French Bread Brioche	Demonstration by instructor and applications by students
12	**SIMPLE CAKES** Demonstration & Preparation of Simple and enriched Cakes, recipes Sponge, Genoise, Fatless, Swiss roll Fruit Cake Rich Cakes Dundee Madeira	
13	**SIMPLE COOKIES** Demonstration and Preparation of simple cookies like Nan Khatai Golden Goodies Melting moments Swiss tart Tri colour biscuits Chocolate chip Cookies Chocolate Cream Fingers Bachelor Buttons.	Demonstration by instructor and applications by students
14	**HOT / COLD DESSERTS** Caramel Custard, Bread and Butter Pudding Queen of Pudding Soufflé – Lemon / Pineapple Mousse (Chocolate Coffee) Bavaroise Diplomat Pudding Apricot Pudding Steamed Pudding - Albert Pudding, Cabinet Pudding	Demonstration by instructor and applications by students

FOUNDATION COURSE IN FOOD & BEVERAGE SERVICE LAB.

Subject Code: BHOM2 - 106 **L T P C**
0 0 4 2

1. Familiarization of F&B Service equipment
2. Basic Technical Skills
   a) Task-01: Holding Service Spoon & Fork
   b) Task-02: Carrying a Tray / Salver
   c) Task-03: Laying a Table Cloth
   d) Task-04: Changing a Table Cloth during service
   e) Task-05: Placing meal plates & Clearing soiled plates
   f) Task-06: Stocking Sideboard
   g) Task-07: Service of Water
   h) Task-08: Using Service Plate & Crumbing Down
   i) Task-09: Napkin Folds
   j) Task-10: Changing dirty ashtray
   k) Task-11: Wiping of Tableware, Chinaware, Glassware
3. **Preparation for Service (restaurant)**
   a) Organizing Mise-en-scene
   b) Organizing Mise-en-Place
   c) Opening, Operating & Closing duties
4. Briefing/debriefing
5. Tea & Coffee Service

FOUNDATION COURSE IN FRONT OFFICE LAB.

Subject Code: BHOM2-107 **L T P C**
0 0 2 1

1. a) Grooming and Hospitality etiquettes.
   b) Personality traits of front office personnel
2. a) Identification of equipment and furniture used in Front Office Department
   b) Front Desk Counter and Bell Desk
3. Countries, their capitals, currencies, airlines and their flags
4. Role Play
   a) Reservations: FIT, Corporate guest and group.
   b) Luggage Handling: FIT, Walk-in, Scanty Baggage, regular, crew and group
5. Great Personalities of Hotel Industry (min 3 personalities to be given as assignment).

FOUNDATION COURSE IN ACCOMMODATION OPERATIONS LAB.

Subject Code: BHOM2-108 **L T P C**
0 0 2 1

1. Cleaning Equipment (manual and mechanical)
   a) Familiarization
   b) Different parts
   c) Function
   d) Care and maintenance

2. Cleaning Agent
   a) Familiarization according to classification
   b) Function
3. Maid's trolley
   a) Contents
   b) Trolley setup
4. Sample Layouts of Guest Rooms
   a) Single room
   b) Double room
   c) Twin room
   d) Suite
5. Guest Room Supplies and Position
   a) Standard room
   b) Suite
   c) VIP room special amenities
6. Public Area Cleaning Procedure

Silver/ Epns
   a) Plate powder method
   b) Polivit method
   c) Proprietary solution (Silvo)

Brass
   a) Traditional/ domestic 1 Method
   b) Proprietary solution 1 (brasso)

Glass
   a) Glass cleanser
   b) Economical method(newspaper)

Wall- care and maintenance of different types and parts
   a) Skirting
   b) Dado
   c) Different types of paints (distemper Emulsion, oil paint etc.)

PRINCIPLES OF FOOD SCIENCE

Subject Code: BHOM2-156 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at preparing student to fully understand importance of healthy diet in commercial catering and procedures used therein.

UNIT-I (11 Hrs.)

Definition and scope of food science and Its inter-relationship with food chemistry, food microbiology and food processing.

Carbohydrates: Introduction, Effect of cooking (gelatinization and retro gradation), Factors affecting texture of carbohydrates (Stiffness of CHO gel & dextrinization, Uses of carbohydrates in food preparations

Fat & Oils: Classification (based on the origin and degree of saturation), Autoxidation (factors and prevention measures), Flavour reversion, Refining, Hydrogenation & winterisation, Effect of heating on fats & oils with respect to smoke point, Commercial uses of fats (with emphasis on shortening value of different fats)

UNIT-II (10 Hrs.)

Proteins: Basic structure and properties, Type of proteins based on their origin (plant/animal), Effect of heat on proteins (Denaturation, coagulation), Functional properties of proteins (Gelation, Emulsification, Foamability, Viscosity), Commercial uses of proteins in different food preparations (like Egg gels, Gelatin gels, Cakes, Confectionary items, Meringues, Soufflés, Custards, Soups, Curries etc.).

UNIT-III (09 Hrs.)

Food Processing: Definition, Objectives, Types of treatment, Effect of factors like heat, acid, alkali on food constituents.

Evaluation of Food: Objectives, Sensory assessment of food quality, Methods, Introduction to proximate analysis of Food constituents, Rheological aspects of food.

UNIT-IV (10 Hrs.)

Emulsions: Theory of emulsification, Types of emulsions, Emulsifying agents, Role of emulsifying agents in food emulsions.

Colloids: Definition, Application of colloid systems in food preparation.

Flavour: Definition, Description of food flavours (tea, coffee, wine, meat, fish spices.

Browning: Types (enzymatic and non-enzymatic), Role in food preparation, Prevention of undesirable browning.

Recommended Books

1. C.H. Robinson, M.R. Lawlar, W.L. Chenoweth and A.E. Garwick, 'Normal and Therapeutic Nutrition', Macmillan Publishing Co., **1986.**
2. M.S. Swaminathan, 'Essentials of Food and Nutrition VI: Fundamental Aspects VII Applied Aspects', **1985.**
3. O. Hughes and M. Bennion, 'Introductory Foods', Macmillan Company, **1970.**
4. S.R. Williams, 'Nutrition and Diet Therapy', C.V. Mosby Co., **1989.**
5. H. Guthrie, 'Introductory Nutrition', C.V. Mosby Co., **1986.**

APPLICATIONS OF COMPUTERS

Subject Code: BHOM2-157 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The objective of this course is to make students acquaint with the information technology will help in developing contemporary skills.

UNIT-I (09 Hrs.)

Automation in The Hospitality Industry:

Information Concepts and Processing: Definitions, Need, Quality and Value of Information, Data Processing Concepts.

Elements of Computer System-Definition, Characteristics of Computers & Limitations.

Generations of Computers and Types of computers.

Computer & its Application in the Hospitality Industry.

UNIT-II (11 Hrs.)

Essentials of Computer Systems:

Components of Computers- Input/output Units, Keyboards, Touch screen terminals, Other Input devices, Monitors, Printers, Common I/O units in the hospitality industry.

The central processing unit, Read Only Memory (ROM), Random access Memory (RAM)

External storage devices- Magnetic tapes, USB Drives, hard Drives, CD Technology and Virtual Storage.

Computer Security: Computer Virus and Antivirus.

UNIT-III (10Hrs.)

Basics of Computer Software:

Meaning of Software, Relationship between Hardware and Software.
Types of Software- Meaning of System, Application and Service Software.
Basics of Microsoft Office- Word, Excel, Publisher and power point (Meaning & Importance) & Its Applications in Tourism and Hospitality Industry

UNIT-IV (10 Hrs.)

Network:

World Wide Web; The Internet & The Hospitality Industry, Email, Browsing & Searching.
Networks Types– LAN, MAN, WAN and their Comparisons.
Network Topologies-Bus, Star, Ring, Tree, Mash &Hybrid.
Guided Media-Fiber Optics Cables, Twisted Cables, Co-axial Cables.

PRACTICALS

Word Processing, Spread Sheets and Presentations

a) Generic application software in hospitality -Word processing software, working with soft copy, on-screen editing techniques, formatting documents, special features, Use of word processors in preparing simple forms, printing of documents
b) Electronic spreadsheet software, spreadsheet design, creating a spreadsheet, updating data & recalculations, common spreadsheet commands, graphics capability, special features, use of spreadsheet in hospitality business transaction in maintaining accounts
c) Power point presentations
d) Internet usage
e) Audio visual equipment: Various audio visual equipment used in hotel, Care and cleaning of overhead projector, slide projector, LCD and power point presentation units, Maintenance of computers, Care and cleaning of PC, CPU, Modem, UPS, Printer, Laptops, Sensors – Various sensors used in different locations of a hotel – type, uses and cost effectiveness.

Recommended Books

1. Thomas Bartee, 'Digital Computer Design'.
2. V. Rajaraman, 'Introduction to Computer Science'.
3. B. B. Beyer, 'Flowcharting, Programming, Software, Designing and Computer Problem Solving'.
4. R.K. Taxali, 'PC Software Made Simple', Tata McGraw Hill.
5. V. Raganeman, 'Analysis & Designing Information System', Prentice Hall of India.

EXECUTIVE COMMUNICATION

Subject Code: BHOM2-158 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The primary objective of Executive Communications to introduce the student to various forms of written and oral communication that are necessary in real-life business situations, perfecting verbal and non-verbal communication skills. Further this course will try to develop overall personality of students.

UNIT-I (09 Hrs.)

Meaning, types, barriers and mechanism of communication, Non-verbal communication, organizational setting of executive communication, Face to face conversation.

UNIT-II (11 Hrs.)

Professional use of telephone, interviews, group discussion and presentations. Office Correspondence: Note Taking, Different Forms of Written Communication: Memos, Agenda, Minutes of a meeting, etc. Formal

Letters – Invitations, Request, Complaints, Orders and Thanks, Questionnaires / Comment Cards / Feedback forms.

UNIT-III (10 Hrs.)

Customer care, appropriate mannerism, handling customers, nature of complaint, handling objections, responding to a complaint & negotiation, resolving conflict.

UNIT-IV (10 Hrs.)

Basic personality traits - dress, address, gestures and manners; self-evaluation and development - identification of strength & weaknesses; overcoming hesitation & fear of facing public; corrective & developmental exercises - confidence building, mock interviews, role plays.

Recommended Books

1. Lynn Vander Wagen, 'Communication, Tourism & Hospitality', Hospitality Press Pvt. Ltd.
2. M.D. Jitendra, 'Organizational Communication', Rajat Publications.
3. Jon & Lisa Burton, 'International Skills in Travel & Tourism', Longman Group Ltd.
4. Rayon, V. Lesikar, John D. Petit, J.R. Richard D. Irwin, 'Business Communication', INC.

INTRODUCTION TO EVENT MANAGEMENT

Subject Code: BHOM2-159 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The purpose of this course is to acquire knowledge about the specialized field of "event management" and to become familiar with management techniques and strategies required for successful planning, promotion, implementation and evaluation of special events.

UNIT-I (11 Hrs.)

Why Event Management, Requirement of Event Manager, Analysing the events, Scope of the Event, Decision-makers, Technical Staff, Developing Record-Keeping Systems, Establishing Policies & Procedures.

UNIT-II (10 Hrs.)

Preparing a Planning Schedule, Organizing Tasks, Assigning Responsibility, and Communicating, Using the Schedule Properly, The Budget, Overall Planning tips, Checklists, Expert Resources, Computer Software Required.

UNIT-III (10 Hrs.)

Who are the people on the Event, Locating People, Clarifying Roles, Developing content Guidelines, Participant Tips, Reference Checks, Requirement Forms, Introduction, Fees &Honorariums, Expense Reimbursement, Travel Arrangements, Worksheets.

UNIT-IV (09 Hrs.)

Types of Events, Roles & Responsibilities of Event Management in Different Events, Scope of the Work, Approach towards Events.

Recommended Books

1. Devesh Kishore, Ganga Sagar Singh, 'Event Management: A.B. looming Industry and an Eventful Career', Haranand Publications Pvt. Ltd.
2. Swarup K. Goyal, 'Event Management', Adhyayan Publisher, **2009.**
3. Savita Mohan, 'Event Management & Public Relations', Enkay Publishing House.

FOUNDATION COURSE IN FOOD PRODUCTION - II

Subject Code: BHOM2-209 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: This paper will give the basic knowledge of cooking to the beginners. They will get versed with different kinds of ingredients, techniques of pre-preparation and cooking, knowledge of various stocks, sauces and soups, cereals, pulses, various cuts of vegetables and meats with their cookery.

UNIT-I

Menu Planning: Meaning Types and importance. Menu Engineering its need and Importance.

Introduction to Indian Cookery Basics:

Introduction to Indian food, Spices used in Indian cookery, Role of spices in Indian cookery, Indian equivalent of spices (names).

Masalas: Blending of spices, Different masalas used in Indian Cookery-Wet masalas, Dry masalas, Composition of different masalas, Varieties of masalas available in regional areas, Special masalas blends.

Gravies: Different types Haryali, Makhni, Shahi/white, Chopped Masala, karahai, Yellow Gravy Basic Tandoori Preparations Indian marinades and Pastes.

Commodities in Indian Cuisine: Souring Agents, colouring agents, tenderizing agent, Flavouring & Aromatic Agents, Spicing Agents.

Rice, Cereals & Pulses: Introduction, Classification and identification.

Cooking of rice, cereals and pulses, Varieties of rice and other cereals.

UNIT-II

Meat Cookery: Introduction to meat cookery, Cuts of beef/veal, Cuts of lamb/mutton, Cuts of pork, Variety meats (offal's), Poultry, (With menu examples of each).

Fish Cookery: Introduction to fish cookery, classification of fish with examples, Cuts of fish with menu examples, Selection of fish and shell fish, Cooking of fish(Effects of heat).

UNIT-III

Pastry: Short crust, Laminated, Choux, Hot water/Rough puff, Recipes and methods of preparation, Differences, uses of each pastry, Care to be taken while preparing pastry, Role of each ingredient, Temperature of baking pastry.

Flour: Structure of wheat, Types of Wheat, Types of Flour, Processing of Wheat – Flour, Uses of Flour in Food Production, Cooking of Flour (Starch)SIMPLE.

Breads: Principles of bread making, Simple yeast breads, Role of each ingredient in break making, Baking temperature and its importance.

Pastry Creams: Basic pastry creams, Uses in confectionery, Preparation and care in production.

UNIT-IV

Basic Commodities: Milk-Introduction, Processing of Milk, Pasteurisation – Homogenisation, Types of Milk – Skimmed and Condensed, Nutritive Value, Cream-Introduction, Processing of Cream, Types of Cream Cheese-Introduction, Processing of Cheese, Types of Cheese, Classification of Cheese, Curing of Cheese, Uses of Cheese Butter-Introduction, Processing of Butter, Types of Butter. Sugar: Its Importance, types of sugar, cooking of Sugar- Various Temperature.

Recommended Books

1. Le Rol A. Polsom, 'The Professional Chef', 4th Edn.
2. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons INC.
3. Kinton & Cessarani, 'Theory of Catering'.
4. K. Arora, 'Theory of Cookery', Frank Brothers.
5. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.
6. Philip E. Thangam, 'Modern Cookery', Vol.-I, Orient Longman.

7. Kinton & Cessarani, 'Practical Cookery'.

FOUNDATION COURSE IN FOOD & BEVERAGE SERVICE -II

Subject Code: BHOM2-210 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, and procedures among trainees. The students will be well versed with menu planning and sale control system.

UNIT-I (09 Hrs.)

Types of Food Service: Silver service, American service, French service, Russian service, Guerdon service, Assisted service, Self-service, Single point service, Specialised Service.

UNIT-II (11 Hrs.)

Menu Planning: Origin of Menu**,** Objectives of Menu Planning, Factors to be consider while planning a menu, Menu terminology, Types of Menu, Courses of French Classical Menu-Sequence, Examples from each course, Cover of each course, Accompaniments, French Names of dishes.
Types of Meals: Early Morning Tea, Breakfast (English, American Continental, Indian), Brunch, Lunch, Afternoon/High Tea, Dinner, Supper.

UNIT-III (10 Hrs.)

Room Service: Introduction, personnel, taking the order, routing the order, preparing the order, delivering the order, providing amenities, Room service menu, sequence of service, Forms & formats.
Sale Control System: KOT/Bill Control System (Manual)-Triplicate Checking System, Duplicate Checking System, Check and bill system, Service with order, computerized system, circumstantial KOT, Alcoholic Beverage order, Billing.

UNIT-IV (10 Hrs.)

Tobacco: History, Processing for cigarettes, pipe tobacco & cigars.
Cigarettes – Types and Brand names, Pipe Tobacco – Types and Brand names.
Cigars: shapes, sizes, colours and Brand names, Care and Storage of cigarettes& cigars.

Recommended Books

1. Bobby George &Sandeep Chatterjee, 'Food & Beverage Service', Jaico Publishing House.
2. R. Singaravelavan, 'Food & Beverage Service', Oxford University Press, New Delhi.
3. Dennis R. Lillicrap. & John.A. Cousins, 'Food & Beverage Service', ELBS.
4. Sudhir Andrews, 'The Waiter Handbook', Grahm Brown', Global Books & Subscription Services, New Delhi.
5. Vijay Dhawan, 'Food and Beverage Service'.

FOUNDATION COURSE IN FRONT OFFICE-II

Subject Code: BHOM2-211 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at familiarising the students with various functions of front office and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills.

UNIT-I (11 Hrs.)

Tariff Structure: Tariff Structure, Rack Rate, Discounted rates, Tariff card and its use, Hotel Day rate, Basis of Charging Room Rent, Various factors affecting Room rent, Fixing Room Tariffs through Cost based pricing & Market based pricing, Rule of Thumb, Hubbart formula.

Front Office Coordination, Meal Plans and Type of Guests, Role of Tour operators and Travel agents in hotel business, Meal Plans –Type, needs and use of such plans, Type of Guests – FIT, VIP, CIP, GIT, Business travellers, Special interest tours, domestic, foreigner etc., Front Office coordination with different departments in hotels.

UNIT-II (10 Hrs.)

Guest Cycle and Reservations: Introduction to guest cycle – Pre arrival, Arrival, During guest stay, Departure and After departure, Reservation and its importance, Basic tools of reservation – Room Status Board, ALC, DCC with formats, Handling reservation and reservation form with formats, Modes of Payment while reservation - an introduction, Sources of Reservation, Systems of Reservation, Types of Reservations, Cancellations and Amendments, Reservation reports and statistics
Overbooking, Upselling, no show, Walk-in guest, scanty baggage, stay over, over stay, under stay, early arrival, turn away, time limit, overstay etc.

UNIT-III (12 Hrs.)

Registration: Registration and its importance, Types of registration records – Bound book register, loose leaf register and Guest Registration Card (GRC) and their formats
Guest Handling: Pre-registration activities, Procedure of Guest Handling – Pre arrival, On Arrival and Post Arrival procedures, handling reserved guests, Procedure for Handling Free Individual Traveller (FIT), Chance guests, VIP, Group arrival, Foreigner guest (C-forms, Foreign currency exchange), Single Lady guest, Corporate guest, Layover passenger, Check-in for guest holding Discount voucher, Turn-away guest.

UNIT-IV (12 Hrs.)

Front Desk Functions: Procedure for Room Assignment, Room not clear, Wash and Change Room, Complimentary stay, Suite Check-in, Upgrading a guest, Downgrading a guest, Handling request for Late Check-out, Precautions for Scanty Baggage guest, Guest Stationery, Handling request for Rental Equipment, Up selling, Material Requisition, Shift Briefing, Morning and Afternoon Shift Handover, Night Shift Handover, Guest Relations, Courtesy Calls, Room amenities for Corporate/VVIP/CIP guest, Handling Awkward guests, Room Change Procedure, Handling Mails, Message and Paging, Key control procedures.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual'.
2. Jatashankar R. Tewari, 'Front office operations and Management'.
3. Colin Dix, Chris Baird, 'Front Office Operations'.
4. Anutosh Bhakta, 'Professional Hotel Front Office Management'.
5. James. A. Bardi, 'Hotel Front Office Management'.
6. S.K. Bhatnagar, 'Front Office Operation Management'.
7. Micheal Kasavana and Brooks, 'Managing Front Office Operations'.
8. Sue Baker & Jermy Huyton, 'Principles of Front Office Operations'.

FOUNDATION COURSE IN ACCOMMODATION OPERATIONS - II

Subject Code: BHOM2-212 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organisation of housekeeping, its systems and functions. A blend of theory and practical will be used to develop sensitivity and high work ethics towards guest care and cleanliness and pest control.

UNIT-I (11 Hrs.)

Cleaning Agents: General Criteria for selection, Polishes, Floor seats, Use, care and Storage, Distribution and Controls.

Area Cleaning: Guest rooms, Front-of-the-house Areas, Back-of-the house Areas, Work routine and associated problems e.g. high traffic areas, Façade cleaning etc.

Water Systems in Hotel: Water distribution system in a hotel, Cold water systems in India, Hardness of water, water softening, base exchange method (Demonstration), Cold water cistern swimming pools, Hot water supply system in hotels, Flushing system, water taps, traps and closets Classification, Use of Eco-friendly products in Housekeeping. (HE).

UNIT-II (10 Hrs.)

Composition, Care and Cleaning of Different Surfaces: Metals, Glass, Leather, Leatherites, Rexines, Plastic, Ceramics, Wood, Wall finishes, Floor Finishes.

UNIT-III (12 Hrs.)

Routine Systems and Records of House Keeping (3rd To 2nd)

Department: Reporting Staff placement, Room Occupancy Report, Guest Room Inspection, Entering Checklists, Floor Register, Work Orders, Log Sheet., Lost and Found Register and Enquiry File, Maid's Report and Housekeeper's Report, Handover Records, Guest's Special Requests Register, Record of Special Cleaning, Call Register, VIP Lists Guest room layout, type of bed & mattresses.

UNIT-IV (12 Hrs.)

Keys: Types of keys, Computerized key cards, Key control.

Overview of Maintenance Department: Roll, Responsibilities& Importance of maintenance department in the hotel industry with emphasis on its relation with other departments of the hotel. Preventive and breakdown maintenance, comparisons (HE).

Recommended Books

1. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELBS with Holder & Stoughton Ltd.
2. Sudhir Andrews, 'Hotel House Keeping a Training Manual', Tata McGraw Hill.
3. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
4. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)' CRC Publisher.
5. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations', 2nd Edn. Wiley Publications.
6. Tucker Schneider, 'The Professional Housekeeper', Wiley Publications.
7. Manoj Madhukar, 'Professional Management of Housekeeping', Rajat Publications.

ENVIRONMENTAL SCIENCE

Subject Code: BESE0-101 **L T P C** **Duration: 26 Hrs.**
2 0 0 2

Course Objectives:

1. To identify global environmental problems arising due to various engineering/industrial/ and technological activities and the science behind these problems
2. To realize the importance of ecosystem and biodiversity for maintaining ecological balance.
3. To identify the major pollutants and abatement devices for environmental management and sustainable development.
4. To estimate the current world population scenario and thus calculating the economic growth, energy requirement and demand.
5. To understand the conceptual process related with the various climatologically associated problems and their plausible solutions.

UNIT-1

1. The Multidisciplinary Nature of Environmental Studies

Definition, scope and importance. Need for public awareness.

2. Natural Resources

Renewable and Non-renewable Resources:

Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
(g) Role of an individual in conservation of natural resources.
(h) Equitable use of resources for sustainable lifestyles.

UNIT-1I

3. Ecosystems

(a) Concept of an ecosystem.
(b) Structure and function of an ecosystem.
(c) Producers, consumers and decomposers.
(d) Energy flow in the ecosystem.
(e) Ecological succession.
(f) Food chains, food webs and ecological pyramids.
(g) Introduction, types, characteristic features, structure and function of the following ecosystem:
    i) Forest ecosystem.
    ii) Grassland ecosystem.
    iii) Desert ecosystem.
    iv) Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).

4. Biodiversity and its Conservation

(a) Introduction – Definition: genetic, species and ecosystem diversity.
(b) Biogeographical classification of India.
(c) Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and
(d) option values.
(e) Biodiversity at global, national and local levels.
(f) India as a mega-diversity nation.
(g) Hot-spots of biodiversity.
(h) Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.
(i) Endangered and endemic species of India.
(j) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-1II

5. Environmental Pollution

Definition

(a) Causes, effects and control measures of:
  i) Air pollution
  ii) Water pollution
  iii) Soil pollution
  iv) Marine pollution
  v) Noise pollution
  vi) Thermal pollution
  vii) Nuclear pollution

(b) Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

(c) Role of an individual in prevention of pollution.

(d) Pollution Case Studies.

(e) Disaster management: floods, earthquake, cyclone and landslides

6. Social Issues and the Environment

(a) From unsustainable to sustainable development

(b) Urban problems and related to energy

(c) Water conservation, rain water harvesting, Watershed Management

(d) Resettlement and rehabilitation of people; its problems and concerns. Case studies.

(e) Environmental ethics: Issues and possible solutions

(f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.

(g) Wasteland reclamation

(h) Consumerism and waste products

(i) Environmental Protection Act

(j) Air (Prevention and Control of Pollution) Act

(k) Water (Prevention and control of Pollution) Act

(l) Wildlife Protection Act

(m) Forest Conservation Act

(n) Issues involved in enforcement of environmental legislation

(o) Public awareness

UNIT-1V

7. Human Population and the Environment

(a) Population growth, variation among nations

(b) Population explosion – Family Welfare Programmes

(c) Environment and human health

(d) Human Rights

(e) Value Education

(f) HIV/AIDS

(g) Women and Child Welfare

(h) Role of Information Technology in Environment and Human Health

(i) Case Studies

8. Field Work

(a) Visit to a local area to document environmental assets river/

(b) forest/grassland/hill/mountain

(c) Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
(d) Study of common plants, insects, birds
(e) Study of simple ecosystems-pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Recommended Books

1. J.G. Henry and G.W. Heinke, 'Environmental Sc. & Engineering', Pearson Education, **2004.**
2. G.B. Masters, 'Introduction to Environmental Engg. & Science', Pearson Education, **2004.**
3. Erach Bharucha, 'Textbook for Environmental Studies', UGC, New Delhi.

FOUNDATION COURSE IN FOOD PRODUCTION –II LAB.

Subject Code: BHOM2-213 **L T P C**
0 0 6 3

PRACTICALS OF FOOD PRODUCTION

S. No.	Topics	Method
1	Meat – Identification of various cuts, Carcass demonstration Preparation of basic Cuts-Lamb and Pork Chops, Tornado, Fillet, Steaks and Escalope Fish-Identification & Classification Cuts and Folds of fish	Demonstrations & simple applications
2	Identification, Selection and processing of Meat, Fish and poultry. Slaughtering and dressing	Demonstrations at the site in local Area/Slaughtering house/Market
3	Preparation of menu **Salads & Soups**- Waldrof salad, Fruit salad, Russian salad, salade nicoise, **Soups preparation:** Chowder, Bisque, Veloute, Broth International soups	Demonstration by instructor and applications by students
4	**Chicken, Mutton and Fish Preparations**- Fish orly**,** a la anglaise, colbert, meuniere, poached, baked Entrée-Lamb stew, hot pot, shepherd's pie, grilled steaks &lamb/Pork chops, Roast chicken, grilled chicken, Leg of Lamb, Beef	Demonstration by instructor and applications by students
5	**Indian Cookery**- Rice dishes, Breads, Main course, Basic Vegetables, Paneer Preparations Marinades, Paste and Tandoori Preparation of Meat, fish Vegetables and Paneer	Demonstration by instructor and applications by students

BAKERY & PATISSERIE

S. No.	Topics	Method
1	**Pastry:** Demonstration and Preparation of dishes using varieties of Pastry	Demonstration by instructor and applications by students

	Short Crust – Jam tarts, Turnovers Laminated – Palmiers, Khara Biscuits, Danish Pastry, Cream Horns Choux Paste – Eclairs, Profiteroles	
2	**Cold Sweet** Honeycomb mould Butterscotch sponge Coffee mousse Lemon sponge Trifle Blancmange Chocolate mousse Lemon soufflé	Demonstration by instructor and applications by students
3	**Hot Sweet** Bread & butter pudding Caramel custard Albert pudding Christmas pudding	Demonstration by instructor and applications by students
4	**Indian Sweets** Simple ones such as chicoti, gajjar halwa, kheer	Demonstration by instructor and applications by students

FOUNDATION COURSE IN FOOD & BEVERAGE SERVICE-II LAB.

Subject Code: BHOM2-214 **L T P C**
0 0 4 2

1. Review Of Semester -1

2. Procedure For Service Of A Meal

a) Task-01: Taking Guest Reservations
b) Task-02: Receiving & Seating of Guests
c) Task-03: Order taking & Recording
d) Task-04: Order processing (passing orders to the kitchen)
e) Task-05: Sequence of service
f) Task-06: Presentation & Encashing the Bill
g) Task-07: Presenting & collecting Guest comment cards
h) Task-08: Seeing off the Guests

3. Table Lay-Up & Service

a) Task-01: A La Carte Cover
b) Task-02: Table d' Hote Cover
c) Task-03: English Breakfast Cover
d) Task-04: American Breakfast Cover
e) Task-05: Continental Breakfast Cover
f) Task-06: Indian Breakfast Cover
g) Task-07: Afternoon Tea Cover
h) Task-08: High Tea Cover

4. Tray/Trolley Set-Up & Service

a) Task-01: Room Service Tray Setup

b) Task-02: Room Service Trolley Setup

5. Social Skills

a) Task-01: Handling Guest Complaints
b) Task-02: Telephone manners
c) Task-03: Dining & Service etiquettes

6. Special Food Service - (Cover, Accompaniments & Service)

a) Task-01: Classical Hors d' oeuvre- Oysters, Caviar, Smoke Salmon, Pate de Foie Gras, Snails, Melon, Grapefruit, Asparagus
b) Task-02: Cheese
c) Task-03: Dessert (Fresh Fruit & Nuts)

7. Service of Tobacco

a) Cigarettes and Cigar
b) Compiling of a menu in French, Service of Non-alcoholic beverages.

FOUNDATION COURSE IN FRONT OFFICE –II LAB.

Subject Code: BHOM2-215 **L T P C**
0 0 2 1

1. **Review of Semester-1**
   a) Welcoming/Greeting of guest
   b) Providing Information to the Guest
   c) Telephone handling, how to handle enquiries
   d) Suggestive selling
2. **Filling up of various Forms and Formats**
   a) Registrations: FIT, VIP, Corporate, Groups/Crew
   b) Security Deposit Box Handling
   c) Credit Card Handling Procedure
   d) Foreign Currency Exchange Procedure
3. **Introduction to PMS**
   a) Hot function keys
   b) Create and update guest profiles
   c) Make FIT reservation
   d) Send confirmation letters
   e) Printing registration cards
   f) Make an Add-on reservation
   g) Amend a reservation
   h) Cancel a reservation-with deposit and without deposit
   i) Log onto cashier code
   j) Process a reservation Deposit
   k) Pre-register a guest
   l) Put message and locator for a guest
   m) Put trace for guest
   n) Check in a reserved guest
   o) Check in day use
   p) Check-in a Walk- in guest
   q) Maintain guest history
   r) Issue a new key

s) Verify a key
t) Cancel a key
u) Issue a duplicate key
v) Extend a key
w) Programme keys continuously
x) Re-programme keys
y) Programme one key for two rooms

FOUNDATION COURSE IN ACCOMMODATION OPERATIONS-II LAB.

Subject Code: BHOM2-216 **L T P C**
0 0 2 1

1. Review of Semester-1

2. Servicing guest room (checkout/ occupied and vacant)

Room

a) Task 1- open curtain and adjust lighting
b) Task 2-clean ash and remove trays if any
c) Task 3- strip and make bed
d) Task 4- dust and clean drawers and replenish supplies
e) Task 5-dust and clean furniture, clockwise or anticlockwise
f) Task 6- clean mirror
g) Task 7- replenish all supplies
h) Task 8-clean and replenish minibar
i) Task 9-vaccum clean carpet
j) Task 10- check for stains and spot cleaning

Bathroom

a) Task 1-disposed soiled linen
b) Task 2-clean ashtray
c) Task 3-clean WC
d) Task 4-clean bath and bath area
e) Task 5-wipe and clean shower curtain
f) Task 6- clean mirror
g) Task 7-clean tooth glass
h) Task 8-clean vanity unit
i) Task 9- replenish bath supplies
j) Task 10- mop the floor

3. Bed making supplies (day bed/night bed)

a) Step 1-spread the first sheet (from one side)
b) Step 2-make miter corner (on both corner of your side)
c) Step 3- spread second sheet (upside down)
d) Step 4-spread blanket
e) Step 5- Spread crinkle sheet
f) Step 6- make two folds on head side with all three (second sheet, blanket and crinkle sheet)
g) Step 7- tuck the folds on your side
h) Step 8- make miter corner with all three on your side
i) Step 9- change side and finish the bed in the same way
j) Step 10- spread the bed spread and place pillow

4. **Records**

a) Room occupancy report
b) Checklist
c) Floor register
d) Work/ maintenance order]
e) Lost and found
f) Maid's report
g) Housekeeper's report
h) Log book
i) Guest special request register
j) Record of special cleaning
k) Call register
l) VIP list
m) Floor linen book/ register
n) Guest Room Inspection
o) Minibar management
p) Issue
q) Stock taking
r) Checking expiry date
s) Handling room linen/ guest supplies
t) Maintaining register/ record
u) Replenishing floor pantry
v) Stock taking
w) Guest handling
x) Guest request
y) Guest complaints

NUTRITION

Subject Code: BHOM2 -260 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at preparing student to fully understand importance of healthy diet in commercial catering and procedures used therein

UNIT-I (11 Hrs.)

Basic Aspects: Definition of the terms Health, Nutrition and Nutrients, Importance of Food – (Physiological, Psychological and Social function of food) in maintaining good health, Classification of nutrients.
Energy: Definition of Energy and Units of its measurement (Kcal), Energy contribution from macronutrients (Carbohydrates, Proteins and Fat), Factors affecting energy requirements, Concept of BMR, SDA, Thermodynamic action of food, Dietary sources of energy. Concept of energy balance and the health hazards associated with Underweight, Overweight.

UNIT-II (10 Hrs.)

Macro Nutrients: Carbohydrates-Definition, Classification (mono, di and polysaccharides), Dietary Sources, Functions, Significance of dietary fiber (Prevention/treatment of diseases)Lipids-Definition, Classification : Saturated and unsaturated fats, Dietary Sources, Functions ,Significance of Fatty acids (PUFAs, MUFAs, SFAs, EFA) in maintaining health, Cholesterol – Dietary sources and the Concept of dietary and blood cholesterol ,Proteins-Definition, Classification based upon amino acid composition,

Dietary sources, Functions, Methods of improving quality of protein in food (special emphasis on Soya proteins and whey proteins)

UNIT-III (10 Hrs.)

Macro Nutrients: Vitamins-Definition and Classification (water and fats soluble vitamins),Food Sources, function and significance of: Fat soluble vitamins (Vitamin A, D, E, K),Water soluble vitamins (Vitamin C, Thiamine, Riboflavin, Niacin, Cyanocobalamin Folic acid MINERALS-Definition and Classification (major and minor),Food Sources, functions and significance of :Calcium, Iron, Sodium, Iodine & Flourine WATER: Definition, Dietary Sources (visible, invisible), Functions of water, Role of water in maintaining health (water balance). BALANCED DIET: Definition, Importance of balanced diet, RDA for various nutrients – age, gender, physiological state

UNIT-IV (09 Hrs.)

Menu Planning: Planning of nutritionally balanced meals based upon the three foods group System-Factors affecting meal planning, Critical evaluation of few meals served at the Institutes/Hotels based on the principle of meal planning. Calculation of nutritive value of dishes/meals.

Mass Food Production: Effect of cooking on nutritive value of food (QFP).

Newer Trends in Food Service Industry in Relevance to Nutrition and Health: Need for introducing nutritionally balanced and health specific meals, Critical evaluation of fast foods, New products being launched in the market (nutritional evaluation)

Recommended Books

1. C.H. Robinson, M.R. Lawlar, W.L. Chenoweth and A.E. Garwick, 'Normal and Therapeutic Nutrition', Macmillan Publishing Co., **1986.**
2. Hughes, O, Bennion, 'Introductory Foods', Macmillan Company, **1970.**
3. S.R. Williams. 'Nutrition and Diet Therapy', C.V. Mosby Co., **1989.**
4. A.H. Guthrie, 'Introductory Nutrition', C.V. Mosby Co., **1986.**
5. S.A. Joshi, 'Nutrition and Dietetics', Tata McGraw Hill Publishing Co. Ltd., **1998.**
6. N.S. Mahay, M. Shadaksharaswamy, 'Foods: Facts and Principles', New Delhi International Publishers, **2001.**

BASICS OF TOURISM

Subject Code: BHOM2-261 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: This course shall introduce learner to tourism's growth and development. The course also highlights the role of tourism as an economic intervention and its significance in economy; Course discusses the global nature of tourism, tourism product and emerging trends in tourism industry. It is also important to appreciate the future of tourism.

UNIT-I (10 Hrs.)

Historical development of global tourism, Advances in transportation, Concept of Tourism: Definition and meaning of tourist, traveller, visitor, excursionist & transit visitor, International tourist & Domestic Tourist, Typologies of Tourists.

UNIT-II (09 Hrs.)

United Nations World Tourism Organisations (UNWTO) – Latest Years' Tourism highlights, Latest Indian Tourism Statistics, Future tourism scenario (Global and Indian). World Tourism Day: Background Concept, Themes, and Celebrations.

UNIT-III (10 Hrs.)

Concept of demand & supply in tourism, factors affecting demand and supply in tourism. Tourism product, Features of tourism product, Types of tourism product (TOPs, ROPs, BTEs), Difference of tourism product from other consumer products. Factors inhibiting growth of tourism.

UNIT-IV (10 Hrs.)

Emerging tourism trends – Eco tourism, Green tourism, Alternate tourism, Heritage tourism, Sustainable tourism, Cultural tourism.

Recommended Books

1. K. Bhatia, 'International Tourism: Fundamental and Practice', Sterling Publishers, New Delhi.
2. E.L. Hudman and D.E. Hawkins, 'Tourism in Contemporary Society: An Introductory Text', Prentice Hall, New Jersey.
3. K.K. Kamra and M. Chand, 'Basics of Tourism: Theory Operation and Practice', Kanishka, New Delhi.
4. D.E. Lundberg, 'The Tourist Business', Van Nostrand, New York.
5. R.C. Reinhold Mill and A.M. Morrison, 'The Tourism System'.
6. McIntosh, Robert, W. Goeldner, R. Charles, 'Tourism: Principles, Practices and Philosophies', John Wiley and Sons Inc., New York, **1990.**
7. P.N. Seth, 'Successful Tourism Management', Sterling Publisher, New Delhi.

ACCOUNTING FOR MANAGERS

Subject Code: BHOM2-262 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course intends to give learners an understanding of the accounting procedures in an organization. It will help to students to understand and apply the concepts of accounting to solve business problems.

UNIT-I (11 Hrs.)

Introduction to Accounting: Meaning and Definition, Types and Classification, Principles of accounting, Systems of accounting, Generally Accepted Accounting Principles (GAAP). Primary and Secondary Books.
Bank Reconciliation Statement: Meaning, Reasons for difference in Pass Book and Cash Book Balances, Preparation of Bank Reconciliation Statement (No Practical's). Trial balance: Meaning, method, advantage, limitations (practicals).

UNIT-II (10 Hrs.)

Final Accounts: Meaning, Procedure for preparation of Final Accounts, Difference between Trading Accounts, Profit & Loss Accounts and Balance Sheet, Adjustments (Only four): Closing Stock, Pre-paid Income and Expenses, Outstanding Income and Expenses, Depreciation.
Capital and Revenue Expenditure: Meaning, Definition of Capital and Revenue Expenditure, Income and Expenditure Account, Receipt and Payment Account (no practicals).

UNIT-III (09 Hrs.)

Cost Accounting, Cost Sheet/Tender/Marginal Costing & Break even Analysis, Budgetary Control.

UNIT-IV (10 Hrs.)

Financial Management: Meaning, aims, Nature, Scope, Objectives and functions of financial management. Sources of finance.
Working Capital Management: Significance Classification, Factors affecting working capital requirement.

Recommended Books

1. M. Pandey, 'Financial Management', Vikas Publishing, New Delhi.
2. M.Y. Khan, 'Financial Management', Tata Mc. Grand Hill Publishing Co. Ltd., New Delhi.
3. R.K. Sharma, and Shashi K. Gupta, 'Management Accounting', Kalyani Publisher, Ludhiana.

4. R.L. Gupta, 'Booking keeping & Accounting', Sultan Chand, New Delhi.
5. T.S. Grewal, 'Introduction to Accounting', S. Chand.
6. Khan and Jain, 'Cost Accountancy', Tata McGraw Hill.

FOOD PRODUCTION OPERATIONS

Subject Code: BHOM2-317 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: This paper will give the basic knowledge of cooking to the beginners. They will get versed with different kinds of regional cuisines, quantity food cooking/ volume feeding, indenting, various equipment used.

UNIT-1

Quantity Food Production Equipment: Equipment required for mass/volume feeding heat and cold generating equipment, Care and maintenance of this equipment, Modern developments in equipment manufacture.

Menu Planning: Basic principles of menu planning – recapitulation, Points to consider in menu planning for various volume feeding outlets such as Industrial, Institutional, Mobile Catering Units, Planning menus for School/college students, Industrial workers, Hospitals, Outdoor parties, Theme dinners, Transport facilities, cruise.

UNIT-2

Indenting: Principles of Indenting for volume feeding, Portion sizes of various items for different types of volume feeding, modifying recipes for indenting for large scale catering, Practical difficulties while indenting for volume feeding, PLANNING: Principles of planning for quantity food production with regard to Space allocation, Equipment selection, Staffing.

UNIT-3

Volume Feeding: Institutional and Industrial Catering, Types of Institutional & Industrial Catering, Problems associated with this type of catering, Scope for development and growth, Hospital Catering, Highlights of Hospital Catering for patients, staff, visitors, Diet menus and nutritional requirements, Off Premises Catering, Reasons for growth and development, Menu Planning and Theme Parties Concept of a Central Production Unit Problems associated with off-premises catering Mobile Catering Characteristics of Rail, Airline (Flight Kitchens and Sea Catering) Branches of Mobile Catering, Quantity Purchase & Storage, Introduction to purchasing, Purchasing system, Purchase specifications, Purchasing techniques, Storage.

UNIT-4

Regional Indian Cuisine: Introduction to Regional Indian Cuisine, Heritage of Indian, Cuisine, Factors that affect eating habits in different parts of the country, Cuisine and its highlights of different states/regions/communities to be discussed: Geographic location, Historical background, Seasonal availability, Special equipment, Staple diets, Specialty cuisine for festivals and special occasions.

States: Andhra Pradesh, Bengal, Goa, Gujarat, Karnataka, Kashmir, Kerala, Madhya Pradesh, Maharashtra, North Eastern States, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh/Uttaranchal.

Communities: Parsee, Chettinad, Hyderabadi, Lucknowi, Avadhi, Malbari/Syrian, Christian and Bohri

Discussions: Indian Breads, Indian Sweets, Indian Snacks.

Recommended Books

1. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons INC.
2. K. Arora, 'Theory of Cookery', Frank Brothers.
3. Fuller J. Barrie &Jenkins, 'Accompaniments & Garnishes from Waiter; Communicate'.
4. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.

5. Philip E. Thangam, 'Modern Cookery', Vol.-I, Orient Longman.

FOOD & BEVERAGE SERVICE OPERATIONS

Subject Code: BHOM2-318 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, and procedures among trainees. The students will be well versed with alcoholic beverages in detail.

UNIT-1

Alcoholic Beverage: Introduction and definition, Production of Alcohol: Fermentation and Distillation Process, Classification with examples.

Wines: Definition, History Classification with examples, Table/Still/Natural, Sparkling, Fortified, Aromatized, Production of each classification, Old World Wines: Principal wine regions wine laws, grape varieties, production and brand names (France, Germany, Italy, Spain, Portugal) New World Wines Principal wine regions wine laws, grape varieties, production and brand names, (India, Chile, South Africa,, Algeria, New Zealand, USA, Australia), Food & Wine Harmony, Storage of wines, Wine terminology.

UNIT-2

Dispense Bar: Introduction and definition, Bar layout – physical layout of bar, Bar stock – alcohol & non-alcoholic beverages, Bar equipment.

Beer: Introduction & Definition, Types of Beer, Production of Beer, Storage.

UNIT-3

Spirits: Introduction &Definition, Production of Spirit (Pot-still method, Patent still method) Production of Whisky, Rum, Gin, Brandy, Vodka, Tequila, Different Proof Spirits, American Proof, British Sikes Scale Gay - Lussac) OIML Scale.

UNIT-4

Aperitifs: Introduction and Definition, Different types of Aperitifs Vermouth (Definition, Types & Brand names), Bitters (Definition, Types & Brandnames)

Liqueurs: Definition & History, Production of Liqueurs, Broad Categories of Liqueurs (Herb, Citrus, Fruit/Egg, Bean & Kernel), Popular Liqueurs (Name, colour, predominant flavour & country of origin)..

Recommended Books

1. Dennis R. Lillicrap. & John A. Cousins, 'Food & Beverage Service', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.
3. Lillicrap & Cousins, 'Food & Beverage Service', ELBS.
4. John Fuller, 'Modern Restaurant Service', Hutchinson.
5. Grahm Brown, 'The Waiter Handbook', Global Books & Subscription Services, New Delhi.

FRONT OFFICE OPERATIONS

Subject Code: BHOM2-319 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at familiarizing the students with various functions of front office and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills.

UNIT-1

Computer Applications in Front Office Operation: Role of information technology in the hospitality industry, Factors for need of a PMS in the hotel, Factors for purchase of PMS by the hotel, Introduction to OPERA & Amadeus.

Control of Cash and Credit

UNIT-2

Front Office (Accounting): Accounting fundamentals, Guest and non-guest accounts, Accounting system (Non automated, semi-automated and fully automated).

UNIT-3

Check Out Procedures: Guest accounts settlement (Cash and credit, Indian currency and foreign currency, Transfer of guest accounts, Express checkout)

Night Auditing: Functions, Audit procedures (Non automated, semi-automated and fully automated).

UNIT-4

Front Office and Guest Safety and Security: Importance of security systems, Safe deposit, Key control, Emergency situations (Accident, illness, theft, fire, bomb).

French Expressions de politesse et les commander et Expressions encouragement, Basic conversation related to Front Office activities, such as, {Reservations (personal and telephonic), Reception (Doorman, Bell Boys, Receptionist etc.), Cleaning of Room & change of Room etc.}.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual', Tata McGraw Hill.
2. Karsavina & Brooks, 'Managing Front Office Operations', Educational Institution, HAMA.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar,
4. S.K.I. Bhavnagar, 'Front office Operation Management', Frank Brothers.
5. Karsavina & Brooks, 'Managing Front Office Operations'.
6. James Socrates Bard, 'Hotel Front Office Management', 4th Edn., Wiley International.

ACCOMMODATION OPERATIONS

Subject Code: BHOM2-320 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organisation of housekeeping, its systems and functions. A blend of theory and practical will be used to develop sensitivity and high work ethics towards guest care and linen room, uniforms, laundry and basics of flower arrangement.

UNIT-1

Linen Room: Activities of the Linen Room, Layout and equipment in the Linen Room, Selection criteria for various Linen Items & fabrics suitable for this purpose, Purchase of Linen, Calculation of Linen requirements, Linen control-procedures and records, Stocktaking- procedures and records, Recycling of discarded linen, Linen Hire.

UNIT-2

Uniforms: Advantages of providing uniforms to staff, Issuing and exchange of uniforms; type of uniforms, Selection and designing of uniforms, Layout of the Uniform room.

Sewing Room: Activities and areas to be provided, Equipment provided.

UNIT-3

Laundry: Commercial and On-site Laundry, Flow process of Industrial Laundering-OPL, Stages in the Wash Cycle, Laundry Equipment and Machines, Layout of the Laundry, Laundry Agents, Dry Cleaning, Guest Laundry/Valet service, Stain removal.

UNIT-4

Flower Arrangement: Flower arrangement in Hotels, Equipment and material required for flower arrangement, Conditioning of plant material, Styles of flower arrangements, Principles of design as applied to flower arrangement.

Indoor Plants: Selection and care.

Recommended Books

1. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELBS with Holder & Stoughton Ltd.
2. Sudhir Andrews, 'Hotel House Keeping a Training Manual', Tata McGraw Hill Ltd., New Delhi.
3. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
4. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)', CRC Publisher.
5. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations (II End.)', Wiley.
6. Tucker Schneider, 'The Professional Housekeeper', Wiley.
7. Manoj Madhukar, 'Professional Management of Housekeeping', Rajat Publications.

FOOD PRODUCTION OPERATIONS LAB.

Subject Code: BHOM2-321 **L T P C**
0 0 6 3

To formulate 36 sets of menus from the following dishes and to include more dishes from the respective regions.

Maharashtra, Awadhi, Bengal, Goa, Punjabi, South India (Tamilnadu, Karnataka, Kerala), Rajasthan, Gujarat, Hyderabad, Kashmiri:

Suggested Menus:

Maharastrian

MENU 01

Masala Bhat, Kolhapuri Mutton, Batata Bhajee, Masala Poori, Koshimbir, Coconut Poli.

MENU 02

Moong Dal Khichdee, Patrani Macchi, Tomato Saar, Tilgul Chapatti, Amti, Basundi.

AWADHI

MENU 01

Yakhni Pulao, Mughlai Paratha, Gosht Do Piaza, Badin Jaan, Kulfi with Falooda.

MENU 02

Galouti Kebab, karkhani, Gosht Korma, Paneer Pasanda, Muzzafar.

BENGALI

MENU 01

Ghee Bhat, Macher Jhol, Aloo Posto, Misti Doi.

MENU 02

Doi Mach, Tikoni Pratha, Baigun Bhaja, Payesh.

MENU 03

Mach Bhape, Luchi, Sukto, Kala Jamun.

MENU 04

Prawan Pulao, Mutton Vidalloo, Beans Foogath, Dodol.

GOAN

MENU 01

Arroz, Galina Xacutti, Toor Dal Sorak, Alle Belle.

MENU 02

Coconut Pulao, Fish Caldeen, Cabbage Foogath, Bibinca.

PUNJABI

MENU 01
Rada Meat, Matar Pulao, Kadhi, Punjabi Gobhi, Kheer.
MENU 02
Amritsari Macchi, Rajmah Masala, Pindi Chana, Bhaturas, Row Di Kheer.
MENU 03
Sarson Da Saag, Makki Di Roti, Peshawari Chole, Motia Pulao, Sooji Da Halwa.
MENU 04
Tandoori Roti, Tandoori Murg, Dal Makhani, Pudinia Chutny, Baingan Bhartha, Savian.
SOUTH INDIAN
MENU 01
Meen Poriyal, Curd Rice, Thoran, Rasam, Pal.
MENU 02
Tamarind Rice, Kori Gashi, Kalan, Sambhar, Savian Payasam.
MENU 03
Coconut Rice, Chicken Chettinad, Avial, Huli, Mysore Pak
RAJASTHANI
MENU 01
Gatte Ka Pulao, Lal Maas, Makki Ka Soweta, Chutny (Garlic), Dal Halwa.
MENU 02
Dal Batti Churma, Besan Ke Gatte, Ratalu Ki Subzi, Safed Mass.
GUJRATI
MENU 01
Sarki, Brown Rice, Salli Murg, Gujrati Dal, Methi Thepla, Shrikhand.
MENU 02
Gujrati Khichadi, Oondhiyu, Batata Nu Tomato, Osaman, Jeera Poori, Mohanthal.
HYDERABADI
MENU 01
Sofyani Biryani, Methi Murg, Tomato Kut, Hare Piaz ka Raita, Double Ka Meetha.
MENU 02
Kachi Biryani, Dalcha, Mirchi Ka Salan, Mix Veg. Raita, Khumani Ka Meetha.
KASHMIRI
Two menus may be formed out of the Dishes given as under:
Rice and Bread Preparations: Mutaegen, Pulao (Kashmiri), Plain Rice, Girdeh, Lawas
Meat Preparations: Gushtaba, Rista, Marchevangan korma, Macch Kofta, Yakhean Kaliya, Tabak Maaz, Rogon Josh
Vegetables and Potato: Ruwangan chaman, Choek wangan, Chaman Qaliyan Alleh Yakhean, Dum Aloo Kashmiri, Nader Palak, Razma Gogji
Sweet Dishes: Kongeh Phirin (Sooji phirni with Saffron), Aae't phirin (Wheat Flour Phirni), Halwa
Chutneys: Mujeh cheten, Ganda Cheten, Dueen cheten, Aleh cheten (pumpkin chutney)
Note: In addition to above each institute to formulate 08 (eight) set of regional menus including snacks, sweets etc.

FOOD & BEVERAGE SERVICE OPERATIONS LAB.

Subject Code: BHOM2-322 **L T P C**
0 0 2 1

1. Dispense Bar - Organizing Mise-en-place
Task-01: Wine service equipment
Task-02: Beer service equipment
Task-03: Cocktail bar equipment
Task-04: Liqueur / Wine Trolley
Task-05 Bar stock - alcoholic &non-alcoholic beverages
Task-06 Bar accompaniments & garnishes
Task-07 Bar accessories &disposables

2. Service of Wines
Task-01 Service of Red Wine
Task-02 Service of White/Rose Wine
Task-03 Service of Sparkling Wines
Task-04 Service of Fortified Wines
Task-05 Service of Aromatized Wines
Task-06 Service of Cider, Perry & Sake

3. Service of Aperitifs
Task-01 Service of Bitters
Task-02 Service of Vermouths

4. Service of Beer
Task-01 Service of Bottled &canned Beers
Task-02 Service of Draught Beers

5. Service of Spirits
Task-01 Service styles - neat/on-the-rocks/with appropriate mixers
Task-02 Service of Whisky
Task-03 Service of Vodka
Task-04 Service of Rum
Task-05 Service of Gin
Task-06 Service of Brandy
Task-07 Service of Tequila

6. Service of Liqueurs
Task-01 Service styles - neat/on-the-rocks/with cream/en frappe
Task-02 Service from the Bar
Task-03 Service from Liqueur Trolley

7. Wine & Drinks List
Task-01 Wine Bar
Task-02 Beer Bar
Task-03 Cocktail Bar

8. Matching Wines with Food
Task-01 Menu Planning with accompanying Wines
a) Continental Cuisine
b) Indian Regional Cuisine
Task-02 Table laying & Service of menu with accompanying Wines
a) Continental Cuisine

b) Indian Regional Cuisine

9. Matching Wines with Food

Task-01 Menu Planning with accompanying Wines

a) Continental Cuisine

b) Indian Regional Cuisine

Task-02 Table laying & Service of menu with accompanying Wines

a) Continental Cuisine

b) Indian Regional Cuisine

FRONT OFFICE OPERATIONS LAB.

Subject Code: BHOM2-323 **L T P C**
0 0 2 1

Course Objectives: Hands on practices of computer application (Hotel Management System) related to Front Office procedures, such as, Reservation, Registration, Guest History, Telephones, Housekeeping, Daily transactions), Front office Accounting Procedures Manual accounting, Machine accounting, Payable, Accounts Receivable, Guest History, Yield Management Role Play, Situation Handling).

Suggestive List of Task for Front Office Operation System

1	Hot function keys
2	Create and update guest profiles
3	Send confirmation letters
4	Print registration cards
5	Make FIT reservation & group reservation
6	Make an Add-on reservation
7	Amend a reservation
8	Cancel a reservation-with deposit and without deposit
9	Log onto cahier code
10	Process a reservation deposit
11	Pre-register a guest
12	Put message and locator for a guest
13	Put trace for guest
14	Check in a reserved guest
15	Check in day use
16	Check -in a walk-in guest
17	Maintain guest history
18	Make sharer reservation
19	Add a sharer to a reservation
20	Make A/R account
21	Take reservation through Travel Agent/Company/ Individual or Source
22	Make room change
23	Make check and update guest folios
24	Process charges for in-house guests and non-resident guests.
25	Handle allowances and discounts and packages
26	Process advance for in-house guest
27	Put routing instructions
28	Print guest folios during stay
29	Processing foreign currency exchange/ cheque exchange

30	Process guest check out by cash and credit card
31	Check out without closing folio-Skipper accounts
32	Handle paymaster folios
33	Check out using city ledger
34	Print guest folio during check out
35	Close bank at end of each shift
36	Check room rate and variance report
37	Tally Allowances for the day at night
38	Tally paid outs for the day at night
39	Tally forex for the day at night
40	Credit check report

ACCOMMODATION OPERATIONS LAB.

Subject Code: BHOM2-324 **L T P C**
0 0 2 1

01	Layout of Linen and Uniform Room/Laundry
02	Laundry Machinery and Equipment
03	Stain Removal
04	Flower Arrangement
05	Selection and Designing of Uniforms

WORK SHOP ON RESEARCH METHODOLOGY

Subject Code: BHOM2-325 **L T P C**
1 0 0 0

Course Objectives: This subject is taught to prepare students on how to approach the subject of Research Project in the 3rd year. Inputs can be given to the students during the institute tenure but topics allotted only after return from IT. This will help students perceive the subject in a better fashion while the vacation period between the two years (2nd & 3rd year) utilized for exploratory research and self-study.

UNIT-1

Introduction to Research Methodology: Meaning and objectives of Research, Types of Research, Research Approaches, Significance of Research, Research methods vs Methodology, Research Process, Criteria of Good Research, Problem faced by Researches, Techniques Involved in defining a problem.

UNIT-2

Research Design: Meaning and Need for Research Design, Features and important concepts relating to research design, Different Research design, Important Experimental Designs.

UNIT-3

Sample Design: Censure and sample Survey, Implication of Sample design, steps in sampling design, Criteria for selecting a sampling procedure, Characteristics of a good sample design, Different types of Sample design, Measurement Scales, Important scaling Techniques.

UNIT-4

Methods of Data Collection: Collection of Primary Data, Collection through Questionnaire and schedule collection of secondary data, Difference in Questionnaire and schedule, Different methods to collect secondary data.

Data Analysis Interpretation and Presentation Techniques: Hypothesis Testing, Basic concepts

concerning Hypothesis Testing, Procedure and flow diagram for Hypothesis Testing, Test of Significance, Chi-Square Analysis, report Presentation Techniques.

Recommended Books

1. Alan Bryman, Emma Bell, 'Business Research Methods', Oxford University Press.
2. Ritchie Goeldner, 'Travel Tourism & Hospitality Research', John Wiley.
3. J.R. Brent Ritchie (Editor), Charles R. Goeldner (Editor), 'Travel, Tourism, and Hospitality Research: A Handbook for Managers and Researchers', 2nd Edn., Wiley International.
4. Judith Bell, 'How to Complete your Research Project Successfully', USB Publisher Distributors, Delhi.
5. Ranjit Kumar, 'Research Methodology – A Step by Step Guide for Beginners', Pearson.

FOOD & BEVERAGE CONTROL

Subject Code: BHOM2-363 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the food and beverage control, procedures, functions, production and sales control.

UNIT-1

Food Cost Control: Introduction to Cost Control, Define Cost Control, The Objectives and Advantages of Cost Control, Basic costing, Food costing

Receiving Control: Aims of Receiving, Job Description of Receiving Clerk/Personnel, Equipment required for receiving, Documents by the Supplier (including format), Delivery Notes, Bills/Invoices, Credit Notes, Statements, Records maintained in the Receiving Department, Goods Received Book, Daily Receiving Report, Meat Tags, Receiving Procedure, Blind Receiving, Assessing the performance and efficiency of receiving department, Frauds in the Receiving Department, Hygiene and cleanliness of area.

UNIT-2

Food Control Cycle: Purchasing Control, Aims of Purchasing Policy, Job Description of Purchase Manager/Personnel, Types of Food Purchase, Quality Purchasing, Food Quality Factors for different commodities, Definition of Yield, Tests to arrive at standard yield, Definition of Standard Purchase Specification, Advantages of Standard Yield and Standard Purchase Specification, Purchasing Procedure, Different Methods of Food Purchasing, Sources of Supply, Purchasing by Contract, Periodical Purchasing, Open Market Purchasing, Standing Order Purchasing, Centralized Purchasing, Methods of Purchasing in Hotels, Purchase Order Forms, Ordering Cost, Carrying Cost, Economic Order Quantity, Practical Problems.

UNIT-3

Storing & Issuing Control: Storing Control, Aims of Store Control, Job Description of Food Store Room Clerk/personnel, Storing Control, Conditions of facilities and equipment, Arrangements of Food, Location of Storage Facilities, Security, Stock Control, Two types of foods received- direct stores (Perishables/non-perishables), Stock Records Maintained Bin Cards (Stock Record Cards/Books), Issuing Control, Requisitions, Transfer Notes, Perpetual Inventory Method, Monthly Inventory/Stock Taking, Pricing of Commodities, Stock taking and comparison of actual physical inventory and Book value, Stock levels, Practical Problems, Hygiene &Cleanliness of area.

UNIT-4

Production Control: Aims and Objectives, Forecasting, Fixing of Standards, Definition of standards (Quality &Quantity), Standard Recipe (Definition, Objectives and various tests), Standard Portion Size (Definition, Objectives and equipment used), Standard Portion Cost (Objectives & Cost Cards) Computation of staff meals.

Sales Control: Sales - ways of expressing selling, determining sales price, Calculation of selling price, factors to be considered while fixing selling price, Matching costs with sales, Billing procedure - cash and credit sales, Cashier's Sales summary sheet.

Recommended Books

1. Lea R. Dopson, 'Food & Beverage Cost Control', Wiley.
2. R.D. Boardman, 'Hotel & Catering Costing & Budgets', Heinemann.
3. D. Hughes and M. Bannion, 'Introductory Foods', The Macmillan Co. Ltd., New York.
4. T.E. Philip, 'Modern Cookery for Teaching and the Trade', Vol.-I, Orient Longman Ltd.

FOOD SAFETY AND QUALITY

Subject Code: BHOM2-364 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The students will get to learn about various micro-organisms in food, knowledge of food spoilage, food contaminants and adulterants.

UNIT-1

Basic Introduction to Food Safety, Food Hazards & Risks, Contaminants and Food Hygiene.

Micro-Organisms in Food: General characteristics of Micro-Organisms, based on their occurrence and structure, Factors affecting their growth in food (intrinsic and extrinsic), Common food borne micro-organisms: {Bacteria, (spores/capsules), Fungi, Viruses, Parasites.

Food Spoilage & Food Preservation: Types & Causes of spoilage, Sources of contamination, Spoilage of different products (milk and milk products, cereals and cereal products, meat, eggs, fruits and vegetables, canned products), Basic principles of food preservation, Methods of preservation (High Temperature, Low Temperature, Drying, Preservatives & Irradiation).

UNIT-2

Beneficial Role of Micro-Organisms: Fermentation & Role of lactic and bacteria, Fermentation in Foods (Dairy foods, vegetable, Indian foods, Bakery products and alcoholic beverages), Miscellaneous (Vinegar & anti-biotic).

Food Borne Diseases: Types (Infections and intoxications), Common diseases caused by food borne pathogens, Preventive measure

Food Additives: Introduction, Types (Preservatives, anti-oxidants, sweeteners, food colours and flavours, stabilizers and emulsifiers).

UNIT-3

Food Contaminants & Adulterants: Introduction to Food Standards, Types of Food contaminants (Pesticide residues, bacterial toxins mycotoxins, seafood toxins, metallic contaminants, residues from packaging material), Common adulterants in food, Method of their detection (basic principle).

Food Laws and Regulations: National - National – PFA Essential Commodités Act (FPO, MPO etc.), International – Codex Alimentarius, ISO, Regulatory Agencies – WTO, Consumer Protection Act.

Quality Assurance: Introduction to Concept of TQM, GMP and Risk Assessment, Relevance of Microbiological standards for food safety, HACCP (Basic Principle and implementation).

UNIT-4

Hygiene and Sanitation in Food Sector: General Principles of Food Hygiene, GHP for commodities, equipment, work area and personnel, Cleaning and disinfect ion (Methods and agents commonly used in the hospitality industry), Safety aspects of processing water (uses & standards), Waste Water & Waste disposal, RECENT CONCERNS: Emerging pathogens, genetically modified foods, Food labeling. Newer trends in food packaging and technology, BSE (Bovine Serum Encephalopathy).

Recommended Books

1. H.L. Cracknell & G. Nobis, 'The New Catering Repertoire', Vol. I, Macmillan.
2. N.S. Mahay, M. Shadaksharaswamy, 'Foods: Facts and Principles', International Publishers, New Delhi, **2001.**
3. 'Food &Beverage Law: Food Safety and Hygiene', Aman Publications.
4. 'The HACCP Food Safety Training Manual', Wiley.
5. 'The Prevention of Food Adulteration Act', **1954.**

MANAGEMENT IN TOURISM

Subject Code: BHOM2-365 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: The course has been designed to familiarise the learners with functions and skills keeping in view their applicability in tourism.

UNIT-1

Understanding Entrepreneurship and Management: Concept and Functions, Entrepreneurship: Concept and Functions, Corporate Forms in Tourism, Management Issues in Tourism.
Understanding Organizational Theory, Understanding Organizations, Planning and Decision Making, Organizing, Monitoring and Controlling.

UNIT-2

Organizational Behaviour Issues, Small Group Behaviour, Inter Personal Behaviour, Inter Group Behaviour, Supervisory Behaviour; Management Functions, Human Resource Management, Financial Management, Operations Management, Marketing Management, Information Technology and Management.

UNIT-3

Managing Financial Operations, Understanding P & L Statements, Understanding Balance Sheet, Profitability Analysis, Project Formulation and Appraisal; Managerial Practices in Tourism, Tour Operators, Travel Agencies, Hotels, Public Relations.

UNIT-4

Managerial Practices in Tourism, Food Services, Tourist Transport, Airlines, Airports; Convention Promotion and Management, Convention Industry, Planning Conventions, Management and Implementation of Conventions.

Recommended Books

1. P.N. Seth, 'Successful Tourism Management', Sterling Publishers, New Delhi.
2. R. Srinivasan and S.A. Chunawalia, 'Management Principles & Practice', Himalaya Publishing House, New Delhi.
3. L.M. Prasad, 'Principles & Practice of Management', Sultan Chand &Sons, New Delhi.
4. A.K. Bhatia, 'Tourism Development: Principles, Practices and Philosophies', Sterling Publishers, New Delhi.
5. John R. Walker, 'Introduction to Hospitality', Pearson.

COMMUNICATION SKILLS IN ENGLISH

Subject Code: BHUM0-101 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: It aims at making you aware of how a communicative situation influences the choice of sentence structure and vocabulary.

UNIT-1

Letters, Some Concepts in Communication, Formal Letters, Informal Letters, Conversation, Formal Conversation: Face-to-Face, Informal Conversation: Face-to-Face, Discussions; Telephone Conversation.

UNIT-2

Other Forms of Official Communication: Memoranda, Reports, Minutes of Meetings, Telegrams and Telexes; Interviews and Public Speaking, Interviews, Debates, Discussions, Speeches, Seminar Talks.

UNIT-3

Diaries, Notes, Tables and Figures, Diaries: Private, Diaries: General, Travelogues, Notes, Tables, Charts and Graphs; Mass Media: Print: Writing for Newspapers, Articles for Journals, Advertising.

UNIT-4

Writing for Radio

Writing for Radio-1: The Movement of Sounds,

Writing for Radio-2: The Movement of Ideas, Radio Drama; Mass Media: Television: A Television Script, Television Drama, Documentary and Feature Programmes, Interviews, Media, Contexts and Words.

Recommended Books

1. W.W.S. Bashkir and N.S. Prabhu, 'English Through Reading', MacMillan, **1978.**
2. R.C. Sharma and K. Mohan, 'Business Correspondence and Report Writing', Tata McGraw Hill, **1994.**
3. Lynn Van der Wagen, 'Communications in Tourism & Hospitality', Hospitality Press.
4. K.K. Sinha, 'Business Communication'.
5. Dale Carnegie, 'How to Win Friends and Influence People', Pocket Books.
6. Lesikar & Flatley, 'Basic Business Communication', Tata McGraw Hills.

20-WEEKS INDUSTRIAL EXPOSURE TRAINING

Subject Code: BHOM2-426

Course Objectives: Objective of industrial training is to provide to students the feel of the actual working environment and to gain practical knowledge and skills, which in turn will motivate, develop and build their confidence. Industrial training is also expected to provide the students the basis to identify their key operational area of interest.

1. Attendance in the 3rd Semester would be calculated on the basis of feedback given by Hotels. Industrial Training will require an input of 120 working days i.e. (20-week x 06 days = 120 days). A student can avail leave to a maximum of 15% (15 days) only with prior permission of the hotel authorities. Similarly, the institute Director can condone an additional 10% (10 days) on production of a medical certificate.
   a) Students who are unable to complete a **minimum of 45 days** of Industrial Training would be disallowed from appearing in the term end examinations as per University Rules.
   b) Students who complete **more than 45 days of industrial** training but are unable to complete **75 days** due to medical reasons may complete the rest of the training during the summer vacation. Such students will be treated as 'absent' in Industrial Training and results declared as per University Examination Rules.
2. For award of marks, 20% marks of IT would be on the basis of feed-back from the industry in a prescribed Performance Appraisal Form (PAF). It will be the students' responsibility to get this feed-back/assessment form completed from all the four departments of the hotel for submission to the institute at the end of Industrial Training. For the remaining 80% marks, students would be assessed on the basis of seminar/presentation before a select panel. The presentation would be limited to only one key area of the student's interest. A hard copy of the report will also have to be submitted to the panel.
3. Responsibilities of institute, hotel and the student/trainee with aims & objectives have been prescribed for

adherence. Once the student has been selected/deputed for Industrial Training by the institute, he/she shall not be permitted to undergo IT elsewhere. In case students make direct arrangements with the hotel for Industrial Training, these will necessarily have to be approved by the institute. Students selected through campus interviews will not seek Industrial Training on their own.

4. There will be no inter change of candidates from one batch to another i.e. winter batch to summer batch and vice versa.

Responsibilities of the Trainee

The trainee should

a) Be punctual.
b) Maintain the training logbook up-to-date.
c) be attentive and careful while doing work.
d) be keen to learn and maintain high standards and quality of work.
e) Interact positively with the hotel staff.
f) be honest and loyal to the hotel and towards their training.
g) get their appraisals signed regularly from the HOD's or training manager.
h) Gain maximum from the exposure given, to get maximum practical knowledge and skills.
i) attend the training review sessions / classes regularly.
j) bepreparedforthearduousworkingconditionandshouldfacethempositively.
k) Adhere to the prescribed training schedule.
l) take the initiative to do the work as training is the only time where you can get maximum exposure.
m) On completion of Industrial Training, handover all the reports, appraisals, logbook and completion certificate to the institute.

Responsibilities of the Institute

The Institute should

a) give proper briefing to students prior to the industrial training
b) make the students aware of the industry environment and expectations.
c) notify the details of training schedule to all the students.
d) coordinate regularly with the hotel especially with the training manager.
e) visit the hotel, wherever possible, to check on the trainees.
f) sort out any problem between the trainees and the hotel.
g) take proper feedback from the students after the training.
h) Brief the students about the appraisals, attendance, marks, logbook and training report.
i) ensure that change of Industrial Training hotel is not permitted once the student has been interviewed, selected and has accepted the offer.
j) Ensure that change of Industrial Training batch is not permitted.
k) ensure trainees procure training completion certificate from the hotel before joining institute.

Responsibilities of the Hotel

First Exposure: A young trainee's first industry exposure is likely to be the most influential in that person's career. If the managers / supervisors are unable or unwilling to develop the skills young trainees need to perform effectively, the latter will set lower standards than they are capable of achieving, their self-images will be impaired, and they will develop negative attitudes towards training, industry, and - in all probability - their own careers in the industry. Since the chances of building successful careers in the industry will decline, the trainees will leave in hope of finding other opportunities. **If on the other hand, first managers/supervisors help trainees achieve maximum potential, they will build the foundations for a successful career.**

Hotel should

a) give proper briefing session/orientation/induction prior to commencement of training.
b) make a standardized training module for all trainees.
c) strictly follow the structured training schedule.
d) ensure cordial working conditions for the trainee.
e) co-ordinate with the institute regarding training programme.
f) be strict with the trainees regarding attendance during training.
g) Check with trainees regarding appraisals, training report, log book etc.
h) inform the institute about truant trainees.
i) allow the students to interact with the guest.
j) specify industrial training's "Dos and Don'ts" for the trainee.
k) ensure issue of completion certificate to trainees on the last day of training.

Industrial Training (Performance Appraisal)
Maharaja Ranjit Singh Punjab Technical University, Bathinda

Name of Student:_____
University Roll No:_____
Name of the Hotel:_____
Duration: 5 weeks (30 working days) From:_____ **to:**_____
Department: F&B / FP / HK / FO and Other Ancillary Departments

Appearance		
Immaculate Appearance, Spotless uniform, Well-groomed hair, Clean nails &		5
Smart Appearance, Crisp uniform, Acceptable hair, Clean nails and hands		4
Well Presented, Clean Uniform, Acceptable hair, Clean nails & hands		3
Untidy hair, Creased ill kept uniform, Hands not clean at times		2
Dirty / disheveled, Long / unkempt hair, Dirty hands & long nails		1
Allotted		**/5**
Punctuality /Attendance(___days present out of 30 days)		
On time, Well Prepared, Ready to commence task, Attendance Excellent	100%	5
On time, Lacks some preparation but copes well, Attendance Very good	90%	4
On time, Some disorganized aspects-just copes, Attendance Regular	80%	3
Occasionally late, Disorganized approach, Attendance irregular	60%	2
Frequently late, Not prepared, Frequently absent without excuse	50%	1
Allotted		**/5**
Ability to Communicate (Written / Oral)		
Very confident, demonstrates outstanding confidence & ability both		5
Confident, Delivers information		4
Communicates adequately, but lacks depth and confidence		3
Hesitant, lacks confidence in spoken / written communication		2
Very inanimate, unable to express in spoken or written work		1
Allotted		**/5**
Attitude to Colleagues / Customers		
Wins / retains highest regard from colleagues has an outstanding rapport with		5
Polite, considerate and firm, well liked.		4
Gets on well with most colleagues, Handles customers well.		3
Slow to mix, weak manners, is distant has insensitive approach to customers		2
Does not mix, relate well with colleagues & customers		1
Allotted		**/5**
Attitude to Supervision		
Welcomes criticism, Acts on it, very co-operative		5
Readily accepts criticism and is noticeably willing to assist others		4

Accepts criticism, but does not necessarily act on it		3
Takes criticism very personally, broods on it		2
Persistently disregards criticism and goes own way		1
Allotted		**/5**
Initiative / Motivation		
Very effective in analyzing situation and	Demonstrates ambition to achieve	5
resourceful in solving problems	Progressively	
Shows ready appreciation and willingness to	Positively seeks to improve knowledge and	4
tackle problems	Performance	
Usually grasps points correctly	Shows interest in all work undertaken	3
Slow on the uptake	Is interested only in areas of work	2
Rarely grasps points correctly	Lacks drive and commitment	1
Allotted		**/5**
Reliability / Comprehension		
Is totally trust worthy in any working situation? Understands in detail, why and how the job is		5
Can be depended upon to identify work requirements and willing to complete them. Readily		4
Appreciates, how and why the job is done?		
Gets on with the job in hand. Comprehends, but doesn't fully understand work in hand		3
Cannot be relied upon to work without supervision. Comprehends only after constant		2
Requires constant supervision. Lacks any comprehension of the application		1
Allotted		**/5**
Responsibility		
Actively seeks responsibility at all times.		5
Very willing to accept responsibility.		4
Accepts responsibility as it comes.		3
Inclined to refer matters upwards rather than make own decision.		2
Avoids taking responsibility.		1
Allotted		**/5**
Quality of Work		
Exceptionally accurate in work, very thorough usually unaided.		5
Maintains a high standard of quality		4
Generally good quality with some assistance.		3
Performance is uneven.		2
Inaccurate and slow at work.		1
Allotted		**/5**
Quantity of work		
Outstanding in output of work.		5
Gets through a great deal.		4
Output satisfactory.		3
Does rather less than expected.		2

Output regularly insufficient	1
Allotted	**/5**
Total Allotted	**/50**

Stipend Paid per Month: Rs._____

Name of Appraiser: _____ **Signature:** _____

Designation of Appraiser: _____ **Date:** _____

Signature of Student:_____ **Date:**

ADVANCED FOOD PRODUCTION OPERATIONS

Subject Code: BHOM2-527 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This paper will give the students the technical skills of cold kitchen of a hotel. The students will learn about Larder, Charcuterie and various kinds of cold meats that are used in food production.

UNIT-I

Larder- Layout & Equipment: Introduction of Larder Work, Definition, Equipment found in the larder, Layout of a typical larder with equipment and various sections.
Terms & Larder Control: Common terms used in the Larder and Larder control, Essentials of Larder Control, Importance of Larder Control, Devising Larder Control Systems, Leasing with other Departments, Yield Testing.

UNIT-II

Duties and Responsibilities of the Larder Chef: Functions of the Larder, Hierarchy of Larder Staff, Sections of the Larder, Duties & Responsibilities of a larder Chef.
Charcuterie: Introduction to charcuterie,
Sausages: Types & Varieties,
Casings: Types & Varieties,
Fillings: Types & Varieties, Additives & Preservatives
Forcemeats: Types of forcemeats, Preparation of forcemeats, Uses of forcemeats,
Brines, Cures & Marinades: Types of Brines, Preparation of Brines, Methods of Curing, Types of Marinades, Uses of Marinades, Difference between Brines, Cures & Marinades,
Ham, Bacon & Gammon: Cuts of Ham, Bacon & Gammon, Differences between Ham, Bacon & Gammon Processing of Ham & Bacon, Green Bacon, Uses of different cuts,
Galantines: Making of galantines, Types of Galantine Ballotines,
Pates: Types of Pate, Pate de foie gras, Making of Pate, Commercial pate and Pate Maison Truffle - sources, Cultivation and uses and Types of truffle.

UNIT-III

Mouse & Mousseline: Types of mousse, Preparation of mousse, Preparation of mousseline, Difference between mousse and mousseline.
Chaud Froid: Meaning of Chaud froid, making of chaud frod & Precautions, Types of chaud froid, Uses of chaud froid.
Aspic & Gelee: Definition of Aspic and Gelee, Difference between the two, Making of Aspic and Gelee, Uses of Aspic and Gelee.
Quenelles, Parfaits, Roulades: Preparation of Quenelles, Parfaits and Roulades
Non Edible Displays: Ice carvings, Tallow sculpture, Fruit & vegetable Displays, Salt dough, Pastillage, Jelly Logo, Thermocol work.

UNIT-IV

Appetizers & Garnishes: Classification of Appetizers, Examples of Appetizers, Historic importance of culinary Garnishes, Explanation of different Garnishes.
Sandwiches: Parts of Sandwiches, Types of Bread, Types of filling: Classification, Spreads and Garnishes, Types of Sandwiches, Making of Sandwiches, Storing of Sandwiches.

Recommended Books

1. Le Rol A. Polsom, 'The Professional Chef', 4th Edn.
2. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons Inc.
3. Kinton & Cessarani, 'Theory of Catering'.
4. K. Arora, 'Theory of Cookery', Frank Brothers.

5. Fuller J. Barrie & Jenkins, 'Accompaniments & Garnishes from Waiter'.
6. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.
7. Philip E. Thangam, 'Modern Cookery', Vol-I, Orient Longman.
8. Kinton & Cessarani, 'Practical Cookery'.

ADVANCED FOOD & BEVERAGE OPERATION

Subject Code: BHOM2-528 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, and procedures among students. The students will learn the importance, planning and execution of Food and beverage outlets.

UNIT-I

Function Catering: Banquets: History, Types, Organization of Banquet department, Duties & responsibilities, Sales, Booking procedure, Banquet menus.
Banquet Protocol: Space Area requirement, Table plans/arrangement, Misc-en-place, Service, Toast & Toast procedures.
Informal Banquet: Réception, Cocktail parties, Convention, Seminar, Exhibition, Fashion shows, Trade Fair, Wedding, Outdoor catering.

UNIT-II

Function Catering: Buffets: Introduction, Factors to plan buffets, Area requirement, Planning and organization, Sequence of food, Menu planning, Types of Buffet, Display, sit down, Fork, Finger, Cold Buffet, Breakfast Buffets, Equipment, Supplies, Check list.

UNIT-III

Cocktails & Mixed Drinks: Definition and History, Classification, Parts, Methods of mixing, measures, pourers and pouring, Garnishes, Bar equipment, Cocktail glasses, Syrups and other non-alcoholic ingredients, Juices, Liqueurs in cocktails, service of cocktails.
Preparation and Service of Innovative Cocktails: Infused drinks, Sour drinks, trendy drinks, long drinks, short drinks, cream drinks, wine based drinks, Hot drinks, Mock tails.

UNIT-IV

Preparation and Service of Classic Cocktails: Martini - Dry & Sweet, Manhattan - Dry & Sweet, Mai Tai, LIIT, Mojito, Cosmopolitan, Caipirinha, Bellini, Mint Julep, Side Car, Tom Collins Gin FIZZ, Flips, Noggs, Champagne Cocktail, Between the Sheets, Daiquiri, Bloody Mary, Screw Driver, Tequilla Sunrise, Gin-Sling, Planters Punch, Singapore Sling, Pinacolada, Rusty Nail, Black Russian, Margarita, Gimlet - Dry & Sweet, Cuba Libre, Whisky Sour, Blue Lagoon, Harvey Wall Banger, Bombay Cocktail.

Recommended Books

1. Dennis R. Lillicrap. & John. A. Cousins, 'Food & Beverage Service', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill. Food & Beverage Service Lilli rap & Cousins, ELBS.
3. John Fuller, Hutchinson, 'Modern Restaurant Service'.
4. Brian Varghese, 'Professional Food & Beverage Service Management'.
5. Grahm Brown, 'The Waiter Handbook', Global Books.

ROOM DIVISION OPERATIONS

Subject Code: BHOM2-529 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with Planning& Evaluation of Hotel performance in terms of room sale and guest room planning aspects. A blend of theory and practical will be used to develop sensitivity and high work ethics.

UNIT-I

Planning & Evaluating Front Office Operations: Setting Room Rates (Details/Calculations thereof), Hubbart Formula, market condition approach & Thumb Rule, Types of discounted rates - corporate, rack etc. Forecasting techniques, Forecasting Room availability, Useful forecasting data (% of walking, % of overstaying, % of under stay).

UNIT-II

Forecasting: Forecast formula, Types of forecast, Sample forecast forms, Factors for evaluating front office operations.

UNIT-III

Safety and Security: Work environment Safety and job safety analysis, Potential Hazards in Housekeeping, Safety awareness and accident prevention, slips and falls, Crime prevention and dealing with emergency situation, Thefts, First Aid.

UNIT-IV

Layout of Guest Rooms: Sizes of rooms, Sizes of furniture, Furniture arrangement, Principles of design, Refurbishing and redecoration.

Recommended Books

1. Sudhir Andrews, 'Front Office Training Manual', Tata McGraw Hill.
2. 'Managing Front Office Operations', Kasavana & Brooks Educational Institution, AHMA.
3. Ahmed Ismail (Thomson Delmar), 'Front Office Operations and Management'.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry–Front Office Operations', Colin Dix & Chris Baird.
5. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELBS with Hodder & Stoughton Ltd.
6. Sudhir Andrews, 'Hotel House Keeping: A Training Manual', Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
8. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)', CRC Publisher.

FOOD & BEVERAGE MANAGEMENT

Subject Code: BHOM2-530 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course helps the students to understand the cost dynamics and various measures and cost management which can be implemented to cut down on the cost of an institution.

UNIT-I

F & B Management in Food and Beverage Operations: Introduction, Objectives of F&B Management, constraints of F & B Management, Basic policies – Financial, Marketing and Catering (Fast food and Popular catering, Industrial catering, School catering and Hospital catering) Organizing and Staffing, Control and performance measurements, Approaches to quality management, Managing Quality.

UNIT-II

Cost Dynamics: Elements of cost, Classification of cost. **SALES CONCEPTS**: Various sales concept, Uses of sales concept.

UNIT-III

Beverage Control: Purchasing, Receiving, Storing, Issuing, Production Control, Standard Recipe, Standard Portion Size, Bar Frauds, Books maintained, Beverage Control.
Sales Control: Procedure of Cash Control, Machine System, Electronic Cash Register, National Cash Register, Preset Machines, Point of Sale, Reports, Thefts, Cash Handling,
Budgetary Control: Define Budget, Define Budgetary Control, Objectives, Frame Work, Key Factors, Types of Budget, Budgetary Control.
Inventory Control: Importance, Objectives, Methods, Levels and technique, Perpetual inventory, Monthly inventory, Pricing of commodities, Comparison of physical and perpetual inventory.

UNIT-IV

Variance Analysis: Standard cost, Standard costing, Cost variances, Material variances, Labor variances, Overhead variance, Fixed overhead variance, Sales variance, Profit variance.
Breakeven Analysis: Breakeven chart, P.V. Ratio, Contribution, Marginal cost, graphs.
Menu Merchandising: Menu control, Menu structure, Planning and pricing of menus, Types of menus, Menu as marketing tool, Layout, Constraints of menu planning.
Management Information System: Reports, Statistical revenue report, cumulative and non-cumulative.

Recommended Books

1. Sudhir Andrews, 'Text Book of Food and Beverage Management', Tata McGraw Hill Education Pvt., Ltd., New Delhi.
2. Kamal Manaktola and Alok Prasad, 'Food and Beverage Comprehensive Cost Control System Management', Kanishka Publishers and Distributors, New Delhi.
3. Jagmohan Singh Negi, 'Food and Beverage Management Cost Control', Kanishka Publishers and Distributors, New Delhi.

PRINCIPLES OF MANAGEMENT

Subject Code: BHOM2-531 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: To familiarise the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms

UNIT-I

Management Concept and Nature: Science or art, process & functions; management levels, managerial skills & managerial roles. Management and Society.
Role of Manager: Management as a profession, Professional Manager & his tasks, Managerial Skills, Roles & Levels, Managerial ethics & organizations culture, Management process, External & internal, Factors that affect Management.

UNIT-II

Planning: Nature, Purpose, Types and process. Management by Objectives, Strategies and policies, Decision making.
Organizing: concept of organizing and organization. Line and Staff, authority and responsibility, span of Control, Delegation, Decentralization, Organizational structure and design.

UNIT-III

Motivation: Basic concept & Definition, Theories and practices of motivating people in organizations,

UNIT-IV

Leadership: Basic Concepts & Definitions, Theories & Styles, Situational Lead, Team building.
Controlling: basic Concepts & Definitions, Process, Methods & Techniques.
Co-Ordination: Meaning & Techniques.

Recommended Books

1. Chandra Bose, 'Principles of Management & Administration,' Prentice Hall of India.
2. C.B. Gupta, 'Management Theory & Practice,' Sultan Chand & Sons.
3. Freeman & Gilbert, 'Management Stoner,' Prentice Hall of India Pvt., Ltd.
4. Burton Jene, 'Management Today: Principles and Practice,' Tata McGraw Hill Publishing Co. Ltd.
5. Weihrich, Heinz and Koontz, Harold, 'Management: A Global Perspective', Tata McGraw-Hill Publication Company, New Delhi, **1993.**

ADVANCED FOOD PRODUCTION OPERATIONS LAB.

Subject Code: BHOM2-532 **L T P C**
0 0 4 2

MENU 01 Consommé Carmen, Poulet Sauté Chasseur, Pommes Loretta, Haricots Verts
MENU 02 Bisque D'écrevisse, Escalope De Veau viennoise, Pommes atailles, Epinards au Gratin
MENU 03 Crème Du Barry, Darne De Saumon Grille, Sauce paloise, Pommes Fondant, Petits Pois A La Flamande
MENU 04 Veloute Dame Blanche, Cote De Porc Charcuterie, Pommes De Terre A La Crème, Carottes Glace Au Gingembre
MENU 05 Cabbage Chowder, Poulet A La Rex, Pommes Marguises, Ratatouille
MENU 06 Barquettes Assortis, Stroganoff De Boeuf, Pommes Persilles, Riz Pilaf
MENU 07 Duchesse Nantua, Poulet Maryland, Croquette potatoes, Banana fritters, Corn gallets
MENU 08 Kromeskies, Filet De Sols Walweska, Pommes Lyonnaise, Funghi Marirati
MENU 09 Vol-Au-Vent De Volaille Et Jambon, Poulet a la kiev, Creamy Mashed Potatoes, Butter tossed green peas
MENU 10 Quiche Lorraine, Roast Lamb, Mint sauce, Pommes Parisienne

Bakery and Pattiserrie

1. Brioche Baba au Rhum,
2. Soft Rolls, Chocolate Parfait,
3. French Bread, Tarte Tartin,
4. Garlic Rolls, Crêpe Suzette,
5. Harlequin Bread, Chocolate Cream Puffs,
6. Foccacia, Crème Brûlée,
7. Vienna Roll, Mousse Au Chocolate,
8. Bread Sticks, Souffle Milanaise,
9. Brown Bread, Pâte Des Pommes,
10. Clover Leaf Rolls, Savarin des fruits,
11. Whole Wheat Bread, Charlotte Royal,
12. Herb & Potato Loaf, Doughnuts,
13. Milk Bread, Gateaux des Peache,
14. Ciabatta, Chocolate Brownie,
15. Buffet desserts, Modern Plating Styles,
16. Plus 5 Buffets Cold Buffet, Hot Continental, Hot Indian, Buffet Desserts, Bread Displays.

ADVANCED FOOD & BEVERAGE OPERATION LAB.

Subject Code: BHOM2-533 **L T P C**
0 0 4 2

Bar Operations

Preparation and Service of Innovative Cocktails: Infused drinks, Sour drinks, trendy drinks, long drinks, short drinks, cream drinks, wine based drinks, Hot drinks, Mock tails.

Function Catering - Banquets

1. Planning & organizing Formal & Informal Banquets.
2. Planning & organizing Outdoor caterings.

Function Catering - Buffets

1. Planning & organizing various types of Buffet.

Bar Operations

1. Designing & Setting the bar.
2. Bar mise-en –place.
3. Preparation & Service of Classic Cocktail & Mixed Drinks.

ROOM DIVISION OPERATION LAB.

Subject Code: BHOM2-534 **L T P C**
0 0 2 1

Forecasting

1. Forecasting room availability.
2. Forecasting room revenue.

Planning & Evaluating Front Office Operations:

1. Setting room rates.
2. Preparing room tariff card.
3. Student exercise on evaluating front office operations & Statistics.

First Aid

1. First Aid Kit.
2. Dealing with Emergency Situation.
3. Maintaining Records.

Layout of Guest Room

1. To The Scale.
2. Earmark Pillars.

3.Specification of Colors, Furniture, Fixture, Fitting, Soft Furnishing and Accessories etc. used.

FINANCIAL MANAGEMENT

Subject Code: BHOM2-566 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This course shall prepare students to get well versed with various financial decisions to be taken in a business.

UNIT-I

Financial Management Meaning & Scope: Meaning of business finance, Meaning of financial management, Objectives of financial management.

Financial Statement Analysis and Interpretation: Meaning and types of financial statements, Techniques of

financial analysis, Limitations of financial analysis, Practical problems

UNIT-II

Ratio Analysis: Meaning of ratio, Classification of ratios, Merits and demerits of ratios, Profitability ratios, Turnover ratios, Financial ratios and Practical Problems.

Funds Flow Analysis: Meaning of funds flow statement, Uses of funds flow statement, Preparation of funds flow statement, Practical problems

Cash Flow Analysis: Meaning of cash flow statement, Merits & Demerits of cash flow, Preparation of cash flow statement, Difference between cash flow and funds flow analysis, Practical problems.

Financial Planning Meaning & Scope: Meaning of Financial Planning, Objectives, Types, Steps, Significance and Limitations

UNIT-IV

Capitalisation and Capital Structure: Meaning of Capital Structure, Factors determining capital structure, Capital Structure Theory, Over capitalization and under capitalization.

Working Capital Management: Meaning of working capital, Factors determining working capital needs.

Basics of Capital Budgeting: Importance of Capital Budgeting, Capital Budgeting appraising methods, Payback period, Average rate of return, Net Present Value, Profitability index, Internal rate of return, Practical problems.

Recommended Books

1. P. Chandra, 'Financial Management.', Tata McGraw Hill Publishing Co.Ltd., New Delhi:
2. F. Donald, 'Financial Management in Hotel and Catering,' Heinemann, London, **1986.**
3. P. Kulkarni, 'Financial Management,' Himalaya Publishing House, Mumbai.
4. I. Pandey, 'Financial Management,' Vikas Publication House, New Delhi.

BAR AND BEVERAGE OPERATIONS

Subject Code: BHOM2-567 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: It aims at making you aware of different bar operations and control practices being used in hotel industry.

UNIT-I

Bar planning: types of bar, target clientele, location, atmosphere and décor, basic elements of layout and design consideration.

UNIT-II

Introduction to bar operations, types of bars i.e. pubs, lounge bar, wine bar, cocktail bar, banquet bar, dispense bar etc. parts of bar, shapes of bar, bar operation procedures.

UNIT-III

Bar cellar management -Introduction, cellar location, temperature and storage procedure, equipment required in bar storage area, cellar control and records, purchase order, celler inward book, bin card, beverage requisition, celler control book, villages and breakages record, return book, credit memo, empties return book, transfer book, stock book.

UNIT-IV

Bar records and control- comparing actual with standard cost, analyzing the consumption and the cost, potential sales value, weighted average value, par stock or bottle control, inter bar transfers, spillage allowance, breakage and spoilage, functions of bar control, frauds and bar routines

Recommended Books

1. Dennis R. Lillicrap & John. A. Cousins, 'Food & Beverage Service', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.

3. John Fuller, 'Modern Restaurant Service,' Hutchinson.
4. Grahm Brown, 'The Waiter Handbook', Global Books.
5. Lea R. Dopson, 'Food & Beverage Cost Control,' Wiley Publishers.

BUSINESS ETHICS

Subject Code: BHOM2-568 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course helps the students to understand the importance of business ethics in an organisation.

UNIT-I

Business Ethics: Meaning, Importance, Source, Ethical responsibility of Managers, Principles of being ethical HR manager, Most unethical situations, HR ethical issues, Techniques of Managing Ethics, Difficulties, Role of ethical leadership.

UNIT-II

Morale: Meaning, Individual & Group Morale, High or Low Morale, Morale & Motivation, Morale & Productivity, Factors influencing Morales, causes of low morale, Factors improving Morale, Managing Morale in difficult times.

UNIT-III

Ethical Issues In Capitalism And Market: Socially responsible business behavior, role of ethics in business success, ethical business practices in different countries.

UNIT-IV

Corporate Governance: Corporate Social responsibility, Ethics and Government**.**

Recommended Books

1. O.C. Ferrell, John Fraedrich, Ferrell, 'Business Ethics: Ethical Decision Making & Cases', 11th Edn., Cengage Learning.
2. Linda K. Trevino , Katherine A. Nelson, 'Managing Business Ethics: Straight Talk about How to Do It Right,' 6th Edn , Wiley.
3. Steven Mintz, Roselyn Morris, 'Ethical Obligations and Decision-Making in Accounting: Text and Cases,' 4th Edn, McGraw Hill Education.
4. William H. Shaw, Vincent Barry, 'Moral Issues in Business', 13th Edn., Cengage Learning.
5. Laura Hartman, Joseph Des Jardins, Chris MacDonald, 'Business Ethics: Decision Making for Personal Integrity & Social Responsibility, 3rd Edn,, McGraw Hill Education.

INTERNATIONAL CUISINES

Subject Code: BHOM2-635 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This paper will give the basic knowledge about International cooking's and get well versed with terminology, use of ingredients, techniques of cooking of various countries. They will also learn Management aspects of Food Production.

UNIT-I

International Cuisine: Geographic location, Historical background Staple food with regional Influences, Specialties, Recipes, Equipment in relation to: Great Britain, France, Italy, Spain & Portugal, Scandinavia, Germany, Middle East, Oriental, Mexican, Arabic.

Chinese: Introduction to Chinese foods, Historical background, Regional cooking styles, Methods of cooking, Equipment & utensils.

French: Culinary French, Classical recipes (recettes classique), Historical Background of Classical Garnishes, Offal's/Game, Larder terminology and vocabulary leadership.

UNIT-II

Icings & Toppings: Varieties of icings, Using of Icings, Difference between icings & Toppings, Recipes.
Frozen Desserts: Types and classification of Frozen desserts, Ice-creams – Definitions, Methods of preparation, Additives and preservatives used in Ice-cream manufacture**.**
Meringues: Making of Meringues, Factors affecting the stability, Cooking Meringues, Types of Meringues, Uses of Meringues.
Chocolate: History, Sources, Manufacture & Processing of Chocolate, Types of chocolate, Tempering of chocolate, Cocoa butter, white chocolate and its applications.

UNIT-III

Production Management: Kitchen Organization, Allocation of Work - Job Description, Duty Rosters, Production Planning, Production Scheduling, Production Quality & Quantity Control, Forecasting & Budgeting, Yield Management.
Product & Research Development: Testing new equipment, Developing new recipes, Food Trails, Organoleptic & Sensory Evaluation.

UNIT-IV

Food Presentation Principles: Basic presentations, Modern perspectives, Use of technology, Use of contemporary plates, Role and use of garnish, Unconventional garnishes, Plate Presentation techniques .

Recommended Books

1. Le Rol A. Polsom, 'The Professional Chef ', 4th Edn.
2. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons INC.
3. Kinton & Cessarani, 'Theory of Catering'.
4. K. Arora, 'Theory of Cookery', Frank Brothers.
5. Fuller J. Barrie & Jenkins, 'Accompaniments & Garnishes from Waiter; Communicate.'
6. S.C. Dubey, 'Bakery & Confectionery', Society of Indian Bakers.
7. Philip E. Thangam, 'Modern Cookery', Vol-I, Orient Longman.
8. Kinton & Cessarani, 'Practical Cookery.'

RESTAURANT PLANNING & MANAGEMENT

Subject Code: BHOM2-636 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate knowledge of food Management, Bar Operations, functions, procedures among students

UNIT-I

Planning & Operating Various F & B Outlets: Physical layout of functional and ancillary areas, Objective of a good layout, steps in planning, Factors to be considered while planning, calculating space requirement, Various set ups for seating, Planning staff requirement, Menu planning, Constraints of menu planning, Selecting and planning of heavy duty and light equipment, Requirement of quantities of equipment required like crockery, Glassware, Cutlery - steel or silver etc. Suppliers & manufacturers, Approximate cost, Planning Décor, furnishing fixture etc.

UNIT-II

Customer Relationship Management: Introduction, Importance of Customer Relation, Guest Satisfaction, Attitude of staff, Complaint handling, Suggestions by Guest, Pulling, Retaining and Pushing Factors.

UNIT-III

Managing Food & Beverage Outlet: Supervisory skills, Developing efficiency, Standard Operating Procedure, Training and Development**.**

UNIT-IV

Gueridon Service: History of gueridon, Definition, General consideration of operations, Advantages & Dis-advantages, Types of trolleys, Factor to create impulse, Buying - Trolley, open kitchen, Gueridon equipment, Gueridon ingredients, KITCHEN STEWARDING: Importance, Opportunities in kitchen stewarding Record maintaining, Machine used for cleaning and polishing, Inventory.

Recommended Books

1. Dennis R. Lillicrap. & John. A. Cousins, 'Food & Beverage Service', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.
3. John Fuller, Hutchinson, 'Modern Restaurant Service'.
4. Brian Varghese, 'Professional Food & Beverage Service Management'.
5. Grahm Brown, 'The Waiter Handbook', Global Books & Subscription Services, New Delhi.
6. Vijay Dhawan, 'Food and Beverage Service'.

ROOM DIVISION MANAGEMENT

Subject Code: BHOM2-637 **L T P C** **Duration: 35 Hrs.**

3 0 0 3

Course Objectives: The course is aimed at familiarizing the students with various functions of room division management and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills

UNIT-I

Interior Decoration: Elements of design, Color and its role in décor, Types of color schemes, Windows and window treatment, Floor finishes, Carpets, Furniture and fittings, Accessories.

Electricity and Lighting: Fundamentals of electricity, Lighting and lighting fixtures, Types of lighting, Different lighting devices, Incandescent lamps, Fluorescent lamps and other gas discharged lamps, Illumination and units of illumination, External lighting, Safety in handling electrical equipment.

UNIT-II

New Property Countdown.

UNIT-III

Budgeting: Types of budget & budget cycle, making front office budget, Factors affecting budget planning, Capital & operations budget for front office, Refining budgets, budgetary control, Forecasting room revenue, Advantages & Disadvantages of budgeting.

UNIT-IV

Property Management System: Fidelio / IDS / Shawman, Amadeus.

Recommended Books

1. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations,' 2nd Edn., Wiley Publications.
2. Tucker Schneider, 'The Professional Housekeeper', Wiley Publications.
3. Manoj Madhukar, 'Professional management of Housekeeping', Rajat Publications.
4. Sudhir Andrews, 'Front Office Training manual', Tata Mac Graw Hill.
5. Kasavana & Brooks Educational Institution, 'Managing Front Office Operations', AHMA.
6. Ahmed Ismail, 'Front Office – operations and management', Thomson Delmar.

ENTREPRENEURSHIP DEVELOPMENT

Subject Code: BHOM2-638 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course helps the students to understand the role and functions of Entrepreneurship, project preparation and designing of business.

UNIT-I

Introduction to Entrepreneurship: Meaning, Importance, Qualities, Nature and Types of entrepreneurs. Factors influencing entrepreneurship. Role of entrepreneurship in the development of an economy. Difference between Entrepreneur and Intrapreneur. Problems and promotion of Women entrepreneurs

UNIT-II

Small Scale Enterprises: Small scale enterprises, Tiny industries/Ancillary industries/ Cottage Industries-definition, meaning, product range, capital investment, ownership patterns. Importance and role played by SSI in the development of the Indian economy. Policies governing SSI's,

Sickness in SSE's: Meaning and definition of a sick industry, Causes of industrial sickness.

UNIT-III

Starting A Small Business: Business opportunity, Scanning the environment for opportunities, Evaluation of alternatives and selection based on personal competencies,

Steps Involved in Starting a Business Venture: Location, Clearances and permits required, Formalities, Licensing and registration procedures,

Assessment of The Market for the Proposed Project: financial, technical and social feasibility of the project, Preparing a business plan & project report

UNIT-IV

Institutional & Government Assistance to Small Scale Enterprises: Role of central and state government in promoting entrepreneurship, Introduction to various incentives, subsidies and grants. Export Oriented Units. Financial assistance through SFC's, SIDBI, Commercial Banks.

Recommended Books

1. D.F. Kuratko, 'Entrepreneurship-ASouth-Asian prespective,' Cengage Learning India Pvt.Ltd. Delhi .
2. D. Hisrich, R., P.M Peter, 'Entrepreneurship Development', Tata McGraw Hill.
3. Desai, 'Dynamics of Entrepreneurial Development and Management', V. Himalaya Publishing House, Delhi.
4. N. Srinivasan, Gupta, G.P. Sultan, 'Entrepreneurship Development', Chand & Sons.

PRINCIPLES OF MARKETING

Subject Code: BHOM2-639 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate the basic knowledge of marketing the hospitality products effectively and efficiently to the clients of service industry

UNIT-I

Introduction to Marketing: Meaning and definition, Nature and Scope, Feature, Characteristics, Concepts of Marketing, Customer Expectations from hospitality services, Solving Customers problems, Relevance of marketing in the Hospitality Industry.

UNIT-II

Hospitality Marketing Mix: Meaning and Definition of Marketing Mix, The Seven Ps of marketing.

UNIT-III

The Marketing Environment: The importance of Environmental scanning, Types of Environments, SWOT analysis, The future of hospitality marketing in India.

Marketing Segmentation, Targeting and Positioning: Meaning, Importance and basis of market segmentation, Essentials of sound market segmentation, STP Strategies

UNIT-IV

Consumer Behaviour In Hotel Industry: Factors influencing Consumer behavior, Buying decision process.

Marketing Research: Meaning and definition of marketing research, Stages of marketing research for services, Types and methods of market research.

Recommended Books

1. Dhruv Grewal & Michael Levy, ' Marketing', McGraw Hill Education.
2. Zeital Valerire – A and Mary Jo Baiter, 'Services Marketing,' Mc Graw Hill.
3. Philip Kotler, 'Marketing Management', Prentice Hall of India, New Delhi
4. Robert Lewis and Richard Chambers, 'Marketing Leadership in Hospitality-Foundations and Practices.'
5. Prasanna Kumar, 'Marketing of Hospitality and Tourism Services,' Tata McGraw Hill, **2010.**

INTERNATIONAL CUISINES LAB.

Subject Code: BHOM2-640 **L T P C**
0 0 6 3

Country	Topic
Chinese	**MENU 01** Prawn Ball Soup, Fried Wantons, Sweet & Sour Pork, Hakka Noddle's **MENU 02** Hot & Sour soup, Beans Sichuan, Stir Fried Chicken & Peppers, Chinese Fried Rice **MENU 03** Sweet Corn Soup, Shao Mai, Tung-Po Mutton, Yangchow Fried Rice **MENU 04** Wanton Soup, Spring Rolls, Stir Fried Beef & Celery Chow Mein **MENU 05** Prawns in Garlic Sauce, Fish Szechwan, Hot & Sour Cabbage, Steamed Noddle's
Spain	**MENU 06** ,Gazpacho, Pollo En Pepitoria, Paella, Fritata De Patata, Pastel De Mazaana
Italy	**MENU 07** Minestrone, Ravioli Arabeata, Fettocine Carbonara, Pollo Alla Cacciatore, Medanzane Parmigiane
Germany	**MENU 08** Linsensuppe, Sauerbaaten, Spatzale, German Potato Salad
U.K.	**MENU 09** Scotch Broth, Roast Beef, Yorkshire Pudding , Glazed Carrots & Turnips, Roast Potato
Greece	**MENU 10** Soupe Avogolemeno, Moussaka A La Greque, Dolmas, Tzaziki

Bakery & Patisserie

1.	Grissini, Tiramisu
2.	Pumpernickle, Apfel Strudel
3.	Yorkshire Curd Tart, Crusty Bread
4.	Baklava, Harlequin Bread
5.	Baguette, Crepe Normandy
6.	Croissants, Black Forest Cake
7.	Pizza base, Honey Praline Parfait
8.	Danish Pastry, Cold Cheese Cake
9.	Soup Rolls, Chocolate Truffle cake

10.	Ginger Bread, Blancmange
11.	Lavash, Chocolate Parfait
12.	Cinnamon & Raisin Rolls, Soufflé Chaud Vanilla
13.	Fruit Bread, Plum Pudding
14.	Demonstration of: Meringues, Icings & Toping's
15.	Demonstration of: Wedding Cake & Ornamental cakes

RESTAURANT PLANNING & MANAGEMENT LAB.

Subject Code: BHOM2-641 **L T P C**
0 0 4 2

Planning & Operating Food & Beverage Outlets
Class room Exercise
1. Developing Hypothetical Business Model of Food & Beverage Outlets
2. Case study of Food & Beverage outlets - Hotels & Restaurants

F&B Staff Organization
Class room Exercise (Case Study method)
1. Developing Organization Structure of various Food & Beverage Outlets
2. Determination of Staff requirements in all categories
3. Making Duty Roster
4. Preparing Job Description & Specification

Supervisory Skills
1. Conducting Briefing & Debriefing - Restaurant, Bar, Banquets & Special events
2. Drafting Standard Operating Systems (SOPs) for various F & B Outlets
3. Supervising Food & Beverage operations
4. Preparing Restaurant Log

Gueridon Service
1. Organizing Mise-en-place for Gueridon Service
2. Dishes involving work on the Gueridon
3. Task-01 Crepe suzette
4. Task-02 Banana au Rhum
5. Task-03 Peach Flambe
6. Task-04 Rum Omelette
7. Task-05 Steak Diane
8. Task-06 Pepper Steak

ROOM DIVISION MANAGEMENT LAB.

Subject Code: BHOM2-641 **L T P C**
0 0 2 1

Special Decoration (Theme Related to Hospitality Industry)
1. Indenting
2. Costing
3. Planning with Time Split
4. Executing

New Property Countdown
1. Preparation of SOPs

Budgeting

1. Preparation of sales budget
2. Budgetary control

Property Management System

1. Hands on practice of computer applications on PMS front office operational procedures of Guest Cycle.

RESEARCH PROJECT VIVA VOCE

Subject Code: BHOM2-642 **L T P C**
0 0 0 2

Course Objectives: This Course will give the learner the basic insight of photography and journalism in the field of hospitality and will help the learner to choose a career in food photography or food journalism.

Evaluation	The performance of the students will be evaluated on the basis of class participation, house tests, regularity and assignments carrying 30 percent of the total credit and rest through semester end examination of 3 hrs. duration.
Instructions for External Examiner	The research project will be presented to a panel of internal and external examiner through a report and viva voce of 100 marks
	The purpose of research is to seek answers to problems through the application of scientific methodology, which guarantees that the information is reliable and unbiased. This information is utilized to make conclusions and recommend solutions. Good research depends on addressing key points based on a checklist approach. Some elementary factors need to be kept in mind while preparing a research and deciding the topic, these could be based on its relevance, feasibility, coverage, accuracy and research, objectivity and ethics. Based on the above principles, the research project would be prepared by a student under guidance of a faculty member. The research would clearly spell out the objective, its findings, the methodology adopted, a conclusion and recommendations. **Research Methodology has already been taught in the 2nd year and topic for research allotted to students in 5th Semester. In the 6th Semester the student will undertake field survey and will do the preparation of the project.**

AVIATION AND CRUISE LINE MANAGEMENT

Subject Code: BHOM2-669 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organization, Functions and work ethics of Aviation and Cruise line operations. Give insight of safety regulations.

UNIT-I

Introduction to Airline Industry: Introduction, Structure of the Airline Industry, Major & National Carriers, Regional Carriers, Role of Regional Air Carrier.

Safety Regulation and Oversight of Flight Operation: Introduction, Safety Regulation of Flight Operations, Flight crew requirements for flight safety, Alternate arrangements by operator, In-flight Monitoring by Operator, Flight operation to a new station, security clearance for foreign pilot and Engineers, Flight safety manual, Safety Audit.

UNIT-II

Air Transport Services: Indian scenario an overview of airports, The role of private operators, Airport development fees, Rates and tariffs.

Market of Air Transport Services: Apparent and true need, Customers in the business air travel market, Customer in leisure air travel market, Customer in air passenger and air freight market, Building customer satisfaction, Distribution channel, Strategies and distribution systems.

UNIT-III

Cruise Line Introduction & Overview: Objective, Introduction, Origin of Cruise Industry, Present Cruise Industry, Typology of cruises products, Name of International Cruise Liners and their routes

Cruise Operation and Management Process: Standard Operating Procedure(s) for Cruise Liners, Attributes required in crew members, Organization chart, duties and responsibilities, Recruitment Process & Policy, Career in Cruise Liners, Travel Tips for Cruisers.

UNIT-IV

Marketing & Pricing of Cruise Products: Overview of cruise market, Key marketing Techniques for cruise designers and developers, Pricing of cruise product and targeting the market segments, Cruise Along Ganges.

Recommended Books

1. Stephen Shaw, 'Airline Marketing & Management', 7th Edn.
2. Philip Gibson, 'Cruise Operations Management', Taylor & Group, **2008.**
3. Clarence C. Rodrigues & Stephen K. Cusick, 'Commercial Aviation Safety', 8th Edn.
4. Douglas Ward, Berlitz, 'Complete Guide to Cruising and Cruise Ships 2002', **2002**.

PERSONALITY DEVELOPMENT AND SOFT SKILLS

Subject Code: BHOM2-670 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This course familiarizes a student in understanding the importance, need of personality and soft skills in Hospitality profession.

UNIT-I

Soft Skills for Hospitality Industry: Introduction, Defining Personality, Creating First Impression, Grooming, Attire/ Clothing, Basic Social Etiquette's. Personality traits as antecedents of employees' performance. Attitude and Behaviour in Hospitality industry.

UNIT-II

Body Language: Introduction, Genetics and Cultural roots, Why body language, positive body gestures, negative body gestures, leadership skills, motivational skills, self-confidence, Attitude, Self Esteem, Time management.

Essentials of Body Language in Hospitality Sector: Expression while standing, sitting, Head and Hand movement, Facial Expression. Importance of Body language for Hospitality Professionals..

UNIT-III

Communication and Listening Skills: Introduction, guidelines for effective communications-voice modulation, Active listening skills, essentials of active listening, ways to improve active listening skills.

Presentation Skills: Managing presentation nerves, Six steps to conquering your presentation nerves, planning an effective presentation, Delivering an effective presentation.

UNIT-IV

Group Dynamics and Team Building: Importance of groups in organization, Interaction in group. Group decision, team building, how to build a good team. Introduction to Motivation, relevance and types of Motivation, Motivate the sub-ordinates, Analysis of Motivation.

Recommended Books

1. Rajiv. K. Mishra, 'Personality Development', Rupa & Co.
2. 'Soft Skills', Career Development Centre, Green Pearl Publication, **2015**.
3. 'Soft Skills, Career Development Centre', Green Pearl Publication, **2015.**
4. Rajiv. K. Mishra, 'Personality Development', Rupa & Co.
5. Neeraj Aggarwal, 'Personality and Body Language for Hospitality Professionals', Aman Publication, Delhi.

GASTRONOMIC TOURISM

Subject Code: BHOM2-671 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The student will be able to have in depth understanding of culture, local food, promotion of gastronomy tourism and various other allied areas for the promotion of food tourism like the trends and consumer practices in the field of gastronomic tourism

UNIT-I

Introduction: Introduction to Gastronomic Tourism, Importance of Cuisine of a destination in the Promotion of Tourism, Global trends in Gastronomic tourism

UNIT-II

Gastronomy in Indian Context: Indian Regional Cuisines and their unique characteristics (Regional specialities of India), Potential of Gastronomic Tourism in India, Guided Tours for Gastronomic Tourism

UNIT-III

Scope of Gastronomic Tourism: Gastronomy's importance in the development of tourism, Exploring local Indian culture through Food, Indian Trends in Food Tourism.

UNIT-IV

Advantages: Benefits of gastronomic tourism for the development of region/territory, Role of local foods in gastronomic tourism promotion, Interconnection of gastronomy & culture, The main trends & consumer policies in the field of gastronomy tourism.

Recommended Books

1. J. Stanley, John Stanley, 'Food Tourism - A Practical Marketing Guide', Associates, Australia.
2. Lucy M. Long, 'Culinary Tourism', University Press of Kentucky, **2004.**
3. C. Michael Hall, Liz Sharples, Richard Mitchell, 'Food Tourism Around the World'.

ADVANCED CULINARY OPERATIONS

Subject Code: BHOM2-744 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This course familiarizes a student in understanding the core concepts that need to be kept in mind while opening a hotel.

UNIT-I

New Concepts in International Cuisine: Genetically modified food, Organic food, Slow food movement, Molecular gastronomy, Sous Vide, Cook Freeze, Cook Chill, Vegan cuisine.
International Spices and Condiments: Types of spices and condiments, Usage in cooking, Availability, Medicinal and therapeutic properties, International sauces, condiments, marinades, spice blends and rubs recipes.
Food Preservation: Simple preservation methods using natural and chemical preservatives, dehydration, jams and jellies, squash and syrups, dehydrated foods, chutneys, pickles and preserves recipes.

UNIT-II

Food Styling: Use of non-edible components, Role of dimension.

Centralized Kitchens: Preparation of food in centralized outlets, Advantages and disadvantages of using centralized outlets, Equipment required for centralized preparation, H.A.C.C.P. procedures followed during centralized preparation, Transportation of food to different outlets.

UNIT-III

Art of Dessert Presentation: Essentials of plate presentation, Garnishes for dessert Presentations – tulip Paste, chocolate stensils, nougat garnishes, etc., Buffet presentations, Modern trends in Presentation, Portioning usage of contemporary plates, technology, etc.

UNIT-IV

Cooked Sugar Techniques: Spun sugar, caramel decorations, poured sugar works, Pulled Sugar, Blown Sugar, Rock sugar, Nougatine.

Uncooked Sugar Displays: Pastillage, Gumpaste Moulding, Modelling techniques, Marzipan (cooked/Uncooked) Modelling cutouts, Royal Icing stencils, filigree works, Center piece prepared using sugar works.

Bread Arts: Bread Center pieces, Bread Basket, Braided Bread, Saltillage Salt dough, Types and techniques, Usage

Recommended Books

1. Le Rol A. Polsom, 'The Professional Chef', 4th Edn.
2. Bo Friberg, 'The Professional Pastry Chef', 4th Edn., Wiley & Sons INC.
3. Kinton & Cessarani, 'Theory of Catering'.
4. K. Arora, 'Theory of Cookery', Frank Brothers.
5. Fuller J. Barrie & Jenkins, 'Accompaniments & Garnishes from Waiter', Communicate.
6. S.C. Dubey, 'Bakery & Confectionery,' Society of Indian Bakers.
7. Philip E. Thangam, 'Modern Cookery', Vol-I, Orient Longman Practical Cookery.

ADVANCED FOOD & BEVERAGE SKILLS

Subject Code: BHOM2-745 **L T P C** **3 0 0 3** **Duration: 35 Hrs.**

Course Objectives: The course aims to inculcate knowledge of food service principles, functions, and procedures among students. The students will learn the importance, planning and execution of Food and beverage outlets

UNIT-I

Cellar Operations: The Cellar, Cellar Products, Refrigeration Systems & Storage Conditions, Safety & Maintenance, Stock Management, Gas Systems, Keys Handling & Storage, Safety Procedures

UNIT-II

Event Management: Role of events for promotion of hospitality products, Types of Events-Cultural, festivals, religious, business etc. Need of event management, Key factors for best event management. Case study of some events.

Mice: Introduction, Concept of MICE, Definition of conference and the components of the conference market. The nature of conference markets and demand for conference facilities. The impact of conventions on local and national communities.

UNIT-III

Revenue Management In F & B Service: Budgeting, Forecasting, Restaurant Revenue Management.

UNIT-IV

Recent Concerns and Trends: Future of quick service restaurants, Concepts of dining practices, Technology in food and beverage industry, Innovative practices used in food and beverage industry.

Recommended Books

1. Dennis R. Lillicrap. & John. A. Cousins, 'Food & Beverage Services', ELBS.
2. Sudhir Andrews, 'Food & Beverage Service Training Manual', Tata McGraw Hill.
3. John Fuller, Hutchinson, 'Modern Restaurant Service'.
4. Brian Varghese, 'Professional Food & Beverage Service Management'.
5. Grahm Brown, 'The Waiter Handbook', Global Books.

ADVANCED CULINARY OPERATIONS LAB.

Subject Code: BHOM2-746 **L T P C**
0 0 8 4

1. Preparation of 4 menus using only organic raw ingredients
2. Preparation of 4 Vegan Menus
3. Preparation of 5 menus using molecular gastronomy techniques
4. Preparation of Jams, Jellies, Preserves, Pickles etc.
5. Fruit and Vegetable Carvings
6. Preparation of various cooked and uncooked sugar displays
7. Preparation of Bread Centre Pieces
8. Preparation of saltilage centre displays

ADVANCE FOOD & BEVERAGE OPERATIONS LAB.

Subject Code: BHOM2-747 **L T P C**
0 0 4 2

S. No.	Topic
1.	Cellar Operations: Maintenance and upkeep of cellar registers, Practicing stock management, Practicing safety procedures
2.	Event Management: Practicing theme setups, Layout for MICE, Plan checklist for events and MICE, Planning different theme menus, Planning for outdoor catering
3.	Planning an operating budget for F & B outlets, Managing Revenue management Software's
4.	Project Planning for fast food restaurants, Report on innovative practices used in service industry, Menu merchandising for quick service restaurants

ADVANCED FRONT OFFICE MANAGEMENT

Subject Code: BHOM2-748 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course is aimed at familiarizing the students with various functions of front office and to develop work ethics towards customer care and satisfaction. Special efforts will be made to inculcate practical skills.

UNIT-I

Yield Management: Concept and importance, Applicability to rooms division, Capacity management, Discount allocation, Duration control, Measurement yield, Potential high and low demand tactics, Yield management software, Yield management team.

UNIT-II

Timeshare & Vacation Ownership: Definition and types of timeshare options, Difficulties faced in marketing timeshare business Advantages & disadvantages of timeshare business**.**

UNIT-III

Exchange Companies: Resort Condominium International, Intervals International, how to improve the timeshare / referral/condominium concept in India- Government's role/industry role**.**

UNIT-IV

French: Conversation with guests, providing information to guest about the hotel, city, sightseeing, car rentals, historical places, banks, airlines, travel agents, shopping centers and worship places etc. Departure (Cashier, Bills Section and Bell Desk.

Recommended Books

1. Sudhir Andrews, 'Front Office Training manual', Tata McGraw Hill.
2. Kasavana & Brooks, 'Managing Front Office Operations,' Educational Institution AHMA.
3. Ahmed Ismail, 'Front Office – Operations and Management', Thomson Delmar.
4. Michael Kasavana & Cahell, 'Managing Computers in Hospitality Industry'.
5. Colin Dix & Chris Baird, 'Front Office Operations'.
6. S.K. Bhatnagar, 'Front Office Operation Management', Frank Brothers.
7. Kasavana & Brooks, 'Managing Front Office Operations'.
8. Sue Baker & Jermy Huyton, Continum, 'Principles of Hotel Front Office Operations'.
9. Jerome Vallen, 'Check in Check Out.'
10. James Socrates Bardi, 'Hotel Front Office Management', 4th Edn., Wiley.
11. Philip E. Thangam, 'Modern Cookery', Vol-I, Orient Longman Practical Cookery', Kinton & Cessarani..

ADVANCED ACCOMMODATION MANAGEMENT

Subject Code: BHOM2-749 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course familiarizes students with the organization of housekeeping, its systems and functions. A blend of theory and practical will be used to develop sensitivity and high work ethics towards guest care and cleanliness.

UNIT-I

Planning and Organizing the House Keeping Department: Area inventory list, Frequency schedules, Performance and Productivity standards, Time and Motion study in House Keeping operations, Standard Operating manuals - Job procedures, Job allocation and work schedules, calculating staff strengths & Planning duty rosters, team work and leadership in House Keeping.

UNIT-II

Budgeting: Inventory level for non-recycled items, Budget and budgetary controls The budget process, Planning capital budget, Planning operation budget, operating budget - controlling expenses - income statement, purchasing systems - methods of buying, Stock records - issuing and control

UNIT-III

Contract Services: Necessity of contract, advantages and disadvantages of contract, Essential requirements of a contract, types of contract, their comparative advantages and disadvantages. Procedure for inviting and processing tenders, negotiating and finalizing.

Equipment Replacement Policy: Circumstances under which equipment are replaced. Replacement policy of items which gradually deteriorates Replacement when the average annual cost is minimum, Replacement when the present cost is minimum, Economic replacement cycle for suddenly failing equipment

UNIT-IV

Human Resource Management in Housekeeping: Recruiting, Selecting, Hiring, Orienting, and Training, Employee motivation, Employee evaluation and Compensation, Employee discipline.

Recommended Books

1. Joan C. Branson & Margaret Lennox, 'Hotel Hostel and Hospital Housekeeping', ELBS with Hodder & Stoughten Ltd.
2. Sudhir Andrews, 'Hotel House Keeping a Training Manual', Tata McGraw Hill publishing company Ltd., New Delhi.
3. Raghubalan, 'Hotel Housekeeping Operations & Management', Oxford University Press.
4. H. Burstein, 'Management of Hotel & Motel Security (Occupational Safety and Health)', CRC Publisher.
5. Robert J. Martin & Thomas J.A. Jones, 'Professional Management of Housekeeping Operations', 2nd Edn., Wiley Publications.
6. Tucker Schneider, 'The Professional Housekeeper', Wiley Publications.
7. Manoj Madhukar, 'Professional Management of Housekeeping', Rajat Publications.

ADVANCED FRONT OFFICE MANAGEMENT LAB.

Subject Code: BHOM2-750 **L T P C**
0 0 8 4

1. Hands on practice of computer application (Hotel Management System) related to front office procedures such as
   a) Students Exercises/Activities/Role Plays
   b) Yield Management
   c) Situation handling - handling guests & internal situations requiring management tactics/strategies
2. Interview Skills: Resume Writing, Mock Group Discussions, Mock Personal Interviews, Current Affairs, Interview Questions, Different Elimination rounds, Outside the interview room.

ADVANCED ACCOMMODATION MANAGEMENT LAB.

Subject Code: BHOM2-751 **L T P C**
0 0 4 2

Team Cleaning
1. Planning
2. Organizing
3. Executing
4. Evaluating
5. Inspection Checklist

Time and Motion Study
1. Steps of bed making
2. Steps in servicing a guest room etc.

Devising/Designing Training Module 12
1. Refresher training (5 days)
2. Induction training (2 days)
3. Remedial training (5 days)

Preparing SOP
1. Guest room cleaning
2. Bed making

3. Glass cleaning
4. Stain removal
5. Metal polishing

Preparing Operating Budget for Housekeeping Department

PROJECT REPORT: MARKET FEASIBILITY AND FINICALITY VIABILITY OF PROPOSED HOTELS/RESTAURANT

Subject Code: BHOM2-752 **L T P C**
0 0 4 2

Type of Report: This project should be based on a field study leading to the identification of a site of a proposed new hotel project (3, 4, 5-star category only). The students should then establish the market feasibility of this proposed hotel followed by the financial viability leading to the validation of the survey

Formulation

The length of the report may be 150 double spaced pages (excluding appendices and annexures). 10 % variation on either side is permitted.

LIST OF CONTENTS OF THE PROJECT REPORT	
Chapter I	Introduction
Chapter II	Scope, Objective, Methodology, and limitation of the project
Chapter III	Information of place and site
PART A - A Market Feasibility	
Chapter IV	Demand quantification.
Chapter V	Technical details of proposed project
Chapter VI	Recommended market mix
Chapter VII	Conclusion
PART B - Financial Viability	
Chapter VIII	Introduction to financial aspect of the proposed project.
Chapter IX	Cost of the project (Introduction to fixed assets and capital costs)
Chapter X	Manpower requirement and cost
Chapter XI	Sales revenue
Chapter XII	Operational expenses
Chapter XIII	Working capital requirement
Chapter XIV	Financing the project
Chapter XV	Profitability statement
Chapter XVI	Cash flow statement
Chapter XVII	Break even analysis and debt service ratio
Chapter XVIII	Coverage ratio
Chapter XIX	Ratio analysis
Conclusion	
Bibliography	
Annexures and Exhibits	

STRATEGIC MANAGEMENT

Subject Code: BHOM2-753 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This Course will help a student to understand about the importance of strategies in an organization

UNIT-I

Strategy: Definition, nature, scope, need, benefits and importance of strategy; and strategic management, Process of strategic management and levels at which strategy operates.
Defining Strategic Intent: Vision, Mission, Goals and Objectives.
Environmental Appraisal: Concept of environment, components of environment (Economic, legal, social, political and technological). Environmental scanning techniques- ETOP, QUEST, PEST and SWOT (TOWS).

UNIT-II

Internal Appraisal: The internal environment, organizational capabilities, Methods and techniques used for organizational appraisal.
Corporate Level Strategies: Stability, Expansion, Retrenchment and Combination strategies.
Types of Strategies: Forward integration, Backward integration, Horizontal integration, Market penetration, Market development, Product development, Concentric diversification, Conglomerate diversification, Horizontal diversification, Joint Venture, Retrenchment, Liquidation

UNIT-III

Strategic Analysis and Choice: Criteria for evaluating strategic alternatives.
Input Stage: Internal factor evaluation matrix, External factor evaluation matrix, Competitive profile matrix.
Matching Stage: Threats opportunities weaknesses strengths matrix (TOWS), Strategic position and action evaluation matrix (SPACE), Boston consulting group matrix (BCGM), Internal-External matrix, Grand Strategy matrix.
Decision Stage: Quantitative Strategic Planning matrix (QSPM)

UNIT-IV

Strategic Implementation: Analyzing & managing Strategic Change, Issues in strategy implementation, Matching the organizational structure to Strategy.
Functional Implementation of Strategies: Operations policies, Marketing Policies, financial policies, Human policies, Management information system.
Strategic Evaluation & Control: Techniques of strategic evaluation & control

Recommended Books

1. P. Rao, ' Strategic Management'. Himalaya Publishing House. Mumbai.
2. Hill, W.L. Charles and Gareth R. Jones, 'Strategic Management', Dreamtech Press India, Indian Adaptation.
3. Hitt, Michael and Hoskisson, Robert E., South Western Thomson, 'Strategic Management: Competitiveness and Globalization'.
4. J. David Hunger, Wheelen, Thomas L. and Wheelen Tom, 'Essentials of Strategic Management', Prentice Hall of India.
5. M.E. Porter, 'Competitive Advantage', The Free Press, New York.
6. Arther A. Thompson, A.J. Strickland and John E. Gamble, 'Strategic Management, Concepts and Cases', Tata McGraw Hill.

HUMAN RESOURCE MANAGEMENT

Subject Code: BHOM2-754 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: The course aims to inculcate the basic knowledge of marketing the hospitality products effectively and efficiently to the clients of service industry

UNIT-I

Introduction To Human Resource Management- Definitions, Functions of Personnel Management, Objectives of Personnel Management, Qualities of a Good Personnel Manager.
Human Resource/Man Power Planning- Definitions, Need of Manpower Planning, Objectives Of Hr Planning, Advantages Disadvantages Of Manpower Planning, Process/Steps.

UNIT-II

Recruitment- Definition, Sources of Recruitment, Internal Sources of Recruitment& (Advantages, Dis-Advantages), External Sources (Advantages, Dis-Advantages).
Selection- Definition, steps in Selection Process (Application Blank, Initial Interview of the Candidates, Employment Tests, Interviews, Checking Reference, Physical Or Medical Examination, Final Interview & Induction)

UNIT-III

Training and Development -Training Definition, Importance of Training, The Training Process, Training Methods (On The Job- Job Instruction Training, Job Rotation, Special Assignments).
Off the Job (Vestibule Training, Lecture Method, Conference Method, Seminar or Team Discussion, Case Study Method Development-Definition, Need, Methods -On The Job -Off the Job.

UNIT-IV

Performance Appraisal- Definition, Objectives, Process, Methods- -Past Oriented -Future Oriented.
Job Evaluation- Definition, Objectives, Principles, Methods-Non Analytical, Analytical.
Employee Remuneration- Definition, Components, Factors Influencing Employee Remuneration, Concept of Wages.

Recommended Books

1. David K. Hayes, Jack D. Ninemeier, 'Human Resources Management in the Hospitality Industry'.

FACILITY PLANNING

Subject Code: BHOM2-755 **L T P C** **Duration: 35 Hrs.**
3 0 0 3

Course Objectives: This course familiarizes a student in understanding the core concepts that need to be kept in mind while opening a hotel.

UNIT-I

Hotel Design: Design Consideration, Attractive Appearance, Efficient Plan, Good location, Suitable material, Good workmanship, Sound financing, Competent Management.
Facilities Planning: The systematic layout planning pattern (SLP), Planning consideration, Flow process & Flow diagram ,Procedure for determining space considering the guiding factors for guest room/ public facilities, support facilities & services, hotel administration, internal roads/budget hotel/5 star hotel Architectural consideration, Difference between carpet area plinth area and super built area, their relationships, reading of blue print (plumbing, electrical, AC, ventilation, FSI, FAR, public Areas), Approximate cost of construction estimation, Approximate operating areas in budget type/5 star type hotel approximate other operating areas per guest room, Approximate requirement and Estimation of water/electrical load gas, ventilation.

UNIT-II

Star Classification of Hotel: Criteria for star classification of hotel (Five, four, three, two, one & heritage).
Kitchen Equipment: requirement for commercial kitchen. Heating - gas/electrical, Cooling (for various catering establishment). Developing Specification for various Kitchen equipment. Planning of various support services (pot wash, wet grinding, chef room, larder, store & other staff facilities).
Kitchen Lay Out & Design: Principles of kitchen layout and design, Areas of the various kitchens with recommended dimension, Factors that affect kitchen design, Placement of equipment, Flow of work, Space allocation, Kitchen equipment, manufacturers and selection, Layout of commercial kitchen (types, drawing a layout of a Commercial kitchen), Budgeting for kitchen equipment.

UNIT-III

Kitchen Stewarding Layout and Design: Importance of kitchen stewarding, Kitchen stewarding department layout and design Equipment found in kitchen stewarding department,
Stores - Layout and Design: Stores layout and planning (dry, cold and bar) Various equipment of the stores, Work flow in stores.

UNIT-IV

Car Parking: Calculation of car park area for different types of hotels.
Planning for Physically Challenged Project Management: Introduction to Network analysis, Basic rules and procedure for network analysis, C.P.M. and PERT, Comparison of CPM and PERT, Classroom exercises, Network crashing determining crash cost, normal cost.

Recommended Books

1. Tarun Dayal, 'Hotel Facility Planning', Oxford University Press, New Delhi.

16-WEEKS SPECIALIZED HOSPITALITY TRAINING

Subject Code: BHOM2-855 **L T P C**
0 0 0 10

Course Objectives: Objective of specialized training is to provide to students the feel of the actual working environment and to gain practical knowledge and skills, which in turn will motivate, develop and build their confidence in the key operational area of interest.

1. Attendance in the 8th Semester would be calculated on the basis of feedback given by Hotels. Trainee will require an input of 72 working days i.e. (16-weeks x 06 days = 72 days). A student can avail leave to a maximum of 15% (15 days) only with prior permission of the hotel authorities. Similarly, the institute Director can condone an additional 10% (10 days) on production of a medical certificate.
   a) Students who are unable to complete a **minimum of 45 days** of Specialized Training would be disallowed from appearing in the term end examinations as per University Rules.
   b) Students who complete **more than 45 days of industrial** training but are unable to complete **75 days** due to medical reasons may complete the rest of the training during the summer vacation. Such students will be treated as 'absent' in Industrial Training and results declared as per University Examination Rules.
2. For award of marks, 20% marks of Specialized Hospitality Training (SHT) would be on the basis of feed-back from the industry. For the remaining 80% marks, students would be assessed on the basis of seminar/presentation before a select panel. The presentation would be limited to only key area of the student's interest. A hard copy of the report will also have to be submitted to the panel.
3. Once the student has been selected/deputed for SHT by the institute, he/she shall not be permitted to undergo SHT elsewhere. In case students make direct arrangements with the hotel for SHT, these will necessarily have to be approved by the institute. Students selected through campus interviews will not seek SHT on their own.

5-LECTURES ON PROJECT REPORT ON EMERGING TRENDS IN HOSPITALITY INDUSTRY

Subject Code: BHOM2-856 **L T P C**
0 0 0 5

B. TECH. ELECTRCAL ENGINEERING

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMAT0- 301	Mathematics-III	3	1	0	40	60	100	4
BELE1-301	Transformers	3	1	0	40	60	100	4
BELE1-302	Network Analysis and Synthesis	3	1	0	40	60	100	4
BELE1-303	Electronic Devices & Circuits	3	1	0	40	60	100	4
BELE1-304	Electrical Measurement & Instrumentation	3	1	0	40	60	100	4
BELE1-305	Measurement & Instrumentation Lab.	0	0	2	60	40	100	1
BELE1-306	Electronic Devices & Circuit Lab.	0	0	2	60	40	100	1
BELE1-307	Training#	0	0	4	60	40	100	2
BHUM0-F91	Soft Skills-I	0	0	2	60	40	100	1
Total		**15**	**5**	**10**	**440**	**460**	**900**	**25**

#Workshop training will be imparted in the institution at the end of 2nd semester for four-week duration

(Minimum 36 hrs. per week) industrial tour will also from the part of this training.

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BELE1- 408	DC Machines	3	1	0	40	60	100	4
BELE1- 409	Digital Electronics	3	1	0	40	60	100	4
BELE1- 410	Electrical Engineering Materials	3	1	0	40	60	100	4
BELE1- 411	Linear Control System	3	1	0	40	60	100	4
BELE1- 412	Electromagnetic Field Theory	3	1	0	40	60	100	4
BELE1- 413	Electrical Machine - I Lab.	0	0	2	60	40	100	1
BELE1-414	Control System Lab.	0	0	2	60	40	100	1
BELE1-415	Digital Electronics Lab.	0	0	2	60	40	100	1
BHUM0- F92	Soft Skills - II	0	0	2	60	40	100	1
Total		**15**	**5**	**8**	**440**	**460**	**900**	**24**

After 4th semester, student will go for 6 Weeks Institutional / Industrial Training in which he/she should cover complete knowledge of at least one of the following software: MATLAB/LabVIEW/C/C++/Automation/AutoCAD (Electrical)/Data Analysis using Excel.

SEMESTER 5th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1- 516	Asynchronous Machines	3	1	0	40	60	100	4
BEEE1- 517	Power Electronics & Drives	3	1	0	40	60	100	4
BEEE1- 518	Generation and Economics of Electric Power	3	1	0	40	60	100	4
BEEE1-519	Power Electronics Lab.	0	0	2	60	40	100	1
BEEE1-520	Electrical: Estimation & Costing Lab.	0	0	2	60	40	100	1
BELE1-521	Industrial Training#	0	0	4	60	40	100	2
BHUM0-F93	Soft Skills-III	0	0	2	60	40	100	1
Department Elective – I (Select any one)		3	0	0	40	60	100	3
BEEE1-556	Power Plant Engineering							
BEEE1-557	Signals and Systems							
BEEE1-558	Microprocessors and Microcontroller							
BEEE1-559	Instrumentation Engineering							
Open Elective – I		3	0	0	40	60	100	3
Total		**15**	**3**	**10**	**440**	**460**	**900**	**23**

#Industrial training to be imparted at the end of 4th semester for six weeks

SEMESTER 6th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BELE1- 622	Synchronous Machines	3	1	0	40	60	100	4
BELE1- 623	Power System-I (Transmission and Distribution)	3	1	0	40	60	100	4
BELE1- 624	Electrical Machines-II Lab.	0	0	2	60	40	100	1
BELE1- 625	Programming in MATLAB	0	0	2	60	40	100	1
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
Department Elective – II		3	0	0	40	60	100	3
BELE1-660	Electrical Power Utilization							
BELE1-661	Energy Auditing & Management							
BELE1-662	Substation Equipment & Design							
BELE1-663	Digital Control System							
Department Elective – III		3	0	0	40	60	100	3
BELE1-664	Energy Efficient Machines							
BELE1-665	Virtual Instrumentation							
BELE1-666	Flexible AC Transmission System Devices							
BELE1-667	Non-conventional Energy Sources							
Open Elective – II		3	0	0	40	60	100	3
Total		**15**	**2**	**6**	**380**	**420**	**800**	**20**

Students will undergo 8 weeks industrial training after end semester examinations of sixth semester and present a seminar along with submission of report in 7th semester

SEMESTER 7th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BELE1- 726	Non-linear and Digital Control System	3	1	0	40	60	100	4
BELE1- 727	Power System-II (Switchgear and Protection)	3	1	0	40	60	100	4
BELE1- 728	Minor Project*	0	0	4	60	40	100	2
BELE1- 729	Software Lab.	0	0	2	60	40	100	1
BELE1-730	Power System-II Lab.	0	0	2	60	40	100	1
BELE1-731	Industrial Training#	0	0	0	60	40	100	3
Department Elective – IV		3	0	0	40	60	100	3
BELE1-768	Industrial Automation							
BELE1-769	System Engineering and Reliability							
BELE1-770	Digital Signal Processing							
BELE1-771	EHVAC Transmission							
Open Elective – III		3	0	0	40	60	100	3
Total		**12**	**2**	**08**	**400**	**400**	**800**	**21**

***** *In this semester, the candidate shall submit a Minor Project (Hardware/Software) based on area of interest in consultation with his/her supervisor. Student has to deliver the seminar associated with the same work. The same work of minor project can be extended to Major Project in the next semester.*

 # Industrial training to be imparted at the end of 6th semester for eight weeks

SEMESTER 8th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BELE1- 832	Power System Analysis and Design	3	1	0	40	60	100	4
BELE1- 833	High Voltage Engineering	3	0	0	40	60	100	3
BELE1- 834	Major Project	0	0	12	60	40	100	6
BELE1-835	Power System Analysis and Design Lab.	0	0	2	60	40	100	1
Department Elective – IV		3	0	0	40	60	100	3
BEEE1-872	Electrical Machine Design							
BEEE1-873	HVDC Transmission							
BEEE1-874	Fuzzy Logic Systems							
BEEE1-875	Neural Networks							
Total		**9**	**1**	**14**	**240**	**260**	**500**	**17**

Total Credits

Semester	Credits
I	25
II	25
III	25
IV	24
V	23
VI	20
VII	21
VIII	17
Total	**180**

MATHEMATICS-III

Subject Code: BMAT0-F91 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (13 Hrs.)

Fourier Series: Periodic function, Fourier Seies, Dirichlet's conditions, Fourier series for even and odd functions, Change of interval, Half range Fourier series, Other forms of Fourier series.

Fourier Transforms: Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse Theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Properties of Fourier transform, Convolution theorem of Fourier transforms, Parseval's identity.

UNIT-II (10 Hrs.)

Laplace Transforms: Laplace transforms of various standard functions (Exponential, Algebraic, Sine, Cosine), Properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function,

Application of Laplace Transforms: Solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

UNIT-III (12 Hrs.)

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients. Classification of partial differential equation.

Applications of PDEs: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

UNIT-IV (10 Hrs.)

Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic

functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues(Integration Of type $\int_0^{2\pi} F(Cos\theta, Sin\theta)d\theta, \quad \int_{-\infty}^{\infty} \frac{f(x)}{F(X)}dx$)

Recommended Books

1. E. Kreyszing, 'Advanced Engineering Mathematics', 8th Edn., John Wiley, New Delhi.
2. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, New Delhi.
3. Ian N. Sneedon, 'Elements of Partial Differential Equations', McGraw- Hill, Singapore, **1957**.
4. Peter. V. O'Nil, 'Advanced Engineering Mathematics', Wadsworth Publishing Company.
5. H.C. Taneja, 'Engineering Mathematics', Volume-I & II, I.K. Publisher.

TRANSFORMERS

Subject Code: BELE1-301 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To aware the students about the basics of Transformer.

2. To provide basic concepts of different types of transformer connections and their applications.
3. To impart knowledge of single phase transformer, auto transformer and three phase transformer.
4. To impart knowledge about analysis of different transformer connections.

Course Outcomes

1. Students will be having skills to analyse transformer connections.
2. Knowledge of different types of transformer operations and applications.

UNIT-I (12 Hrs.)

Single Phase Transformer: Construction, working principle of operation, E.M.F. equation, phasor diagram under loaded and unloaded condition, rating of transformers, losses in transformer, transformer testing, open and short circuit tests, back to back test, voltage regulation and efficiency, condition for maximum efficiency, equivalent circuit, ideal Transformer, parallel operation of single phase transformers, applications of transformers.

UNIT-II (11 Hrs.)

Auto-Transformer: Construction, working principle of operation, phasor diagram, saving of conductor material, comparison of auto transformer and two winding transformer, advantages, disadvantages and applications, equivalent circuit.

UNIT-III (12 Hrs.)

Three Phase Transformer: Three winding transformer, construction of three phase transformer, three phase transformer connections: Star-star connection, delta-delta connection, delta-star connection, star-delta connection, phasor groups, three phase to two phase and six phase conversion, scott connection- three phase to two phase conversion, phase shifting from primary to secondary windings, Parallel operations of three phase transformers, harmonics and excitation phenomenon, inrush current phenomenon.

UNIT-IV (10 Hrs.)

Transformer Materials: Different types of insulting materials for transformer core, winding, insulation, need for bushings, various cooling techniques, effect of temperature on the performance of transformer.

Recommended Books

1. P.S. Bhimbra, 'Electrical Machinery', Khanna Publishers, Delhi, **2004**
2. A.E. Fitzgerald, C. Kingsley and S.D. Umans, 'Electric Machinery', TMH, **2002.**
3. A.S. Langsdorf, 'Theory of AC Machinery', Tata McGraw Hill, **1955.**
4. Ashfaq Hussian, 'Electrical Machines', Dhanpat Rai and Company, **2002**.
5. S.J. Chapman, 'Electrical Machinery Fundamentals', McGraw Hill, New York, **1991.**

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: BELE1-302 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To aware the students about the basics of networks.
2. To provide them basic concepts of different types of network theorems and their applications.
3. To impart knowledge about different circuits, analysing and synthesizing the circuits.

Course Outcomes

1. Students will be having skills to design, analyse and synthesize the circuits.
2. Knowledge of mathematical forms such as Laplace transforms and designing of filters circuits.

UNIT-I (10 Hrs.)

Circuits Concepts: Independent and dependent sources, Standard test signals: Step, ramp, impulse, and doublet. Mesh and nodal analysis. Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Millman's, Tellegen's and Reciprocity.

UNIT-II (11 Hrs.)

Time and Frequency Domain Analysis: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform, transient and steady response, transfer function, poles and zeros, pole zero diagram, time domain behaviors from poles and zeros, Convolution Theorem.

UNIT-III (12 Hrs.)

Network Synthesis: Network functions, Impedance and admittance function, Transfer functions. Network function for two port network, Sinusoidal network in terms of poles and zeros, Real liability condition for impedance synthesis of RL, LCand RC circuits, network synthesis techniques for 2-terminal network, foster and cauer forms.

UNIT-IV (12 Hrs.)

Filters Synthesis: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, pass bands and stop bands, Design of Constant-K, m-derived filters, Composite filters.

Recommended Books

1. Bird John, 'Electrical Circuit Theory and Technology', Newnes, **2003.**
2. Abhijit Chakraborty, 'Circuit Theory', Dhanpat Rai, **2001.**
3. D. Roy Chaudhury, 'Networks and Synthesis', New Age International.
4. T.S.K. VIyer, 'Circuit Theory', Tata McGraw Hill, **2006.**
5. Mohan, Sudhakar Sham, 'Circuits and Networks Analysis and Synthesis', TMH, **2005.**
6. Van Valkenberg, 'Network Analysis and Synthesis', PHI Course, **2009.**

ELECTRONICS DEVICES AND CIRCUITS

Subject Code: BELE1-303 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

1. To aware the students about basic electronic components.
2. To update the knowledge about amplification circuits to amplify the signal.
3. Various types of circuits to generate signals.
4. How electronic components are specified and selected for industrial applications.

Course Outcomes

1. The students could have skills about the basic electronic circuits, their operational characteristics and their applications.
2. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

UNIT-I (10 Hrs.)

Introduction: Introduction to semiconductors theory, P type and N-Type semiconductors, different types of diodes, Drift current, diffusion current. Rectifiers.

UNIT-II (11 Hrs.)

Bipolar Junction Transistor: Working action of NPN and PNP. CE, CB and CC configurations, Current components, Concept of D.C. and A.C. load line and operating point, Q point selection, bias stability, various biasing circuits- fixed bias, collector to base bias, emitter bias, voltage divider, Stability factors.

UNIT-III (12 Hrs.)

Power Amplifiers: Classifications according to mode of operation and driving output, Class A direct coupled with resistive load, operation of class- B power amplifier, Push-Pull Amplifiers, Concept of feedback in amplifiers: Positive and negative feedback, effect of negative feedback.

Oscillators: Principle of operation of different oscillator circuits-RC Phase shift, Wien Bridge, Hartley Bridge, Colpits and Crystal oscillators.

UNIT-IV (12 Hrs.)

Field Effect Transistors: FET construction and working, P-channel and N-channel JFETs. Comparison with BJT, Characteristics of JFET, JFET parameters- AC drain resistance, trans-conductance, amplification factor, dc drain resistance. Construction, working and characteristics of MOSFET. Comparison of BJT, JFET and MOSFET.

Recommended Books

1. Boylstad and Nashelsky, 'Electronic Devices and Circuits', Prentice Hall, **2010.**
2. Millman and Halkias, 'Integrated Electronics', McGraw Hill, **2001.**
3. Malvino, 'Electronic Principles', McGraw Hill, **2007.**
4. V.K. Mehta, 'Principles of Electronics', S. Chand, **2006.**
5. Donald L. Shilling and Charles Belowl, 'Electronic Circuits', TMH, **2009.**

ELECTRICAL MEASUREMENT & INSTRUMENTATION

Subject Code: BELE1-304 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

1. To aware the students about the basics of measurements and instrumentation systems.
2. To impart knowledge about different instruments for electrical measurements.
3. To provide them basic concepts of different types of sensors and transducers.

Course Outcomes

1. The students will be having skills to design, analyse and instruments.
2. To gain the skill knowledge of bridges and CRO operations.

UNIT-I (12 Hrs.)

Measuring Instruments: Introduction to measuring techniques, necessity of measurements, block diagram of measurement system, types of instruments, classification of standards, fundamental and derived units. Instrument characteristics; accuracy, precision, repeatability and sensitivity. Different types of errors in measurement. Principle of operation and constructional features; D'Arsonval galvanometer, Moving Coil PMMC and Moving Iron instrument (Repulsion and Attraction type), Electrodynamics instruments.

UNIT-II (11 Hrs.)

Measurement of Resistance: Low, Medium and High resistance measurement using Kelvin Double Bridge, Ammeter-Voltmeter method, Wheat Stone Bridge, Loss of Charge and Megger.

Measurement of Inductance and Capacitance: Maxwell Inductance, Hay's, Anderson and Schering Bridges, Measurement of frequency by Wein bridge method.

UNIT-III (11 Hrs.)

Oscilloscope: Basic principle and construction of Analog CRO, sweep modes, applications in measurement of voltage, frequency (Lissajous pattern), Introduction to Dual Trace Oscilloscope, Digital Storage Oscilloscope, sampling oscilloscope. Comparison between analog and digital oscilloscope.

UNIT-IV (11 Hrs.)

Transducers: Transducer and its classifications, basic requirements of Transducer/Sensors. Displacement Transducers: LVDT, RVDT and Piezo Electric. Resistance Thermometer, Thermistors, Thermocouples and Strain Gauge Transducer: Basic principle of operation of Resistance strain gauge.

Recommended Books

1. H. Cooper, 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990.**
2. A.K. Sawhney, Electronic Instrumentation and Measurement', Dhanpat Rai & Sons, **2011.**
3. Jones and Chin, 'Electronic Instruments and Measurement', **2010**.
4. J. Toppin, 'Theory of Errors', Wessely Publishing, **2000.**

MEASUREMENT AND INSTRUMENTATION LAB.

Subject Code: BELE1-305 **L T P C**
0 0 2 1

Course Objectives

1. To understand the working principal and construction of the measuring instruments and recorders.
2. To measure various electrical parameters using meters and transducers.
3. To calibrate the measuring devices such as meters and transducers.

Course Outcomes

1. The students could have skills about the basic measurement circuits.
2. Ability to use the techniques and skills to operate CRO.

EXPERIMENTS

1. Study of principle of operation of various types of electromechanical measuring instruments.
2. To measure high value of DC current and voltage using shunt and multiplier.
3. To measure low resistance using wheat stone bridge.
4. To measure active and reactive power in 3-phase balanced load by one wattmeter
5. method.
6. To measure the active power in 3-phase balanced and unbalanced load by two wattmeter method and observe the effect of power factor variation on wattmeter readings.
7. To study and calibrate single phase energy meter.
8. Measurement of resistance using Kelvin's Bridge.
9. Measurement of self-inductance using Anderson's Bridge.
10. Measurement of capacitance using Schering Bridge.
11. Plotting of Hysteresis loop for a magnetic material using flux meter.
12. Measurement of frequency using Wein's Bridge.
13. To study the connections and use of Current and Potential transformers and to find out ratio error.
14. Determination of frequency and phase angle using CRO.
15. Measurement of unknown voltage using potentiometer.
16. To find 'Q' of an inductance coil and verify its value using Q-meter.

Note: At least ten experiments should be performed in semester.

ELECTRONICS DEVICES AND CIRCUIT LAB.

Subject Code: BELE1-306 **L T P C**
0 0 2 1

Course Objectives

1. To understand the characteristics of various semiconductor devices.
2. To understand identification and selection of various electronic components.

Course Outcomes

1. Ability to understand all types of electronics devices and circuits.
2. Ability to analyse and interpret data.

EXPERIMENTS

1. To analyse the response of Zener diode as regulator
2. To analyse the response of half wave, full wave and Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To plot the input and output characteristics of CB configuration.
5. To examine the characteristics of a Class-A amplifier.
6. To examine the characteristics of Class-B amplifier.
7. To analyse the characteristics of Class-B push-pull amplifier.
8. To analyse the characteristics of complementary symmetry amplifier.
9. To discuss the response of RC phase shift oscillator and determine frequency of oscillation.
10. To discuss the response of Hartley oscillator and determine frequency of oscillation.
11. To analyse the response of Colpitt's oscillator and determine frequency of oscillation.
12. To analyse the response of Wien Bridge oscillator and determine frequency of oscillation.
13. To study the characteristics and response of crystal oscillator.
14. To plot the characteristics of FET.
15. To plot the characteristics of MOSFET.

Note: At least ten experiments should be performed in semester.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C** **Duration: 37 Hrs.**
0 0 2 1

Course Objectives

The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes

At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

Soft Skills: Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
Self-Discovery: Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

Forming Values: Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

Art of Listening: Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

Etiquette and Manners: ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

DC MACHINES

Subject Code: BELE1-408 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

1. To understand the basic concepts of D.C machines.
2. To introduce different techniques of speed control of DC machines.
3. To study different types of testing methods.

Course Outcomes

1. To understand all basic concepts of DC motors and generators.
2. To understand operation and control of DC machines.

UNIT-I (12 Hrs.)

General Concepts of DC Machines: Principles and construction: generator action, motor action, commutator, commutation, interpolar and compensating windings, brushes, armature core, armature windings, winding pitch, commutator pitch, commutator segments, armature reaction: de-magnetizing and cross magnetizing effects.

UNIT-II (11 Hrs.)

DC Generators: Operation, emf equation, effect of speed upon voltage and flux, types of DC generators. Characteristics of series, shunt and compound generators, voltage regulation, Condition for maximum efficiency, applications.

UNIT-III (10 Hrs)

DC Motors: Operation, concept of back emf, torque equation, power developed, Characteristics of DC motors (series, shunt and compound), effect of saturation and applications.

UNIT-IV (12 Hrs.)

Starters, Speed Control and Testing: Speed control of DC motors, Ward-Leonard control (Voltage control), various starting techniques for DC motors: Three-point starter, four-point starter, Electric breakings of DC shunt and series motors, Testing of DC machines: Brake test, Swinburne's test, Hopkinson's test, Retardation test, Field's test.

Recommended Books

1. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers.
2. P.K Mukherjee and S. Chakravorty, 'Electrical Machines', Dhanpat Rai, **2004.**

3. I.J. Nagrath and D.P. Kothari, 'Electric Machines', Tata McGraw Hill, **2004.**
4. Fitzgerald Kingsley, and Stephen Umans, 'Electric Machinery', McGraw Hill, **2002.**
5. J.B. Gupta, 'Theory and Performance of Electrical Machinery', S.K. Kataria and Sons.
6. B.L. Theraja and A.K. Theraja, 'A Text Book of Electrical Technology', S. Chand.

DIGITAL ELECTRONICS

Subject Code: BELE1-409 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To provide knowledge about basics of digital electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic algebra to represent digital gates inthe creation of solutions to design problems.

Course Outcomes

1. An ability to understand all types of combinational and sequential digital circuits and their designing.
2. Students will have skills to simplify a digital design problem as part of the systematic approach to solving a problem.

UNIT-I (12 Hrs.)

Number System and Binary Code: Introduction, Binary, decimal, Octal, hexadecimal, BCD number system, Signed and unsigned numbers, binary operations: Addition, Subtraction. Multiplication and division. Subtractions using 1's and 2's compliment. ASCII code. Excess 3 codes and Gray code. Logic gates: OR, AND, NOT, NOR, NAND, Ex-OR gates, Basic theorems of Boolean algebra, sum of products and product of sums. Minimisation using theorems, minimisation using K-map up to 4 variables.

UNIT-II (10 Hrs.)

Combinational logic circuits: Combinational circuit design, multiplexer, demultiplexer, encoders, decoders, adders, subtractors, code converters, parity checkers, BCD display drive, magnitude comparators.

UNIT-III (11 Hrs.)

Sequential circuits: Flip Flop fundamentals, different flip flop configurations: SR, JK, D, T. Edge triggered and clocked flip flops, Registers: Types of Registers, series and parallel shift: circuit diagram, timing wave form and operations. Counters: synchronous and asynchronous, Johnson counter.

UNIT-IV (12 Hrs.)

D/A and A/D Converters: Introduction, Weighted register D/A converter, binary ladder D/A converter, D/A accuracy and resolution, parallel A/D converter, Counter type A/D converter, Successive approximation A/D converter, Single and dual slope A/D converter, A/D accuracy and resolution.

Recommended Books

1. D.P. Kothari and J.S. Dhillon, 'Digital Circuits and Design', Pearson, **2015.**
2. R.P. Jain, 'Modern Digital Electronics', TMH, **2011.**
3. Malvino and Leach, 'Digital Principles and Applications', TMH, **1991.**
4. Fletcher, 'An Engg. Approach to Digital Design', PHI, Indian Ed., **2011.**

ELECTRICAL ENGINEERING MATERIALS

Subject Code: BELE1-410 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives
1. To provide knowledge about basics of electrical engineering materials.
2. Students will obtain skills of application of materials in daily life.

Course Outcomes
1. An ability to understand all types of magnetic and conducting materials.
2. To understand the various properties of electrical engineering materials.

UNIT-I (10 Hrs.)

Elementary Materials Science Concepts: Bonding and types of solids and its defects, resistivity, factors affecting resistivity, temperature dependence of resistivity, Skin Effect, Hall Effect.

UNIT-II (12 Hrs.)

Dielectric Properties of Insulators in Static and Alternating Field: Dielectric constant of gases, molecules and solids, internal field in solids and liquids, Properties of ferro-electric materials, polarization, types of polarizations, polarizability: atomic and molecular, frequency dependence of electronic and ionic polarizability, piezoelectricity and dielectric losses.

UNIT-III (12 Hrs.)

Magnetic Properties and Superconductivity: Magnetization of matter, magnetic material classification, ferromagnetic origin, Curie-Weiss law, soft and hard magnetic materials, Superconductivity and its origin, critical temperature, critical magnetic field, zero resistance and Meissner Effect, Type-I and Type-II superconductors, applications of superconductors.

UNIT- IV (11 Hrs.)

Conductivity of Metals: Drift velocity, relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.

Semiconductor Materials: Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, fermi level, applications of semiconductors in electrical engineering.

Recommended Books

1. S.P. Seth, 'A Course in Electrical Engineering Materials', Dhanpat Rai and Sons, **2001.**
2. Electrical Engineering Materials, T.T.T.I, Madras, **1998.**
3. K.B. Raina and S.K. Bhattacharya, 'Electrical Engineering Materials', S.K. Kataria and Sons, **2004.**
4. P.K. Palanisamy, 'Material Science for Electrical Engineering', Scitech Pub. (India) Pvt. Ltd., Chennai, **2011.**

LINEAR CONTROL SYSTEM

Subject Code: BELE1-411 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
1. To obtained transfer functions for electrical circuits, translational/rotational mechanical systems and electromechanical systems.
2. To learn basic goals of control systems in terms of transient/steady state time response behaviour.
3. To update the knowledge about control components.

Course Outcomes

1. The students will have skills to model the control systems.
2. Ability to analyse the stability of designed systems.

UNIT-I (10 Hrs.)

Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, Block diagrams, some illustrative examples.

UNIT-II (12 Hrs.)

Modeling: Force voltage analogy, force current analogy, Transfer function, Block diagram reduction technique, signal flow graphs and Mason's gain formula, characteristics equation.
Time Domain Analysis: Transient response of the first and second order systems, Time domain specifications, Steady state error and coefficients, Absolute and relative stability, Routh-Hurwitz Criterion.

UNIT-III (12 Hrs.)

Stability Analysis: Root locus technique, sketch of the root locus plot, Frequency domain analysis: Closed loop frequency response, bode plots, relative stability using bode plot. Frequency response specifications, relation between time and frequency response for second order systems. Nyquist criterion for stability.

UNIT-IV (11 Hrs.)

State Space Analysis: State space representations, transfer function from state model, state transition matrix, controllability, observability. Control components: Error detectors-potentiometers and synchros, servo motors, A.C. and D.C. techno generators, Magnetic amplifiers.

Recommended Books

1. Dorf Richard and Bishop Robert, 'Modern Control System', Addison-Wesley, Pearson, **2009.**
2. K. Ogata, 'Modern Control Engineering', Prentice Hall, **2011.**
3. B.C. Kuo, 'Automatic Control System', Prentice Hall, **1999.**
4. I.J. Nagrath and M. Gopal, 'Control System Engineering', Wiley Eastern Ltd, **1997.**
5. B.S. Manke, 'Linear Control Systems', **2002.**

ELECTROMAGNETIC FIELD THEORY

Subject Code: BELE1-412 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

1. To provide the knowledge about the time varying fields and Maxwell's equations.
2. To provide knowledge about the propagation of electromagnetic wave along different mediums.
3. Study of physical concept and all the important fundamental parameters of waveguides.

Course Outcomes

1. The students will learn the concepts of electromagnetic field theory and fundamental field equations.
2. The students will have skills to identify, formulates and solves engineering problems related to electromagnetic fields.

UNIT-I (11 Hrs.)

Review of Electrostatic and Magnetostatic Fields: Review of vector algebra, Review of Cartesian, Cylindrical and spherical coordinate systems, Introduction to del operator, Use of del operator as gradient, divergence, curl. Introduction to coulomb's law, Gaussian law.

Laplace's and Poission's equation in various coordinate systems. Introduction to Ampere's law, Magnetic vector potential.

UNIT-II (11 Hrs.)

Time Varying Fields and Maxwell's Equations: Equation of continuity, Inconsistency of Ampere's law for time varying fields, Concept of displacement current, Maxwell's equation in integral and differential form (for static fields, time varying fields, free space, good conductors, harmonically varying fields), Poynting theorem.

UNIT-III (12 Hrs.)

Uniform Plane Waves: Introduction, Uniform plane wave propagation, Wave equations: Wave equations for free space, Wave equations for conductors. Transverse nature of uniform plane waves, Reflection of electromagnetic waves by perfect conductor and perfect dielectric, wave impedance and propagation constant, depth of penetration, surface impedance.

UNIT-IV (11 Hrs.)

Wave Guides: Introduction, simple waveguides between two infinite and parallel conducting plates, Transverse Electric (TE) Waves or H-Waves, Transverse magnetic (TM) Waves or E-Waves, Characteristics of TE and TM waves, Transverse Electromagnetic (TEM) waves and its characteristics.

Recommended Books

1. Jordan and Balmain, 'Electromagnetic Wave', PHI and Radiation System, **2010.**
2. Kraus, 'Electromagnetics', T.M.H. **2003.**
3. W.H. Hayt and J.A. Buck, 'Problem and Solutions in Electromagnetics', Tata McGraw Hill, **1999.**
4. W.H. Hayt, 'Engineering Electromagnetic', Tata McGraw Hill, **2012**.

ELECTRICAL MACHINE-I LAB.

Subject Code: BELE1-413 **L T P C**
0 0 2 1

Course Objectives

1. To understand the characteristics of D.C. Machines.
2. To understand speed control methods and testing methods.
3. To study universal motor.

Course Outcomes

1. To acquire skills to operate all types of dc machines.
2. Ability to analyse the speed control and efficiency of DC machine.

EXPERIMENTS

1. To study various components/cut-section of DC machines.
2. To perform starting techniques of various DC machines.
3. To obtain torque and speed characteristics of a D.C. Shunt motors.
4. To obtain external characteristics of a D.C. shunt generators.
5. To obtain external characteristics of a D.C. series generators.
6. To obtain external characteristics of DC compound generators.
7. Speed control of a dc shunt motor by varying armature circuit and field circuit methods.
8. To obtain performance characteristics of universal motor.
9. To perform Swinburne's Test.
10. To perform Hopkinson's Test.
11. To perform the Brake Load Test.
12. To calculate the power rating of DC machines.
13. To determine losses and efficiency of DC machines.

Note: At least ten experiments should be performed in semester.

CONTROL SYSTEM LAB.

Subject Code: BELE1-414 **L T P C**
0 0 2 1

Course Objectives

1. To understand the basics concepts of MATLAB software.
2. To introduce variety of control system strategies.
3. To comment about the stability of designed systems.

Course Outcomes

1. To acquire skills to understand all types of control components
2. Ability to analyse the stability of control systems

EXPERIMENTS

1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox and PSPICE.
2. Determination of step response for first order and second order system with unity feedback and their display on CRO. Calculation and verification of time constant, peak overshoot, setting time etc. from the response.
3. Simulation of step response and impulseresponsefortype-0, type-1and type-2 systems with unity feedback using MATLAB and PSPICE.
4. Determination of Root Locus, Bode-Plot, Nyquist Plot using MATLAB-Control system toolbox for 2^{nd} order system. Determination of different control system performance indices from the plots.
5. Experimental determination of approximate transfer function from Bode plot.
6. Evaluation of steady state error, settling time, percentage peak overshoot, gain margin, phase margin, with addition of lead compensator and by compensator in forward path transfer function for unity feedback control system using PSPICE.
7. Design of a second order linear time invariant control system and study of system response with unit step input.
8. To study the characteristics of potentiometers and to use 2-potentiometers as an error detector in a control system.
9. To study the synchro Transmitter-Receiver set and to use it as an error detector.
10. To study the Speed-Torque characteristics of an AC Servo Motor and to explore its applications.
11. To study the Speed-Torque characteristics of a DC Servo Motor and explore its applications.
12. To study various electro-mechanical transducers i.e. resistive, capacitive and inductive transducers.
13. To study the speed control of an A.C. Servo Motor using a closed loop and an open loop system.
14. To study the operation of a position sensor and study the conversion of position in to corresponding voltage

Note: At least ten experiments should be performed in semester.

DIGITAL ELECTRONICS LAB.

Subject Code: BELE1-415 **L T P C**
0 0 2 1

Course Objectives

1. To give students a practical knowledge about all types of digital circuits.
2. To give students a working knowledge to connect digital circuits and verify their truth

tables.
3. To give students knowledge of different combinational and sequential circuits.

Course Outcomes

1. Anabilitytotestandverifyworkingandtruthtablesofcombinationalandsequentialcircuits.
2. To give knowledge of various logic families.

EXPERIMENTS

1. To Study Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and realization of OR, AND, NOT and XOR functions using universal gates.
2. To design Half Adder using Logic gates on bread board.
3. To design Full Adder using Logic gates on bread board.
4. To design Half Subtractor using Logic gates on bread board.
5. To design Full Subtractor using Logic gates on bread board.
6. To design 4-Bit Binary-to-Gray Code Converter on bread board.
7. To design 4-Bit Gray-to-Binary Code Converter on bread board.
8. To study and design 4-Bit magnitude comparator using logic gates on bread board.
9. Design and verification of Truth-table of multiplexer.
10. Realization of Half adder and Full adder using MUX.
11. Design and verification of Truth-table of Demultiplexer.
12. Realization of half subtractor and full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers: SIPO, SISO, PIPO, and PISO.
16. To Study digital logic families.

Note: At least ten experiments should be performed in semester.

SOFT SKILLS-II

Subject Code: **BHUM0-F92** **L T P C**
0 0 2 1

Course Objectives

The course aims to address various challenges of communication as well as behavioural skills faced by individual at work place and organizations. Also, it aims to enhance the employability of the students.

Course Outcomes

At the end of the course the student will be able to understand the importance of goal setting. They will also be able to handle stress in their lives and future in a better way.

UNIT-1

Developing Positive Attitude: Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.

Improving Perception: Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

Career Planning: Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

Art of Reading: Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

Stress Management: Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

ASYNCHRONOUS MACHINES

Subject Code: BELE1-516 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To impart knowledge of the constructional features and principle of operation of three-phase and single-phase induction machines.
2. To impart knowledge about methods of starting and speed control of induction motors.
3. To make the students aware about construction, principle of operation and applications of special purpose motors.

Course Outcomes:

1. The students will be having skills to analyse the performance of the asynchronous machines using the phasor diagrams and equivalent circuits.
2. To gain knowledge of speed control and testing of asynchronous machines.
3. To gain the knowledge to select appropriate asynchronous machine for any application and appraise its significance.

UNIT-I (18 Hrs.)

Three Phase Induction Motors: Constructional features, Production of rotating field in space distributed three-phase winding, Principle of operation, Concept of slip, rotor frequency, current, torque and power output, Types of induction motors, Analogy between induction motor and transformer, no load and blocked rotor test, Circle diagram, Equivalent circuit parameters, Phasor diagram, Torque-slip characteristics, Effect of rotor circuit resistance, Crawling and Cogging, Cage motors (double cage and deep bar motor).

UNIT-II (12 Hrs.)

Starting Methods and Speed Control: Starting methods of squirrel cage and slip ring induction motor, Different speed control methods, effect of voltage injection in rotor circuit of slip ring induction motor.

Induction Generator: Isolated and Grid mode operation, method of excitation, performance characteristics of three-phase self-excited induction generator, introduction to doubly fed induction generator.

UNIT-III (10 Hrs.)

Single Phase Motors: Introduction, Double revolving field theory, types of single phase motors (Split phase, capacitor start, capacitor run, capacitor start and run) and their characteristics, shaded pole motor: working principle and characteristics. Reluctance motor: construction, principle of operation and applications.

UNIT-IV (8 Hrs.)

Special Purpose Motors: Stepper Motor: construction, principle of operation and applications. Linear Induction Motor: construction, principle of operation and applications. Universal Motor: construction, principle of operation and applications.

Recommended Books

1. A.E. Fitzgerald, C. Kingsley and S.D. Umans, 'Electric Machinery', 6th Edn., McGraw Hill, **1998**.
2. E.H. Langsdorff, 'Principles of A.C. Machines', McGraw Hill, **2010**.
3. I.J. Nagrath and D.P. Kothari, 'Electrical Machines', 4th Edn., Tata McGraw Hill, **2011**.
4. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, **1999**.
5. M.G. Say,' Alternating Current Machines', 5th Edn., Sir Isaac Pitman and Sons Ltd., **2004**.

POWER ELECTRONICS AND DRIVES

Subject Code: BELE1-517 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To make the students aware about the power electronic devices and construction, operation and characteristics of most popular member of thyristor family i.e. SCR.
2. To acquaint them with basic concepts of operation of different types of convertors.
3. To impart knowledge about application of converters to motor drives.

Course Outcomes:

1. The students will learn the operation and characteristics of power electronic devices
2. The students will be able to analyse operation of diffferent types of converter circuits such as; AC-DC, DC-DC, AC-AC and DC-AC.
3. The students will be able to understand application of converters for control of motor drives.

UNIT-I (14 Hrs.)

Introduction: Thyristor family and SCR, Constructional features of SCR, its static and dynamic characteristics, turn-on and turn-off methods and firing circuits, Ratings and protection of SCR'S, series and parallel operation, commutation circuits.

UNIT-II (12 Hrs.)

Phase Controlled Converters: Principle of phase control, single phase and three phase converter circuits with different types of loads, dual converters and their operation.
DC Choppers: Principle of chopper operation, control strategies, types of choppers, step up and step down choppers, voltage, current and load-commutated choppers.

UNIT-III (14 Hrs.)

Inverters: Single phase Voltage source bridge inverters, Modified Mc-Murray half bridge inverter, series inverters, three phase bridge inverters with 180^0 and 120^0 modes. Single phase PWM inverters, Current source inverters.
AC Voltage Controllers: Types of single-phase voltage controllers, single-phase voltage controller with R and RL type of loads.
Cycloconverters: Principle of operation, single phase to single phase step up and step down Cycloconverters, three phase to single phase cycloconverters.

UNIT-IV (08 Hrs.)

DC Motor Drives: DC motor drive – starting, braking, transient analysis, speed control, controlled rectifier converters for DC drives and chopper fed DC drives.
AC Motor Drives Induction motor drive – starting, braking, transient analysis, speed control, ac controller fed induction motor, voltage source inverter, current source inverter and cyclo-converter fed induction motor drive.

Recommended Books

1. G.K. Dubey, S.R. Doradla, A. Joshi, R.N.K. Sinha, 'Thyristorised Power Controllers', New Age International (P) Limited, Publishers, **2004**.
2. M. Rashid, 'Power Electronics', Prentice Hall of India Private Ltd., **2006**.

3. P.S. Bimbhra, 'Power Electronics', Khanna Publishers, **2004**.
4. Bimal Bose, 'Power Electronics and Motor Drives', Academic Press, **2006**.
5. P.C. Sen, 'Power Electronics', Tata McGraw Hill Company Ltd., New Delhi, **1992**.
6. C. Rai Harish, 'Power Electronics and Industrial Applications', 1st Edn., CBS Publishers & Distributors Pvt Ltd., **2018**.

GENERATION AND ECONOMICS OF ELECTRIC POWER

Subject Code: BELE1-518 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Learning Objectives:
1. To familiarize the students with different types of loads and load curves.
2. To apprise them with different types of costs involved in power plant and tariffs imposed on the electricity consumers
3. To impart knowledge about selection and economic operation of steam plants.
4. To impart knowledge about hydrothermal coordination.

Course Outcomes:
1. Students will get knowledge of different types of loads and related terminology.
2. They will learn about various costs involved in the power plants and tariffs imposed on different categories of consumers.
3. They will gain the knowledge about co-ordinated operation of Hydro and Steam power plants.

UNIT-I (10 Hrs.)

Loads and Load Curves: Types of load (fixed voltage loads, resistive loads, Inductive motor loads, mechanical load), effect of load on supply voltage, maximum demand, group diversity factor, peak diversity factor, types of load, chronological load curves, load-duration curve, mass curves, load factor, capacity factor, utilization factor, base load and peak load plants, load forecasting.

UNIT-II (12 Hrs.)

Power Plant Economics: Capital cost of plants, annual fixed cost, operating costs and effect of load factor on cost of energy, depreciation, tariffs and power factor improvement, objectives of tariff making, different types of tariff (domestic, commercial, agricultural and industrial loads). Need for power factor improvement, power factor improvement using capacitors, determination of economic power factor.

UNIT-III (14 Hrs.)

Selection of Plant: Plant location, plant size, number and size of units in plants, economic comparison of alternatives based on annual cost, rate of return, present worth and capitalized cost methods. Economic operation of steam plants, methods of loading turbo-generators, input- output curve, heat rate, incremental cost, method of Lagrangian multiplier, effect of transmission losses, co-ordination equations, and iterative procedure to solve co-ordination equations.

UNIT-IV (12 Hrs.)

Hydro-Thermal Co-ordination: Advantages of combined working of Run-off River plant and steam plant, reservoir hydro plants and thermal plants, long-term operational aspects, scheduling methods. Cogeneration: Definition and scope, Topping and Bottoming Cycles, Benefits, cogeneration technologies.

Recommended Books

1. M.V. Deshpande, 'Power Plant Engineering', Tata McGraw Hill, **2004**.
2. M.M. EI-Wakit, 'Power Plant Engineering', McGraw Hill, USA, **2010.**
3. D.P. Kothari and I.J. Nagrath, 'Power System Engineering', Tata McGraw Hill, **2008**.

4. S.C. Arora and S. Dom Kundwar, 'A Course in Power Plant Engineering', 6th Revised Edn., Dhanpat Rai, **2011-12**.
5. P.K. Nag, 'Power Plant Engineering', Tata McGraw Hill, **2014**.
6. B.R. Gupta, 'Generation of Electrical Energy', S. Chand, **2017**.

POWER ELECTRONICS LAB.

Subject Code: BELE1-519 **L T P C**
0 0 2 1

Course Objectives:
1. To obtain the characteristics of SCR and UJT and to obtain triggering pulses for them.
2. To verify the performance of various converter circuits by measuring the currents and voltages at different points in the circuit and to display their waveforms.
3. To control speed of motors by using thyristors.

Course Outcomes:
1. Students will be able to verify the characteristics of SCR and UJT and triggering pulses for them.
2. They will be able to visualize and analyse the performance of various converter circuits.
3. They will be able to control the speed of motors using thyristors.

EXPERIMENTS

1. To obtain V-I characteristics of SCR and measure latching and holding currents.
2. To plot V-I Characteristics of UJT.
3. To obtain triggering wave forms for SCR using R and RC firing circuits.
4. To obtain output voltage waveforms of single phase half wave controlled rectifier for R-L load.
5. To obtain output voltage wave forms for single phase full-wave controlled rectifiers with resistive and inductive loads.
6. To simulate three phase bridge rectifier and draw load voltage and load current waveform for resistive and inductive loads.
7. To study different types of chopper circuits and obtain waveforms for at least one of them.
8. To simulate single phase inverter using different modulation techniques and obtain load voltage and load current waveform for different types of loads.
9. To simulate single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
10. To study single phase cycloconverter.
11. To study speed control of induction motor using thyristor.
12. To study speed control of DC motor using thyristor.

Note: At least ten experiments should be performed in the semester.

Recommended Books

1. K.R. Varmah, K. John Ginnes, Abraham Chikku, 'Power Electronics, Design, Testing and Simulation, Laboratory Manual', 1st Edn., CBS Publishers & Distributors Pvt. Ltd., **2017**.
2. O.P. Arora, 'Power Electronics Laboratory, Theory, Practice and Organization', Narosa Publishing House, **2007.**

ELECTRICAL: ESTIMATION AND COSTING LAB.

Subject Code: BELE1-520 **L T P C**
0 0 2 1

Course Objectives:

1. To know about layout of wiring circuits of electrical installations of a residential building or/and an educational institute or/and an industry.
2. To estimate the various costs involved in these electrical installations.
3. To know about wiring arrangements of motor control circuits and to do energy audit of a small utility.

Course Outcomes:

1. The students will become familiar with the layout of wiring circuits of electrical installations and those of motor control circuits.
2. They will be able to estimate the various costs involved in these electrical installations.
3. They will learn to do energy audit of a small utility.

EXPERIMENTS

1. To study Indian electricity act 2003.
2. To carry out wiring diagram of residential building/educational institute/industry.
3. To study design parameters of electrical panel boards.
4. To estimate the cost of a domestic installation (Residential building/laboratory/drawing hall) with concept of illumination design.
5. To estimate the cost of industrial installation.
6. To estimate the cost of overhead service connection.
7. To estimate the cost of underground service connection.
8. To estimate the load and cost of any five electrical appliances.
9. To estimate the cost of repair and maintenance of any five domestic appliances.
10. To study various types of light sources and lighting schemes.
11. To draw wiring diagrams of motor control circuits for starting of induction and synchronous motors.
12. To carryout electrical energy audit of laboratory/office/workshop**.**

Note: At least ten experiments should be performed in semester.

Recommended Books

1. Singh Surjit, 'Electrical Estimating and Costing', Dhanpat Rai & Co., **Reprint 2013**.
2. Deb Tanmoy, 'Installation, Testing, Commissioning and Maintenance of Electrical Apparatus', Dhanpat Rai & Co., **Reprint 2013.**

SOFT SKILLS-III

Subject Code: **BHUM0-F93** **L T P C** **Duration: 37 Hrs.**
0 0 2 1

Course Objectives:

The course aims to equip the students with effective writing skills in English. Also, to make the students understand their role as team players in organizations.

Course Outcomes

At the completion of the course, the student will become well –versed with the behavioural skills. They will also understand the role of body language and non-verbal communication during the interview process.

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

Art of Business Writing: Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

Body Language: Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

Team Building and Team Work: Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration-Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

Time Management: Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procastination.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016.**
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, John M., et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007**.

POWER PLANT ENGINEERING

Subject Code: BELE1-556 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the students to the classification of steam and hydro-electric power plants and make them familiar with the main equipment and machinery used in them.
2. To provide them basic concepts of nuclear, gas and diesel power plants.
3. To impart knowledge about pollution control and combined operation of different plants.

Course Outcomes:

1. The students will acquire knowledge about various equipment used in thermal, hydro and nuclear power generation.
2. They will also become familiar with equipment used in gas and diesel power plants.
3. They will come to know about the importance of co-ordinated operation of different power plants and methods of pollution control.

UNIT-I (16 Hrs.)

Steam Generators, Condensers and Turbines: Classification of steam generators, Types of condensers, effect of air in condensers, steam nozzles, types of steam turbine efficiencies.
Steam Power Plant: Classification, Operation, Description of Rankin cycle, coal handling system, combustion system, Ash handling, Feed pumps, Heat exchangers, Economizers, Super heaters, Reheaters, Air preheaters, Feed water heaters, Evaporators.

UNIT-II (12 Hrs.)

Hydro-Electric Power Plants: Hydrological cycle, Hydrograph, Flow duration curve, Classification of hydro plants, Selection of water turbines for hydro power plant.

Nuclear Power Plants: Nuclear physics, Binding energy, Radioactive decay. Fertile material, Mass defect, Nuclear reactions type and application, Generation of nuclear energy by fission, Nuclear reactors. Safety measures, Future of nuclear power.

UNIT-III (10 Hrs.)

Gas Turbine: Elements of gas turbines, Open and closed cycles for gas turbines, Performance terms, Plant layout, applications.

Diesel Power Plants: Classifications of IC Engines and their performance, four stroke and two stroke diesel engines, combustion phenomenon; Essential components, Cetane number, knocking, super charging, operation and layout of diesel power plant.

UNIT-IV (10 Hrs.)

Combined Operation of Different Power Plants: Advantages of combined operation of plants, load division between power stations, coordination of different types of Power Plants.

Pollution Control: Pollution from thermal and nuclear plants, Particulate emission and control, electrostatic precipitator, solid waste disposal.

Recommended Books:

1. Chakrabarti, Soni, Gupta and Bhatanagar, 'A Textbook on Power System Engineering', Dhanpat Rai & Co., **2013**.
2. M.M. EI-Wakil, 'Power Plant Technology', 2nd Reprint, Tata McGraw Hill Edn., **2010**.
3. R.K. Rajput, 'Power Plant Engineering', 4th Edn., Luxmi Publications, **2010**.
4. P.C. Sharma, 'Power Plant Engineering', Kataria and Sons, **2009**.
5. B.G.A. Skrotzki and W.A. Vapot, 'Power Station Engineering and Economy', 31st Reprint, Tata McGraw Hill Education Pvt. Ltd., **2009**.
6. P.K. Nag, 'Power Plant Engineering', 4th Edn., McGraw Hill Education (India) Pvt. Ltd., **2014**.
7. G.R. Nagpal, 'Power Plant Engineering', 16th Edn., Khanna Publishers, **2013**.
8. S.C. Arora, S. Domkundwar, 'Power Plant Engineering', 6th Edn., Dhanpat Rai, **2013**.

SIGNALS AND SYSTEMS

Subject Code: BELE1-557 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To understand the classification of signals.
2. To apply Fourier series and Fourier Transformation to periodic and aperiodic signals.
3. To introduce the concepts of probability of occurrence of random events.
4. To understand different types of noise associated with signals.

Course Outcomes:

1. The students will learn about various types of signals and systems.
2. They will be able to analyse these signals using Fourier series and transform.
3. The students will learn to analyse various types of noise in the system.

UNIT-I (12 Hrs.)

Introduction: Classification of Signals and Systems, Linear time invariant systems, Convolution, Representation of signals in terms of impulses, Signal Representation using Fourier Series, Complex and Exponential Fourier Series, Fourier Series Representation of Periodic Signals, Properties of Fourier series, Parseval's theorem.

UNIT-II (12 Hrs.)

Signal Analysis: Aperiodic Signal Representation using Fourier Transforms, Fourier Transforms of Periodic Power Signals, Signal Transmission through Linear Networks,

Convolution Theorem and its graphical interpretation, Sampling Theorem, Correlation, Autocorrelation.

UNIT-III (12 Hrs.)

Probability: Introduction to Probability Theory, Definition of Probability of Random Events, Joint and Conditional Probability, Cumulative Distribution Function (CDF), Probability Density Functions (PDF) and Statistical Averages of random variables, introduction to random processes.

UNIT-IV (12 Hrs.)

Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise, Noise in Bipolar Junction Transistors (BJTs), FET noise, Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure, Experimental determination of Noise Figure.

Recommended Books

1. V. Oppenheim Alan, 'Signals and Systems', Prentice Hall, **1997**.
2. S. Haykins and B.V. Veen, 'Signals and Systems', John Wiley and Sons, **2007.**
3. M.J. Roberts, 'Fundamentals of Signals and Systems', SIE Edn., McGraw Hill Education, **2007**.
4. B.P. Lathi, 'Linear Systems and Signals', Oxford University Press, **2009**.
5. Sanjay Sharma, 'Signals and Systems', Katson Publishers, **2013**.
6. Rajeswari K. Raja, Rao B. Visvesvara, 'Signals and Systems', PHI Learning Pvt. Ltd., **2014**.
7. M. Nahvi, 'Signals and Systems', McGraw Hill Education, **2015.**

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: BELE1-558 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To acquire detailed knowledge about architecture and operation of 8085 microprocessor
2. To study 8051 microcontrollers in detail.
3. To interface peripheral devices with microprocessors and microcontrollers.

Course Outcomes:

1. The students will learn about architecture, operation, instruction set and programming of 8085 microprocessors.
2. The students will learn about architecture, operation, instruction set and programming of 8051 microcontrollers.
3. Students will learn how to interface 8085 and 8051 with peripheral devices

UNIT-I (12 Hrs.)

History and Evolution: Background history of Microprocessors, Introduction to Basic features, General Architecture of Microprocessors, Recent trends and Applications.

8085 Microprocessor: Architectural Block Diagram, Schematic and Pin diagrams, Pin functions, Bus Organization, Internal operations and registers, Externally initiated operations, Timing and Control Unit, Microprocessor communication, Multiplexing of address/data bus, Generation of control signals, 8085 machine cycles, Timing Diagrams Addressing Modes, Instruction Set, Interrupts, Programming Examples, Direct Memory Access. Peripheral Controllers: USART (8251), RS-232C, Programmable Peripheral Interface (8255), Programmable Interrupt Controller (8259) and their applications.

UNIT-II (15 Hrs.)

8051 Microcontroller Architecture: Introduction to MCS -51 Family microcontrollers, Architectural block Diagram, Pin diagram and Pin Functions, General Purpose and Special

Function Registers, Oscillator and clock circuit, Reset circuit, I/O Port circuits, Memory organization, Internal program and data memory.

Introduction to Program Development Tools (IDE): Concept of IDE, Editor, Assembler, Compiler, Linker, Simulator, Debugger and assembler directives.

8051 Assembly language programming: Programming model of 8051, Addressing modes, data transfer instructions, I/O Port programming, Arithmetic and Logical instructions, Bit level instructions, Branching instructions (Jump and loop Jump and call), Concept of stack, subroutine and related instructions, writing programs (like time delay using loop, data conversions HEX to ASCII, BCD to ASCII, use of look up table etc.) in assembly language 8051 and testing the same using IDE.

UNIT-III (12 Hrs.)

External Memory Interfacing: Memory address decoding, interfacing 8031/8051 with ROM/EPROM and Data ROM.

8051 Timer/Counter and Programming: Use of counter as timer, Timer/Counters and associated registers, Various modes of timer/counter operations, Time delay programs in Assembly language/ Embedded C.

8051 Serial Port and Programming: Basics of serial communication, RS232 standards, 8051 connections to RS232, Serial data input/output and associated registers, Various modes of serial data communication, serial data communication programs in Assembly language/ Embedded C.

8051 Interrupts: Concept of Interrupt, interrupt versus polling, Types of interrupts in 8051, Reset, interrupt control and associated registers, interrupt vectors, Interrupt execution, RETI instruction, software generated interrupt, interrupt handler subroutine for timer/counter and serial data transmission/reception in Assembly language/ Embedded C.

UNIT-IV (9 Hrs.)

Applications and design of microcontroller based systems: Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key debounce techniques, Keyboard connections, load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, Opto-isolator, stepper motor and DC motor

Recommended Books

1. R.S. Gaonkar, 'The 8085 Microprocessor- Architecture, Programming and Interfacing', Penram International Publishing (India) Pvt. Ltd. 6th Edn., **2013**.
2. D.V. Hall, S.S.S.P. Rao, 'Microprocessors and Interfacing', 3rd Edn., McGraw-Hill Education, **2012**.
3. M.A. Mazidi, J.G. Mazidi and R.D. Mckinlay, 'The 8051 Microcontroller and Embedded Systems: using Assembly and C', Pearson Education, **2007**.
4. Sunil Mathur, 'Microprocessor 8085 & its Interfacing', 2nd Edn., Prentice Hall of India, **2011.**
5. Mandal Soumitra Kumar, 'Microprocessors and Microcontrollers: Architecture, Programming and Interfacing Using 8085, 8086 and 8051', McGraw Hill Education, **2017**.
6. B. Ram, 'Fundamentals of Microprocessors and Microcontrollers', Dhanpat Rai Publications (P) Ltd., **2008**.

INSTRUMENTATION ENGINEERING

Subject Code: BELE1-559 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To acquire knowledge about the various elements of instrumentation systems.

2. To acquire knowledge about working of data acquisition and corresponding signal conditioning.
3. To know about different types of display devices and recorders.

Course Outcomes:

1. Student will get knowledge about various types of transducers, signal conditioning and data acquisition systems.
2. Students will get acquainted with digital measurement systems, display devices and recorders.
3. Students will be able to know about data transmission and telemetry.

UNIT-I (14 Hrs.)

Transducers: Introduction to sensors, transducers, detectors, actuators, Electrical transducers, and its classification, Characteristics and choice of transducers, Resistive and Capacitive transducers, Potentiometers, Strain gauges and its types, Thermistors, RTD, Thermocouples, LVDT, RVDT, Piezo electric transducers, Hall effect transducers, Encoders, Synchros.

UNIT-II (12 Hrs.)

Signal Conditioning: Introduction, role of operational amplifiers in signal conditioning, characteristics of op-amps, instrumentation amplifier, filters, general consideration of A/D and D/A convertors.

Data Acquisition Systems: instrumentation systems and its types, Analog data acquisition system, Digital data acquisition system, recorders, multiplexing and sample/hold circuits in data acquisition system.

UNIT-III (12 Hrs.)

Display Devices: Introduction, digital display methods, segmental displays, Dot Matrices, rear projection display, LED, LCD, segmental gas discharge displays, Electronic counters, digital voltmeters and its types.

Recorders: Requirement of recording, Analog and digital recorders, Graphic recorders, Strip chart recorders, Null type recorders, Potentiometric type recorders, single and multi-point recorders, X-Y records, Ultraviolet recorders, magnetic tape recorders, Frequency and pulse duration modulation type recording, Introduction to direct recording.

UNIT-IV (10 Hrs.)

Digital Measurement Systems: Introduction, types of tools used in digital systems, digital instruments and its types, microprocessor based instrumentation

Data Transmission and Telemetry: methods of data transmission, general telemetry systems, types of telemetry systems, modulations in telemetry, transmission and media channels.

Recommended Books

1. Halfrick Albert D. and Cooper Willium D., 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990**.
2. A.K. Sawhney, 'Electronic Instrumentation and Measurement', 19th Edn., Dhanpat Rai and Sons, **2011**.
2. Jones Larry D. and Chin A. Foster, 'Electronic Instruments and Measurement', 2nd Edn., **1995**.
3. Morris Alan S. and Langari Reza, 'Measurement and Instrumentation, Theory and Applications', Academic Press, Elsevier, **2016**.
4. Malaric Roman, 'Instrumentation and Measurement in Electrical Engineering', Brown Walker Press, Boca Raton, Florida, USA, **2011**.
5. David Bell, 'Electronic Instrumentation and Measurements', 2nd Edn., PHI, **2003**.
6. M.M.S. Anand, 'Electronic Instruments and Instrumentation Technology', PHI, **2004**.
7. H.S. Kalsi, 'Electronic Instrumentation', 2nd Edn., TMH, **2004**.

SYNCHRONOUS MACHINES

Subject Code: BELE1-622 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To make the students aware about the general aspects of synchronous machines.
2. To apprise the students about the construction, operation and characteristics of alternators and synchronous motors.
3. To make them to understand the underlying aspects of parallel operation of alternators.

Course Outcomes:

Students will be able to

1. Understand about the general aspects and winding terminology used in 3-ϕ synchronous machines and 1-ϕ synchronous motors.
2. Analyse the various methods of voltage regulation and EMF equations of alternators.
3. Memorize power-angle characteristics of synchronous machines and the working and characteristics of synchronous motors.
4. Understand the concepts about parallel operation and transient conditions of alternators.

UNIT-I (10 Hrs.)

General Aspects: Construction and working principle of synchronous machines, Excitation systems, Production of sinusoidal electromotive force (EMF) and its equation, flux and magnetomotive force (MMF), phasor diagrams, cylindrical and salient pole rotors, pitch factor, distribution factor.

UNIT-II (14 Hrs.)

Alternators: Construction, Phasor diagram of cylindrical rotor alternator, ratings, armature reaction, determination of synchronous reactance; open-circuit and short- circuit characteristics, short-circuit ratio, short-circuit loss. Determination of voltage regulation: EMF, MMF and zero power factor method. Power flow through inductive impedance, Power-angle characteristics of cylindrical and salient pole synchronous machines, Two-reaction theory of salient pole machines, power factor control.

UNIT-III (12 Hrs.)

Synchronous Motors: Operating characteristics, power-angle characteristics, condition for maximum power, V-curves and inverted V-curves, methods of starting, synchronous motor applications, synchronous condenser, Hunting, damper windings, Hysteresis motors.

UNIT-IV (12 Hrs.)

Parallel Operation of Alternators: Conditions for synchronization of single phase and three phase alternators, conditions for parallel operation, synchronizing power, current and torque, effect of increasing excitation of one of the alternators, effect of change of speed of one of the alternators, effect of unequal voltages, load sharing.

Recommended Books

1. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, **2010.**
2. A.E. Fitzgerald, C. Kingsley and S.D. Umans, 'Electric Machinery', 6th Edn., McGraw Hill.
3. I.J. Nagrath and D.P. Kothari, 'Electrical Machines', 4th Edn., Tata McGraw Hill, **2011**.
4. M.G. Say, 'Alternating Current Machines', 5th Edn., Sir Isaac Pitman and Sons Ltd., **2004**.
5. S. Sarma Mulukutla and Mukesh K. Pathak, 'Electric Machines', 3rd Indian Reprint, CENGAGE Learning, **2009**.

POWER SYSTEM-I (TRANSMISSION AND DISTRIBUTION)

Subject Code: BELE1-623 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce the students to the structure of power and distribution systems.
2. To introduce them to overhead transmission lines and underground cables and make them to understand their operating characteristics.
3. To make them familiar with the components and the mechanical design aspects of overhead transmission lines.

Course Outcomes:

1. Students will be able to understand power distribution systems.
2. Students will be skilled to analyse performance of transmission lines and underground cables.
3. Students will be able to select and design overhead line insulators and transmission lines.

UNIT-I (12 Hrs.)

Structure of Power System: Growth of power systems: Indian overview, Interconnections and their advantages, Electricity act 2003, Environmental and safety measures.

Distribution Systems: DC 2-wire and 3-wire systems, AC single phase, three phase and 4-wire systems, and comparison of copper efficiency. Distribution Systems: primary and secondary distribution systems, concentrated and uniformly distributed loads on distributors; one and both ends, ring distribution, sub mains and tampered mains.

UNIT-II (12 Hrs.)

Overhead Transmission Lines: Materials and types of conductors, line parameters; calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, generalized ABCD constants and equivalent circuits of short, medium and long lines. Line performance: regulation and efficiency of short, medium and long lines, series and shunt compensation.

UNIT-III (12 Hrs.)

Overhead Line Insulators and Mechanical Design of Transmission Lines: Type, string efficiency, voltage distribution in string of suspended insulators, grading ring, preventive maintenance. Different types of towers, sag-tension calculations, Corona-losses, radio and audio noise, transmission line–communication line interference, Comparison of EHVAC and HVDC transmission systems.

UNIT-IV (12 Hrs.)

Underground Cables: classification of cables based upon voltage and dielectric material, insulation resistance and capacitance of single core cable, dielectric stress, capacitance of 3 core cables, methods of laying, heating effect, Maximum current carrying capacity, cause of failure, comparison with overhead transmission lines.

Recommended Books

1. D.P. Kothari and I. J. Nagrath, 'Power System Engineering', Tata McGraw Hill, **2007**.
2. J.B. Gupta, 'Transmission and Distribution of Electrical Power', Katson Books, **2013**.
3. C.L. Wadhwa, 'Electric Power Systems', 7th Edn., New Age International Publishers, **2016**.
4. J. Grainger John and Jr. W.D. Stevenson, 'Power System Analysis', McGraw Hill, **1994**.

ELECTRICAL MACHINES-II LAB.

Subject Code: BELE1-624 **L T P C**
0 0 2 1

Course Objectives:

1. To plot speed-torque characteristics of three-phase and single-phase induction motors.
2. To obtain equivalent circuit parameters of three-phase and single-phase induction motors.
3. To study speed control of induction motors using different techniques.
4. To plot characteristics of a three-phase alternator and a synchronous motor.
5. To synchronise two 3-phase alternators by different methods

Course Outcomes:

Students will be able to

1. Obtain equivalent circuit parameters of single-phase and three- phase Induction motors.
2. Control speed of Induction motors by different methods.
3. Draw open and short circuit characteristics of three-phase alternator and V and inverted V curves of synchronous motor.
4. Find out voltage regulation of an alternator by different tests.
5. Synchronise two or more 3-phase alternators.

EXPERIMENTS

1. To perform load-test on three-phase induction motor and to plot speed-torque characteristics.
2. To perform no-load and blocked rotor test on three-phase induction motor to obtain equivalent circuit parameters and to draw circle diagram.
3. To study the speed control of three-phase induction motor by Kramer's method.
4. To study the speed control of three-phase induction motor by cascading of two induction motors.
5. To study star- delta starters and
   a) To draw electrical connection diagram.
   b) To start the three-phase induction motor using it.
   c) To reverse the direction of three-phase induction motor.
6. To start a three-phase slip ring induction motor by inserting different levels of resistance in the rotor circuits and to plot speed- torque characteristics.
7. To perform no-load and blocked rotor test on single-phase induction motor and to determine the parameters of equivalent circuit.
8. To perform load test on single-phase induction motor and plot speed-torque characteristics.
9. To perform no load and short circuit test on three-phase alternator and draw open and short circuit characteristics.
10. To find voltage regulation of an alternator by zero power factor (ZPF) method.
11. To study effect of variation of field current upon the stator current and power factor of synchronous motor running at no load and draw V and inverted V curves of motor.
12. To synchronise two 3-phase alternators using dark lamp method, and two-bright & one dark lamp method.
13. To start a synchronous motor using appropriate method.

Note: At least ten experiments should be performed in the semester.

PROGRAMMING IN MATLAB

Subject Code: BELE1-625 **L T P C**
0 0 2 1

Course Objectives:

1. To introduce to BASIC built in functions of MATLAB and blocks of SIMULINK.
2. To learn to do various programming operations in MATLAB and develop Simulink models in SIMULINK.
4. To learn to plot various types of graphs in MATLAB.

Course Outcomes:

1. Students will know about BASIC built in functions of MATLAB and blocks of SIMULINK.
2. They will learn to do various programming operations in MATLAB and develop Simulink models in SIMULINK.
3. They will be able to draw 2-D and 3-D plots in MATLAB.

EXPERIMENTS

1. Introduction to Fundamentals of MATLAB Programming.
2. To perform Arithmetic and logic operations in MATLAB.
3. To perform branch and loop operations in MATLAB.
4. To use basic built-in function of Matrices in MATLAB.
5. To develop a user defined function file in MATLAB.
6. To plot 2-D & 3-D graphs in MATLAB, such as plots, subplots, logarithmic plots and multiple plots etc.
7. To plot 3-phase AC supply voltage in MATLAB.
8. To develop MATLAB program to calculate ABCD parameters of transmission line.
9. Introduction to commonly used blocks of SIMULINK.
10. To develop Simulink model to show series resonance phenomenon and to plot voltage & current waveforms and frequency vs impedance graph.
11. To develop Simulink model to show parallel resonance phenomenon and plot voltage & current waveforms and frequency vs admittance graph.
12. To develop a Simulink model of symmetrical three phase power system supplying a three phase balanced load and to display the three phase voltage, current, active and reactive power.
13. To develop Simulink model of three phase transformer and to display the primary and secondary voltages and currents.
14. To develop Simulink model for speed control of dc motors.

Note: At least ten experiments should be performed in semester.

Recommended Books

1. Tyagi Agam Kumar, 'Matlab and Simulink for Engineers', Oxford Publishers, **2012**.
2. S. Swapna Kumar, S.V.B. Lenina, 'MATLAB Easy Way of Learning', PHI, **2016**.
3. Stephen J. Chapman, 'MATLAB Programming for Engineers', Cengage Learning, **2015**.

SOFT SKILLS-IV

Subject Code: **BHUM0-F94** **L T P C** **Duration: 37 Hrs.**
0 0 2 1

Course Objectives:

The course aims at the key areas like conversation skills, group skills and persuasion skills required during the interview process in an organization.

Course Outcomes:

At the end of the course, the student will be able to:

1. Demonstrate soft skills required for business situations.
2. Analyze the value of soft skills for career enhancement.
3. Apply soft skills to workplace environment.
4. Confidently participate in GD and interview process.

UNIT-1

Art of Speaking: Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

Group Discussion: Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Non-verbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

Preparing Cv/Resume: Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

Interview Skills: Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Lucas, E. Stephen, 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004.**
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, 1**985**.

ELECTRICAL POWER UTILIZATION

Subject Code: BELE1-660 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To acquire knowledge about various elements of A.C and D.C electric motor drives and their characteristics.
2. To acquire detailed knowledge about electric traction systems.
3. To know various phenomena related to electrolytic processes and illumination.

Course Outcomes:

1. Students will get knowledge about D.C and A.C electric motor drive characteristics and select them for particular traction systems.
2. They will be able to explore and control various electric heating and welding methods and processes.
3. They will be able to calculate illumination requirements.

UNIT-I (16 Hrs.)

ELECTRIC DRIVES: Introduction concept of electric drives, classification of electric drives, nature of load, factors effecting selection of drive, Running characteristics of D.C, Series and shunt motor, 3-phase induction motor, 3-phase synchronous motor and A.C series motors, Starting methods of D.C series and shunt motors, starting methods of 3-phase induction motors, examples, starting methods of synchronous motors and single-phase induction motor. Speed control of D.C series and shunt motors, examples, Speed control of 3- phase induction motor, examples, Methods of electric braking of D.C motor, examples. Braking of 3-phase induction motor, Mechanical features of electric drive, Load equalization, flywheel calculations, examples. Temperatures rise of electric drives, heating and cooling curves, standard ratings of motors, examples Applications of electric drives and selection of drives for particular service, conservation approach to be considered.

UNIT-II (12 Hrs.)

Electrical Traction: Introductions, different traction systems, various systems of electric traction. Locomotives, tramways, trolleys, track electrification, comparison between A.C and D.C systems of railway electrification, Types of speed and speed-time curves, examples. Mechanics of train movement, tractive effort, power, output, examples., Energy output from driving axles, energy output using simplified speed-time curves, examples, Factors affecting energy consumption, dead weight, accelerating weight, adhesion weight, examples., Traction motors and their characteristics, starting and speed control of D.C series and shunt motors, examples, Starting and speed control of A.C series and 3-phase induction motors, Braking of traction motors and mechanical considerations, conservation approach to be considered.

UNIT-III (10 Hrs.)

Electrical Heating and Welding: Advantages of electric heating, modes of transfer of heat, classification of electric heating methods, Resistances heating methods, requirements of heating elements, design of heating elements, methods of temperature control, problems, Induction heating: principle, types of induction furnaces, direct core type, vertical core type, indirect core type, core less type, advantages and disadvantages, eddy current heating, applications examples., Arc-furnace: principle, types, direct and indirect arc furnaces, power supply and control, condition for maximum output, examples., Dielectric heating: principles, advantages and disadvantages, applications, choice of frequency, examples., Electric welding: different types of resistance welding and electric arc welding, conservation approach to be considered.

UNIT-IV (10 Hrs.)

Electrolytic Process: Principle, Faradays laws of electrolysis, current efficiency, energy efficiency etc., Rating of metals, production of chemicals, Electro deposition, electroplating, power supply for electrolytic processes.

Illumination: Nature of light, definitions, laws of illumination, different types of lamps, tungsten lamp, discharge lamp, sodium vapour lamp, fluorescent lamp, design of lighting scheme, methods of lighting, calculations, examples, flood lighting, factory lighting and street lighting, examples., conservation approach to be considered.

Recommended Books

1. Deb Tanmoy, 'Utilization of Electric Power and Traction', Ane Books-New Delhi, **2012.**
2. R.K. Rajput, 'Utilization of Electrical Energy', Luxmi Publications Pvt. Ltd., **2006**.
3. J.B. Gupta, 'Utilization of Electric Power & Electric Traction', S.K. Kataria and Sons, Katson Books, **2013**.
4. C.L. Wadhwa, 'Generation, Distribution and Utilization of Electrical Energy', New age International Pvt. Ltd., Publishers, **2005**.

5. Tarlok Singh, 'Utilization of Electric Energy', S.K. Kataria and Sons, Katson Books, **2010**.

ENERGY AUDITING AND MANAGEMENT

Subject Code: BELE1-661 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:
1. To understand the importance of energy management and Audit.
2. To study various types of energy dissipating systems such as electrical, compressed air system, HVAC and refrigeration systems.
3. To understand energy audit processes of these systems used in the industry.

Course Outcomes:
1. Students will gain the knowledge about various types of energy dissipating systems.
2. Students will be able to perform the energy audit for various equipment used in daily life.
3. Students will learn the use of various instruments used in energy audit process.

UNIT-I (16 Hrs.)

Energy Scenario: Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act-2001 and its features.

Energy Management and Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

UNIT-II (12 Hrs.)

Material and Energy Balance: Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams.

Financial Management: Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of ESCOs.

UNIT-III (10 Hrs.)

Electrical System: Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement issues, energy efficient motors. Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues

Compressed Air System: Types of air compressors, Compressor efficiency, efficient compressor operation, Compressed air system components, Capacity assessment, Leakage test Factors affecting the performance and efficiency

UNIT-IV (10 Hrs.)

HVAC and Refrigeration System: Vapor compression refrigeration cycle, Refrigerants, Coefficient of performance, Capacity, Factors affecting refrigeration and air conditioning system performance and savings opportunities, Vapor absorption refrigeration system: Working principle, Types and comparison with vapor compression system, Saving potential, Fans, Blowers and pumps- Types, Performance evaluation, efficient system operation, Flow control strategies and energy conservation opportunities.

Recommended Books

1. Y.P. Abbi and S. Jain, 'Handbook on Energy Audit and Environment Management', T.E. R.I. Press, **2006**.
2. Doti Steve, PE, CEM, 'Commercial Energy Auditing Reference Handbook', CRC Press, Taylor & Francis Group, **2010**.
3. Sonal Desai, 'Handbook of Energy Audit', McGraw Hill Education, New Delhi, **2017**.
4. Al-Shemeri Tarik, 'Energy Audits, A workbook for Energy Management in Buildings', John Wiley & Sons, **2011**.
5. Capehart, Turner and Kennedy, 'Guide to Energy Management', CRC Press, Taylor & Francis Group, **2008**.

SUBSTATION EQUIPMENT AND DESIGN

Subject Code: BELE1-662 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To provide knowledge about substation, its layout and main equipment present in it.
2. To impart knowledge about power, current and potential transformer.
3. To understand the importance of reactive power management and the use of capacitor banks in reactive power management.
4. To introduce to elementary design considerations of substation equipment.

Course Outcomes:

1. Students will get familiar with main equipment used in substations and their design considerations.
2. They will be able to know the use of different types of transformers used in substations.
3. They will develop understanding about importance of reactive power and its management by use of capacitor banks.

UNIT-1 (12 Hrs.)

Substation: Introduction, classification and layout of substation, Single Bus bar, Mesh Substation, Factors affecting layout of substation, types of bus bars, Substation equipment specifications, testing of substation Equipment.

Power Transformer: Introduction and Working Principle of Power Transformer, Classification and their types, important characteristics of Transformer Oil.

UNIT-II (10 Hrs.)

Current Transformers (CT): Basic functions of Current Transformer, Rating and Performance of CTs, Burden, Theory and Operation of CT, Diagram of CT's Connection of Power Transformer and Selection of CT.

Potential Transformers (PT): Terminology, requirement of VA Burden, Testing and Commissioning of PTs, Capacitor Voltage Transformer.

Earthing: Introduction and purpose of Earthing, tolerable limits of body currents, soil resistivity, earth resistance and its measurement, tolerable and actual step and touch voltage, types of Earthing, Design of Earthing grid, impulse Behavior of Earthing system, grounded and ungrounded neutral system, Types, M ethods and selection of grounding neutral.

UNIT-III (12 Hrs.)

Reactive Power Management: Introduction to Reactive Power & its Importance in Power System, Sources of Generation & Absorption of Reactive Power, Reactive Power Compensation & its Advantages, Various types of Reactive Power Compensation and its Calculation, Static Synchronous Compensator, Unified Power Flow Controller.

Capacitor Banks: - Need for Reactive Compensation, Power Factor Improvement and its Benefits, Purpose of Installation of Capacitor Bank, Protection of Capacitor Bank and Pre-

Commissioning Checks and tests, Series and Shunt Compensators, Rating and operation of Shunt Capacitor banks.

UNIT-IV (14 Hrs.)

Station Battery and Charging Equipment: Introduction, Variable Load Battery and System Tester, Testing of Battery Charger and Battery, Types of Batteries, Basic Charging Methods.

Elementary Idea of Substation Equipment Design: Substation equipment ratings and its operation from design view point, selection of cables, Isolator Design, Overhead line terminations, bus bar size calculations and panel design, design of Surge Arrestor, selection of power transformer.

Computer Applications in Substation Engineering: Introduction, System Components, Communication Infrastructure and Methods, Trends in SCADA, Remote Terminal Unit, MODEM.

Recommended Books:

1. R.S. Dahiya and Vinay Attri, 'Sub Station Engineering, Design, Concepts and Computer Application', S.K. Kataria & Sons, **2013.**
2. S. Rao, 'Electrical Substation Engineering and Practice', Khanna Publishers, **1992.**
3. P.S. Satnam and P.V. Gupta, 'Substation Design and Equipment', Dhanpat Rai Publications, **2013**.
4. Mcdonald John D., 'Electric Power Substations Engineering', 3rd Edn., CRC Press, **2012.**

DIGITAL CONTROL SYSTEMS

Subject Code: BELE1-663 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To introduce to discrete data control systems, digital signals, sample and hold circuits etc.
2. To study transfer functions and application of z-transforms.
3. To study time response, frequency response and state space techniques of continuous data and discrete data digital control signals.

Course Outcomes:

1. The students will get knowledge about the basics of digital control systems.
2. They will be able to find out the time response and frequency response of these systems
3. They will get skilled to design digital control systems with digital controllers.

UNIT-I (10 Hrs.)

Introduction: Basic Elements of discrete data control systems, advantages of discrete data control systems, examples.

Signal conversion and processing: Digital signals and coding, data conversion and quantization, sample and hold devices, Mathematical modeling of the sampling process; Data reconstruction and filtering of sampled signals: Zero order hold, first order Hold and polygonal hold.

UNIT-II (14 Hrs.)

Review of z-Transforms, Applications of z-Transforms to Difference equations, Modified z- Transforms, transfer functions, Block diagrams, signal flow graphs: Introduction, Pulse Transfer function, and z-Transfer function, Discrete Data System with cascaded elements separated by a sampler and not separated by a sampler. Closed loop systems, characteristic equation in discrete domain, causality and physically realizable systems; The Sampled signal flow graph.

UNIT-III (14 Hrs.)

Time response: Comparison of continuous data and discrete data, Steady state error analysis of digital control systems, correlation between time response and root locations in s-plane and z-plane, Root loci for digital control systems, Effects of adding poles and zeros to open loop transfer function, discrete data systems: Stability tests of discrete data systems: Bilinear transformation method, extension of RH criterion, Jury's Stability Test.

Frequency – Domain Analysis: Polar plot of GH (z), Nyquist stability criterion, Bode plot, Gain Margin and Phase margin, Nicholas chart, Band width considerations, sensitivity analysis.

Unit–IV (10 Hrs.)

State Space Techniques: Review of continuous data systems, state equations of discrete data systems with sample and hold devices, state diagrams of digital systems, Decomposition of discrete data transfer function, state variable analysis of response between sampling instants, Controllability, Observability of LTI discrete data systems.

Design of digital control systems with digital controllers through bilinear transformation. Digital PID controller, Design for dead-beat response, pole placement design by incomplete feedback or output feedback.

Recommended Books

1. B.C. Kuo, Digital Control Systems, Oxford University Press, **1995.**
2. K. Ogata, 'Discrete Time Control Systems', 2nd Edn., Pearson, **2015**.
3. K. Ogata, 'Digital Control Engineering', Prentice Hall, Englewood Cliffs, **1995**.
4. M. Gopal, 'Digital Control Engineering', Wiley Eastern, **1988**.

ENERGY EFFICIENT MACHINES

Subject Code: BELE1-664 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To make the students aware about the basics and need for energy efficient machines.
2. To make them familiar with the energy efficient motors and their applications.
3. To make them to understand the underlying aspects of economics of energy efficient systems.

Course Outcomes:

1. The students will become aware about the need for energy efficient machines.
2. They will come to know about the energy efficient motors and their applications.
3. They will understand the underlying aspects of economics of energy efficient systems.

UNIT-I (10 Hrs.)

Introduction: Need for energy efficient machines, energy cost and two-part tariff, energy conservation in industries and farms -a necessity, introduction to energy management and energy audit system.

UNIT-II (14 Hrs.)

Energy Efficient motors: Review of induction motor characteristics, Standard motor efficiency, energy efficient motor, efficiency determination methods, Direct Measurement method, Loss segregation method, Comparison, motor efficiency labeling, energy efficient motor standards.

Power Factor: The power factor in sinusoidal systems, power factor improvement, power factor with nonlinear loads, Harmonics and power factor.

UNIT-III (12 Hrs.)

Application of Electric motors: Varying duty applications, Voltage variation, Voltage Unbalance, over motoring, Poly-phase induction motors supplied by adjustable frequency power supplies.

UNIT-IV (12 Hrs.)

Induction motors and adjustable drive Systems: Energy Conservation, adjustable speed systems, Application of adjustable speed systems to fans, pumps and constant torque loads.

Economics of Energy Efficient Systems: Motor life cycle, Direct Savings and pay back analysis, efficiency evaluation factor, present worth method with constant power costs, present worth method with increasing power costs, net present worth method.

Recommended Books

1. Andreas John C., 'Energy Efficient Electric Motors', CRC Press, **1992**.
2. Emadi Ali, 'Energy Efficient Electric Motors', 3rd Edn., CRC Press, **2004**.
3. Thuman Albert, 'Introduction to Efficient Electric Systems Design', The Fairmount Press Prentice Hall, **1991.**
4. S.C. Tripathi, 'Electric Energy Utilization and Conservation', Tata McGraw Hill, **1991**.
5. Charles Belove, 'Handbook of Modern Electronics and Electrical Engineering', John Wiley and Sons, **1986**.

VIRTUAL INSTRUMENTATION

Subject Code: BELE1-665 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Course Objectives:

1. To understand Virtual instrumentation and to realize the architecture of VI.
2. To familiarize with the VI software and learn programming in VI.
3. To study various instruments, interfacing and data acquisition methods.

Course Outcomes:

1. The students will be having skills of programming techniques.
2. They will be able to do data acquisition by creating Virtual Instruments for practical works.
3. Students will gain knowledge of analysis tools.

Unit - I (12 Hrs.)

Review of Virtual Instrumentation: Historical perspective, Advantages of virtual instrumentation system, Block diagram and architecture of a virtual Instrument, examples.

Data-flow Techniques: Graphical programming in data flow, Front Panel, Block Diagram, Comparison with conventional programming, Instructions.

VI Programming Techniques: VIs and sub-VIs, Loops and charts, Arrays, Clusters and graphs, Case and sequence structures, Formula nodes, Local and global variables, String and file I/O.

Unit -II (12 Hrs.)

Data Acquisition: Data acquisition boards, A/D Convertors, D/A Convertors, Digital Input and Output, Counters and timers, PC Hardware' structure, Timing, Interrupts, DMA Software and hardware installation.

Common Instrumentation Interfaces: Serial ports: RS-232, USB, Parallel ports: IEEE-1284, GPIB standard IEEE-488.2.

Unit -III (12 Hrs.)

Analysis Tools: Fourier transforms, Power spectrum, Correlation methods, Windowing and filtering, VI Applications in various fields.

Advanced Interface Buses: System buses, USB, PCMCIA, PCI, VXI, SCXl, PXI, Networking basics for office and industrial applications, VISA and IVI, interfere tools for Image acquisition and processing, Motion Control.

Unit -IV (12 Hrs.)

Laboratory Work: Components of Lab VIEW, Celsius to Fahrenheit conversion, Debugging, Sub-VI, Multi-plot charts, Case structures, ASCII files, Function Generator, Waveform generation, use of Property Node, Formula node, shift registers, Array, Strings, Clusters, DC voltage measurement using DAQ, Application of Data Acquisition system for measurement of temperature, pressure, Electrical quantities.

Reference Books

1. G. Johnson, 'LabVIEW Graphical Programming', McGraw Hill, **2006**.
2. L. Sokoloft, 'Basic Concepts of LabVIEW 4', Prentice Hall Inc., **2004**.
3. L.K. Wells and J. Travis, 'LabVIEW for Everyone', Prentice Hall Inc., **1996**.
4. S. Gupta and J.P. Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument Society of America, **1988**.
5. 'LabView Tutorial Manual', National Instruments Corp., **1996-2010** www.ni.com.
6. 'LabVIEW Basics Course Manual', National Instruments Corp., USA, **1998-2010**.
7. Jerome Jovitha, 'Virtual Instrumentation using LABVIEW', PHI, **2010**.

FLEXIBLE AC TRANSMISSION SYSTEM

Subject Code: BELE1-666 **L T P C** **Duration: 48 Hrs.**

3 1 0 4

Learning Objectives:

1. To review the power electronics fundamentals.
2. To review power transmission fundamentals and to introduce the FACTS concept.
3. To introduce to the need of shunt and series compensation and UPFC.

Course Outcomes:

1. Students will refresh the power converters' fundamentals.
2. They will learn about need and applications of FACTS controllers.
3. They would develop understanding about shunt and series compensation and UPFC.

UNIT-I (12 Hrs.)

Power Electronics fundamentals: Basic function of power electronics, Power semiconductor device for high power converters, Static power convertor structures, AC controller based structure, DC link convertor topologies, Convertor output and harmonic control.

UNIT-II (12 Hrs.)

Power Transmission control: Fundamental of ac power transmission, Transmission problems and needs, the emergence of FACTS, FACTS control considerations, FACTS controllers.

UNIT-III (12 Hrs.)

Shunt and Series Compensation: Shunt SVC principles, Configuration and control, STATCOM, Configuration applications. Fundamental of series compensation using GCSC, TCSC and TSSC, Application of TCSC for different problems of power system, TCSC lay out, SSSC principle of operation.

UNIT-IV (12 Hrs.)

Unified Power Flow Controllers: Basic operating principles and characteristics, independent active and reactive power flow control, control of UPFC, installation, applications, UPFC model for power flow studies, comparison of UPFC with the controlled series compensators and phase shifters.

Recommended Books

1. A. Ghosh and G. Ledwich, 'Power Quality Enhancement Using Custom Power Devices', Kluwer Academic Publishers, **2005**.
2. N.G. Hingorani and L. Gyragyi, 'Understanding FACTS: Concepts and Technology of Flexible AC Transmission System', Standard Publishers and Distributors, **2005**.
3. Y.H. Sang and A.T. John, 'Flexible AC Transmission Systems', IEEE Press, **2006**.
4. R.M. Mathur and R.K. Verma, 'Thyristor Based FACTS Controllers for Electrical Transmission Systems', IEEE Press, **2002**.
5. T.J.E. Miller, 'Reactive Power Control in Electric Systems', John Wiley, **1982**.

NON-CONVENTIONAL ENERGY SOURCES

Subject Code: BELE1-667 **L T P C** **Duration: 48 Hrs.**
3 1 0 4

Course Objectives:

1. To obtain knowledge about renewable energy sources and solar energy and their utilization.
2. To introduce to wind energy conversion and bio-mass energy conversion systems.
3. To introduce to geothermal energy and energy from ocean. To make them aware about hydrogen energy sources.

Course Outcomes:

1. Students will get knowledge about utilization of renewable energy sources and solar energy.
2. They will learn about wind energy conversion and bio-mass energy conversion systems.
3. They will become aware about geothermal energy, energy from ocean and hydrogen energy sources.

UNIT-I (14 Hrs.)

Solar Energy: Conventional energy sources and availability, Introduction to new energy techniques & renewable energy sources; Solar Energy, Solar constant, Radiation geometry, Solar energy collectors, Concentrated and flat plate, Energy balance and collector efficiency, Solar energy storage, Application to space heating, distillation, cooking and greenhouse effect.

UNIT-II (14 Hrs.)

Wind Energy: Basic principle of wind energy conversion, site selection, analysis of aerodynamic forces acting on wind mill blades and estimation of power output.
Bio-energy: Biomass conversion technology, photosynthesis, biogas plant, thermal gasification.

UNIT-III (10 Hrs.)

Geothermal Energy: Sources- hydrothermal, hot dry rock, geothermal fossil system, prime movers for geothermal energy.
Energy from Ocean: Ocean thermal electric conversion, energy from tides, small-scale hydroelectric development.

UNIT-IV (10 Hrs.)

Hydrogen Energy Sources: Introduction, hydrogen production methods, storage, utilization, magneto hydrodynamic power, thermionic generation, nuclear fusion energy.

Recommended Books

1. G.D. Rai, 'Non-Conventional Energy Sources', Khanna Publishers, Delhi, **2011**.
2. S. Rao, B.B. Parulekar, 'Energy Technology: Non-Conventional Renewable and Conventional', Khanna Publishers, Delhi.

3. H.P. Garg and Jai Prakash, 'Solar Energy: Fundamentals and Applications', Tata McGraw Hill.
4. Saeed S. Hasan and D.K. Sharma, 'Non-Conventional Energy Resources', Katson Publishers, **2014**.
5. R.K. Rajput, 'Non-Conventional Energy Sources and Utilization', S. Chand Publishers, **2012**.
6. S.P. Sukhatme, 'Solar Energy: Principles of Thermal Collection and Storage', Tata McGraw Hill, N. Delhi, **1984**.
7. Sutton, 'Direct Energy Conversion', McGraw Hill Inc., **1966**.

SEMESTER 1st		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-101	Drafting & Pattern Making	5	-	-	40	60	100	5
MFTE1-102	Textile Studies-1	5	-	-	40	60	100	5
MFTE1-103	Sketching & Fashion Illustration	5	-	-	40	60	100	5
MFTE1-104	History of Fashion	5	-	-	40	60	100	5
MFTE1-105	Computer Applications-I	5	-	-	40	60	100	5
Total		**25**	**0**	**0**	**100**	**400**	**500**	**25**

SEMESTER 2nd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-206	Textile Studies-II	5	-	-	40	60	100	5
MFTE1-207	Inspirational Fashion	5	-	-	40	60	100	5
MFTE1-208	Knitting Technology	5	-	-	40	60	100	5
MFTE1-209	Pattern Drafting, Grading & Construction Studies	5	-	-	40	60	100	5
MFTE1-210	Computer Applications-II	5	-	-	40	60	100	5
Total		**25**	**0**	**0**	**200**	**300**	**500**	**25**

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-311	Fashion Industry, Marketing & Management	3	-	2	40	60	100	4
MFTE1-312	Fashion Illustration and Appreciation	3	-	2	40	60	100	4
MFTE1-313	Garment Ornamentation Lab.	2	-	4	60	40	100	4
MFTE1-314	Advance Garment Construction Techniques Lab.	2	-	4	60	40	100	4
MFTE1-315	Computer Applications – III Lab.	2	-	4	60	40	100	4
Total		**12**	**0**	**14**	**260**	**240**	**500**	**20**

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-416	Garment Production and Techniques	3	-	2	40	60	100	4
MFTE1-417	Design Collection	3	-	2	40	60	100	4
MFTE1-418	Survey and Project	2	-	4	60	40	100	4
MFTE1-419	Computer Applications – IV Lab.	2	-	4	60	40	100	4
MFTE1-420	Entrepreneurship Internship	-	-	8	40	60	100	4
Total		**10**	**0**	**20**	**200**	**300**	**500**	**20**

Overall

Semester	Marks	Credits
1st	500	25
2nd	500	25
3rd	500	20
4th	500	20
Total	**2000**	**90**

QUESTION PAPER PATTERN
END SEMESTER EXAMINATION

Time Allowed: 3 hrs. **Maximum Marks: 60**

The question paper shall consist of three sections.

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each. One question should be set from each unit.
2. Section B consist of 4 questions of 08 marks each with atleast 1 question from each unit. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

DRAFTING AND PATTERN MAKING

Subject Code – MFTE1-101 **L T P C** **Duration – 60 Hrs.**
5 0 0 5

UNIT- I

1. Standard measurement charts for children, Adult- Male and Female,
2. Taking measurements-three styles of taking measurements,
3. Drafting Tools,
4. Basic Grain lines - Straight, off, Bias,
5. Types of Anatomy (Brief)Joints and Muscles, Growth and development and Eight head theory,
6. Types of human figure,
7. Introduction to kids and adult pattern (drafting, pattern making, estimation and layout of the garment,
8. Definition of empire line, Princess line and flat pattern making,
9. Define layout.

UNIT-II

1. Creation of Bodice Block and Lower Block of Child and Adult,
2. Creation of Trouser Block of Ladies and shirt,
3. Creation of Sleeves: Plain, Puffed, Flare, Leg O' mutton, Ruffle, Cape, Raglon, Drop Shoulder, Tulip, Hanky, Bushirt, Kimono, Dolmon, Shirred, Bell, Bishop and Lantern,
4. Drafting of Collars: Peter Pan, Cape, Bias, Flat Tennis, Sailor, Chelsea, Bishop, Shawl, Wing, Shirt, Rippled, Chinese, Coat and Cowl.

UNIT-III

1. Creation of Kids: Slip, Panty and Romper,
2. Drafting of Frock: A-Line, Circular, Frock with Yoke, Frock with empire, Normal and low waist line,
3. Basic Skirt Block and its Adaption. Skirts: Gathered, Novelty Gathered, Two Tied, pleated (Knife, Box, Inverted, Sunray, Kick), Straight, A-Line, Pegged, Tulip, Circular, Gored, Handkerchief, Hip Rider and Slashed,
4. Drafting of Jumpsuit.

UNIT-IV

1. Designing of all Kinds of casual and formal wear garments for children (night suit and sundress),
2. Paper Patterns of all kinds of casual and formal wear garments for children (night suit, sundress, Frock, Skirt and Jumpsuit), on full scale, with all specification,
3. Drafting of Women's sari Blouse and choli blouse,
4. Drafting and paper patterns of all kinds of adult, casual and formal wear garments (blouse, top, skirt, salwar suit, night suit, nighty gown, kurta pajama, trouser), on full scale, with all specifications.

Recommended Books

1. Manmeet Sodhia, 'Advance Drafting and Draping'.
2. Sheria Doongaji Rajj Prakshan, 'Basic Processes and Clothing Construction'.
3. Premlata Malik, 'Garment Const. Skills'.

TEXTILE STUDIES-I

Subject Code – MFTE1-102 **L T P C** **Duration – 60 Hrs.**
5 0 0 5

UNIT-I (6 Hrs.)

Overview of Textile Industry, Natural Fibres:

a) Vegetable (bast, leaf and seed fibres),
b) Animals (wool and silk),
c) Mineral (glass, asbestos and metallic fibres),
d) Cotton: concept of varieties; definition of grading, distinctive properties and end uses,
e) Jute: - varieties, distinctive properties and end uses,
f) Flax and Pineapple fibers: - brief introduction and uses,
g) Protein fibers: -
Wool: Classification, distinctive properties and end uses,
Silk: classification, distinctive properties and end uses.

UNIT-II (9 Hrs.)

Man-made Fibres:

Classification:

a) Regenerated fibres: Acetate, Viscose & diverse forms of viscose, Cuprammonium, alginate. - general properties, end uses,
b) Synthetic fibers:- principles of poly condensation with reference to Polyesters, Polyamides and Polyurethanes, principles of poly addition with reference to Acrylics, Polyolefin, Polyvinyl chlorides and co-polymers,
c) Chemical properties & end uses of polyester, polyamide and poly acrylonitrile fibers,
d) Introduction to the production of manmade fibres:
e) Principles of melt spinning, details of melt spinning process with special reference to polyester-parameters near spinneret, LOY, MOY & POY, dry spinning and wet spinning;
f) Viscosity of melts and solutions,
g) Equipment of manmade fiber production,
h) Main features of the production of some important manmade fibers-viz., viscose, cellulose-acetate, polyamides, polyesters, polypropylene and poly acrylic fibers,
i) Concept of quenching operation and finish application,
j) Concept of micro denier fiber and aramid fibers. Preparatory Process for cotton - Stitching, Singeing, Desizing, Scouring, Bleaching and Mercerization, Preparatory Process for wool and silk, Preparation of blends

UNIT-III

Staple Fiber Spinning (brief idea): Introduction, Raw material, Ginning, Opening, Cleaning, Blending, Equalizing, Drafting, Yarn Formation, Different systems of spinning. Yarn classification, yarn spinning, yarn numbering system. Fiber quality requirements for suitability of fabrics.

UNIT-IV

Elementary idea of the processes of conversion of conversion of yarn into fabric, i.e., weaving, knitting, non-woven.

Industrial Visit.

Recommended Books

1. K.V.P. Singh, 'Introduction to Textiles'.
2. Bernard P. Corbman, 'Textiles-Fiber to fabric', McGraw Hill.

SKETCHING AND FASHION ILLUSTRATION

Subject Code – MFTE1-103 **L T P C** **Duration – 60 Hrs.**
5 0 0 5

UNIT–I

1. Introduction to basics of Sketching & Drawing,
2. Perspective Drawing is an exercise to make the student understand the various perspectives of a form like buildings etc. It will enable the artist to understand the depths the angles and proportions of a form when viewed from a distance.
3. Quick Sketching (doing sketches without eraser in 3-5 minutes),
4. Fashion Cycle, Fashion influence,
5. Define Fashion Forecasting how to use the couture and ready to wear,

UNIT-II

1. Describe Colour,
2. Dimensions of colour- hue, intensity and value,
3. Prepare Chart (colour wheel, colour mixing, complimentary, analogues, split complimentary, warm and cool colours, tint, tones and shades, monochromatic, achromatic, pastel, dusty pastel- the effect of these colour schemes,
4. Effects of colours- red, green, blue, yellow, pink, orange, purple, black, white, grey, neutral,
5. Definition of Textures-what is the uses of in fashion designing, and types and textural effects,
6. Textures (thread pulling, thread crumple, thread rolling, paper dabbing, wax rubbing, wax drop, smoke, blade, leaf, flower, butterfly, lace, jute, thumb, match stick, sponge, cabbage, potato, onion, chilly, lady finger, ink drop, ink blow, batik, dry brush, leather, mesh, comb and cloth dabbing etc.,
7. Fabric rendering effects- plain cotton, chiffon, tissue, brocade and denim.

UNIT-III

1. Fashion terminology commonly used in the industry,
2. Classic and innovative fashion details – necklines, collars sleeves, cuffs, waist line, skirts, trousers, yokes, pockets etc.,
3. Flat sketch of garments,
4. Elements of design and principles of design.

UNIT–IV

1. Illustrate female croquie – Block figure, flashing figure and stick figure,
2. Fashion block figure with all kind of poses,
3. Draping executive wear and casual wear on flashing figure,
4. Explain theme board, mood board client board, research board and color board.

Recommended Books

1. Manmeet Sodhia , ‘Design Studies’.
2. Marry Garthey, ‘Fashion and Colour’.
3. Patric Jone Ireland Batsford, ‘Encyclopedia of Fashion details’.
4. Abling Fairchild, ‘Fashion Sketch Book’.

HISTORY OF FASHION

Subject Code – MFTE1-104 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

History of Indian Costumes: Origin of clothing, changing scenario of Indian costumes,

Major Civilizations of the world, Study of regional costume and lifestyles of India, Costume and fashion in Mohan jo daro period, Principles and classification of fashion, Study of costume from earlier time to present time, Christian Dior (New Look), Charleston Era in lace, satin and silk. Explain all history of fashion Indian/western from 1890 to 1990. Principles of fashion and classification of fashion.

UNIT-II

Indian traditional textiles (embroidered-kasida, chicken-kari, kantha, phulkari. Traditional embroideries of chamba ruma, Kathiawar, kutch, gujarati, sindhi, gold and silver embroidery. Fabric, colour, motifs, stitches used in Indian traditional embroidery. Brief history of woven textiles in india Woven Indian Textiles- Production Process- Printed (Hand block, sanganeri). Dye- (Ikkat, patola and tie and dye). Painted- (Kalamkari).

UNIT-III

Traditional Costumes of the people of Punjab (Male and Female Costumes), Jammu & Kashmir (Hindu and Muslim), Himachal Pardesh People of Upper & Lower Hills (Gaddies & Paharies), Rajasthan, Gujarat, Madhya Pardesh, Uttar Pardesh, Maharashtra.

UNIT-IV

Ancient Civilization: Roman (Toga and its influence), Greek (chiton, and types and its influence) Italian and French influence in global fashion.

Recommended Books

1. Manmeet Sodhia, 'History of Fashion'.
2. B. Parul, 'Traditional Indian Textiles'.

COMPUTER APPLICATIONS-I

Subject Code – MFTE1-105 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

What is computer? Applications of Computer, Characteristics of Computer Types of computer. Generations of Computers, Input and output Devices, Various storage devices like HDD, Optical Disks, Flash Drives. Different Types of data file formats: Types and Applications.

UNIT-II

Explain computer software, types of software (application and system software). Office Automation (Word processing, Spreadsheet, Presentation, Corel draw, adobe Photoshop), operating system, roll of operating system the, user interface-GUI and CUI. Different operating systems- Unix, Dos, Window, Mac, Window NT, Window XP, Window 7,8, Linux.

UNIT-III

Different computer graphic files like- GIF, JPEG, PNG, BMP, TIFF etc. Introduction to computer graphic applications. Image scanner, types installation, basic of scanning, basic computer graphic skills (using Corel draw, macromedia fireworks, adobe Photoshop. Definition and difference between raster and vector graphics. Installing and using a scanner. Scanning and saving files in different file formats according to file size and resolution.

UNIT-IV

What is internet. Internet concepts common software used on internet (browser, e-mail, web server, domain name server, browser plugins). WWW, web page, websites. General types of sites, simple profile websites, web portal, search engine google, yahoo, Lycos, rediff search. What is network different structure of network, network topologies.

Recommended Books

1. Peter Norton, 'Introduction to compute', 4th Edn., TMGH.

TEXTILE STUDIES – II

Subject Code – MFTE1-206 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

Identification of fabric samples (warp and weft direction). Different types of weaves/ weaving designs – plain, satin, sateen, twill, jacquard, bird's eye, basket, ribbed, crepe, pile, lappet, dobby, triaxial. Properties and uses of each of the weaves. Essential properties of fabric.

UNIT-II

Comparative studies of the woven and knitted fabrics- construction and advantages of each. Elementary idea of machinery used in woven, knitted and non-woven fabrics.

UNIT-III

Non - woven – classification. Method of production of non-woven web formation, bonding the web, needle punching the web, finishing. Characteristics of non-woven fabrics. Uses of non-wovens. Decorative fabric construction- braiding, netting, lace. Analyses of fabric samples-file work.

Recommended Books

1. K.V.P. Singh, 'Fabric Studies', Kalyani Publishers.
2. Bernard P. Corbman, 'Textiles - Fiber to Fabric', McGraw Hill.

INSPIRATIONAL FASHION

Subject Code – MFTE1-207 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

Designing on themes like culture, environment, monuments, seasons etc. Illustrating dresses made on innovative themes.

UNIT-II

Appreciation of any five Indian Fashion Designers. Collection and illustration of the work of these Indian designers. Brief history on the work of these designers. The famous and celebrated designs of these designers The shows, studios, and expertise of these designers.

UNIT-III

Designing Clothes line for Kids wear using different themes and fabrics. Designing clothesline for Women wear using different themes, fabrics, and surface ornamentations. Different Presentation Techniques- its forms and purpose. Collage work- collage on the dress, collage in the background, its effective use.

Swatch board- and the use of swatches on the surface texture of the dresses illustrated front and back illustration- the use and different illusion effect.

Client board and its effective use in designing dresses for a particular client.

Stylization of fashion figures, stylization of dresses. Textural effects- effect of silk, velvet, net, chiffon, satin, brocade, etc. Survey board, mood board and theme board.

Recommended Books

1. Kathryn Mckelvey, 'Illustrating Fashion', Blackwell Series.
2. Elisabetta Drudi, 'Fashion Design, Drawing and Presentation', Batsford.
3. Meher Castelino, 'Fashion Kaleidoscope', Rupa and Company.
4. Hindol Sengupta, 'Indian Fashion', Pearson Education.

KNITTING TECHNOLOGY

Subject Code – MFTE1-208 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

Knitted garments-introduction. Difference between woven and knitted structures. Classification of knitted garments. Weft knitted fabrics- plain, rib, purl, etc. Warp knitted fabrics- tricot, kitten raschel, crochet, Milanese knit, simplex Other knitted constructions- jacquard, pile, fleece, high pile, terry knit, velour knit.

UNIT-II

Fully cut knitted garments- knit type, uses. Fully fashioned knitted garments- knit type, uses Integral knitted garments- knit types, uses. Cut stitch shaped knitted garments- knit type, uses, processes involved.

UNIT-III

Seam and stitches used in knitting. Machinery used for knitted garments- Flat bed, two-bar warp knitting machine, circular jacquard knitting machine, circular pile knitting machine. Quality control Defects in knitted fabrics. Industrial visit.

Recommended Books

1. 'Knitting Technology', Kalyani Publishers.
2. Bernard P. Corbman, 'Textiles-Fiber to Fabric', McGraw Hill.

PATTERN DRAFTING, GRADING & CONSTRUCTION STUDIES

Subject Code – MFTE1-209 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

UNIT-I

Market survey of fabrics, buttons, laces and other trimmings used in garment construction. Tailoring techniques- basic hand stitches, seams and seam processes, neckline finishes, pockets, plackets, tucks, fasteners, frills, etc.

UNIT-II

Designing of child garments on different themes. Designing of adult garments on different themes. The layouts, markers and Plans (¼ or 1/6 scale), Paper patterns of different garments with varied fashion elements on full scale. The paper patterns should be marked properly. Grading of the patterns to smaller and bigger sizes. Introduction to the sewing machine Cutting and sewing- processes involved and precautions, etc. Construction of any five garments for children Construction of any five garments for Adults having different themes, different fashion elements, and different surface ornamentation.

UNIT-III

Introduction to contemporary embroideries stitches- stem, back, running, dot, seeding, straight, chain, open chain, twisted chain, wheat tear, lazy daisy, blanket, buttonhole, zigzag chain, double chain, raised chain, spider's web, sheaf, brick. Florentine, holbien, Pekinese, cut work, four sided, goblin, woven bars, cretan, fly. French knots, bullion knots, German knots, fish bone, Romanian, satin, long and short, couching, Jacobean trellis, thorn, cross stitch, chevron, herringbone, appliqué work. Ribbon work, lace work, rope work, other decorations and trimmings.

Recommended Books

1. Manmeet Sodhia, 'Garment Construction', Kalyani Publishers.
2. Gerry Cooklin, 'Garment Technology for Fashion Designers', Blackwell Science.
3. Judy Brittain Dorling, 'Step by Step Needlecraft Encyclopedia', Kindersley.
4. Harold Carr, 'The Technology of Clothing Manufacture', Blackwell Science.

5. Winifred Aldrich, 'Fabric, Form and Flat Pattern Cutting', Blackwell.
6. K.R. Zarapkaar, 'Zarapkaar System of Cutting', Navneet.

COMPUTER APPLICATIONS – II

Subject Code – MFTE1-210 **L T P C** **Duration - 60 Hrs.**
5 0 0 5

Introduction to Graphics and Graphics Devices
Computer Graphics, Graphics Output Devices and their general properties like (resolution and color capability), Graphics Input Devices, Drawing Geometry.

Introduction to coordinate Frames and Color Theory
Points, Vectors and Lines. Two dimensional Cartesian reference frames, Screen Coordinates, Three dimensional Cartesian reference frames.

Introduction to Color Theory

Introduction to Color Modes
Working with different color models and modes, using custom colors, picking colors, Analyzing and editing colors, looking at gamut issues, creating duotones, setting color balance, setting hue and saturation, adjusting brightness and contrast, working with histograms, retouching images, Color ranges and replace color options, cropping images, Understanding Process and spot colors, choosing pantone colors, Applying fill and stroke colors.

Mastering Computer Graphics Skill using Corel Draw

Introduction to CorelDraw
Introduction to Vector and Raster Graphics Type. Starting CorelDraw, Introduction to Corel Draw Menu, Introduction to CorelDraw Page Setup. Introduction to various tools of CorelDraw.

Working with Shapes, Lines, Texts & Objects
Creating rectangles, squares, Circles, Ellipses, Polygons, Starts and Spirals. Selecting Fill and Outlines to any shape.
Moving & Rotating Shapes freely and to Fixed angles. Drawing Curve and Straight Lines, Creating Simple and Artistic Texts. Formatting Texts by changing Font, Size and Shape of Text. Rotating texts, assigning a Fill Color to text, Assigning outline color to text. Creating Paragraph Text, Aligning Texts, Adjusting Line & Letter Spacing in the paragraph text. Spell checking and finding and replacing texts.
Selecting Single and Multiple Objects, Duplicating Objects, Grouping Objects, Trimming Objects, Locking and Unlocking Objects, Aligning Objects.

Working with Outlines and Fills
Introduction to outlines, defining outline width using Outline Fly out, Outline Pen Dialog Box, Setting the Line Cap Style, Changing the Outline Color
Introduction to Fills, Uniform Fill, Fountain Fill, Tow-Color Fountain Fill, Preset Fountain Fill, Pattern Fills, Two-Color, Full Color and Bitmap Pattern Fills, Texture Fills, PostScript texture Fills.

Working with Curves
Introduction to Curves, Nodes and Segments, Drawing Freehand Tools, Drawing Closed Curves, Curved Objects, Selecting Node on a Curved Object, Adding, Removing and Joining Nodes. Bezier Tool, Drawing Curve with Bezier Tool, Drawing Straight Line with Bezier Tools. Drawing with Artistic Media Tools using Preset and Brush Mode. Calligraphic Mode, Pressure- Sensitive Mode, Object Sprayer.

Special Effects

Introduction to Special Effects, Blending Tool, Contouring Objects, Distorting Objects, Envelop Tool, Extruding of the object, Vector Extrusion. Drop Shadow, Creating Drop Shadow, Changing Color of Drop Shadows, Removing Drop Shadows. Applying Lenses, Applying Perspectives.

Filters, Gradients, Patterns, Textures, Swatches Effects

Layouts (Development of different types of Boards)

Drawing Basic Male, Female and Kids Figure in Corel Draw with Grids and Guidelines and Converting them into Objects

Drawing Basic Figure Forms (Legs, Arms, Heat etc.) with Grids and Guidelines and Converting them into Objects.

Saving and Exporting Images.

File formats, opening, saving, importing, exporting, compression, printing, saving for web, publishing as PDF, exporting images with transparency. Printing Images.

Recommended Books

1. Ramesh Bangia, 'Corel Draw'.
2. 'Computer Graphics for Fashion Designing (Practical)'.

FASHION INDUSTRY, MARKETING & MANAGEMENT

Subject Code – MFTE1-311 **L T P C** **Duration - 60 Hrs.**

3 0 2 4

UNIT-I

1. Introduction to Fashion Industry,
2. Indian and Global Fashion Market,
3. Levels of fashion industry- couture, ready to wear, mass production.
4. Organizational set-up of fashion industry,
5. The different departments, personnel and their jobs,
6. Career in fashion industry

UNIT-II

1. Introduction to Marketing,
2. Nature and Scope of Marketing,
3. The Marketing Concept, Market Segmentation,
4. Targeting and Positioning,
5. Strategic Marketing,
6. Fashion market and marketing environment,
7. Fashion marketing planning,
8. Market research,
9. User's buying behavior,
10. Marketing communication.

UNIT-III

1. Management- Concepts, Principles & Characteristics,
2. Advertising,
3. Sales promotion techniques,
4. Exhibitions & sales, fashion shows (concept and presentation skills, publicity campaigns),
5. Retailing- department stores, apparel specialty stores, discount retailing, franchise retailing, malls, direct selling, internet selling, catalogue selling, etc.,
6. Project.

Recommended Books

1. Pooja Chatley, 'Fashion Marketing & Merchandising', Kalyani Publishers.

2. Mike Essay, 'Fashion Marketing', Blackwell Science.
3. Helen Goworek, 'Fashion Buying', Blackwell'.

FASHION ILLUSTRATION AND APPRECIATION

Subject Code – MFTE1-312 **L T P C** **Duration - 60 Hrs.**
3 0 2 4

UNIT-I

1. Inspirational designing and presentation,
2. Design studio -designing based on different themes for a fashion show,
3. Listing of all aspects of the show- the background, the lights, the ramp, the accessories, the make-up, the fabric, surface ornamentation, etc.,
4. Accessory designing and illustration,
5. Illustration of Jewelry using various mediums like pearls, beads, gold and silver, diamonds, wood, wires, velvet, net, etc.,
6. Designing and illustration of head gears,
7. Designing and illustration of bags and belts using various mediums like leather, cane, pearls, beads, wires, velvet, net, etc.,
8. Designing and illustrating footwear of all types,
9. Designing and illustrating bows and ties on varied dresses,
10. Illustrating hairstyles.

UNIT-II

1. Appreciation of Western Fashion,
2. A brief history of any five western designers,
3. Collection and illustration of the famous designs of these designers,
4. Popular and celebrated shows of these designers,
5. The studios and their expertise of these designers.

UNIT-III

1. Fashion Capitals – France and Milan - the designers, the design houses, the shows, the fashion markets, the labels, the institutes, the events, etc.,
2. Fashion Capital –London - the designers, the design houses, the shows, the fashion markets, the labels, the institutes, the events, etc.,
3. Fashion Capital–Mumbai- the designers, the design houses, the shows, the fashion markets, the labels, the institutes, the events, etc.,
4. Introduction to Fashion photography,
5. Cameras, Lenses and Films,
6. Lighting Equipment and Studio Locations,
7. Fashion Shots.

Recommended Books

1. Kathryn Mckelvey, 'Fashion Design Process-Innovation & Practice', Blackwell.
2. Gavin Waddell, 'How Fashion Works', Blackwell.
3. Alex Larg, 'Fashion Shots', Roto Vision.

GARMENT ORNAMENTATION LAB.

Subject Code – MFTE1-313 **L T P C** **Duration - 72 Hrs.**
2 0 4 4

UNIT-I

1. Studying the designs and motifs of traditional embroideries of India- phulkari, chichenkari, kasida, kanthas, kathiawaar, kutch, sindhi, gujarati, chamba rumal.

2. Colours, fabric and stitches of the Traditional embroideries of India- phulkari, chichenkari, kasida, kanthas, kathiawaar, kutch, sindhi, gujarati, chamba rumal.
3. Preparation of samples of the traditional embroideries of India.

UNIT-II

1. Designing embroidery patterns from different sources like objects, photographs, nature, greeting cards, posters, surroundings etc.,
2. Creating embroidery patterns designed from different sources,
3. Sequin work,
4. Lurex work. Lace and ribbon work,
5. Decorations and trimmings.

UNIT-III

1. Understanding the processes of Tie and dye, batik printing, screen printing and block printing,
2. Preparation of samples of all processes of Tie and dye,
3. Preparation of sample of batik printing- wax resistant dyeing.
4. Preparation of a sample with screen printing.
5. Preparation of a sample of block printing.

Recommended Books

1. Parul B, 'Traditional Indian Textiles', Abhishek Publications.
2. Manmeet Sodhia, 'Dress Designing', Kalyani Publishers.
3. Manmeet Sodhia, 'History of Fashion', Kalyani Publishers.

ADVANCE GARMENT CONSTRUCTION TECHNIQUES LAB.

Subject Code – MFTE1-314 **L T P C** **Duration - 72 Hrs.**
2 0 4 4

UNIT-I

1. Metric method of drafting of bodice for a child,
2. Metric method of drafting of bodice for an adult,
3. Metric method of drafting of sleeve for a child,
4. Metric method of drafting of sleeve for an adult,
5. Application of metric method of drafting any one innovative sleeve, collar and a skirt,
6. Draping of bodice, yokes, cowls, etc., on a body form using muslin cloth and later, creating a pattern of the same on the drafting paper,
7. Draping of sleeves and collars, on a body form using muslin cloth and later, creating a pattern of the same on the drafting paper,
8. Draping of skirts on a body form using muslin cloth and later, creating a pattern of the same on the drafting paper,
9. Draping and creating muslin and paper patterns of Different Costumes,
10. Dart manipulation.

UNIT-II

1. Study of fashion forecast, market survey, interpretation,
2. Designing of costumes of varied themes, silhouettes, fabrics, surface ornamentation etc. based on the forecast study,
3. Creating full scale patterns of these self-designed costumes.

UNIT-III

1. Construction of any eight innovative garments for all age groups, for different themes, occasions, seasons (Fall Winter, Fall Spring, and Fall Autumn),
2. After cutting and sewing of the garment, student will also be taught quality control check, finishing and packaging of the garment.

Recommended Books

1. Manmeet Sodhia, 'Advanced Drafting and Draping', Kalyani Publishers.
2. Connie Amaden Crawford, 'The Art of Fashion Draping', Fairchild.
3. Natalie Bray, 'Dress Fitting', Blackwell Science.

COMPUTER APPLICATIONS – III LAB.

Subject Code – MFTE1-315 **L T P C** **Duration - 72 Hrs.**
2 0 4 4

Drawing the details of the following in Corel Draw and Applying various texture and effects: Fashion Details/ Silhouette,

1. **Collar:** Mandarin, High Bias, Tuxedo, Cape, Flat Tennis, Sailors, Chelsea, cowl, bishop.
2. **Sleeves:** Raglan, Hanky, Tulip, Ruffle, Dolman, virago, flare, lantern, Dalmatian, pagoda.
3. **Accessories:** Bags, Belts, Caps, Bows, Jewelry.
4. **Pockets:** Flap, Pouch, Patch, Cross, Slit, Kurta
5. **Skirts:** Novelty Gathered, Hip rider, Trumpet, Pegged, Circular, Pleated, Straight, ALine, straight fitted, fishtail, petal, peplum, puff ball.
6. **Trousers:** Jeans, Straight Pants, Baggy Pants, Jump Suit, Dungries, jogging pants, trouser skirt, Capri, hipsters, baggy jeans, bell bottoms, northern soul, riding habits.
7. **Silhouette:** A Line, funnel shaped, circular, straight, rectangular,
8. **Illusion Effects:** created by fashion details, elements of design, colour, Textures.

Draping the above created details on fashion figures. Importing, Saving and exporting images for the web. Printing Concepts.

GARMENT PRODUCTION AND TECHNIQUES

Subject Code – MFTE1-416 **L T P C** **Duration - 60 Hrs.**
3 0 2 4

UNIT-I

1. Introduction to Garment Technology,
2. Production Planning and Control,
3. Layout –uses and importance, types- single line, double line, product layout, process Layout.
4. Basic work measurements – work measurements, elements, timing, timing errors, rating, allowances, standard time calculation, PMTS.
5. Balancing – basics, theoretical balance, skills inventory, initial balance, balance control.

UNIT-II

1. Principles of Cutting- types of cutters/scissors,
2. Principles of Sewing Technology- types and machines and accessories to speedup up and modernize the basic sewing,
3. Principles of Pressing- types of press,
4. Principles of Garment Finishing & Inspection, Packaging - various methods, people involved, precautions.

UNIT-III

1. Production Department Organization-personnel, their job profiles, their responsibilities,
2. Operation and Communications,
3. Quality control at each stage of Production,
4. Quality standards- ISO, etc.,
5. Quality from design to dispatch,
6. Industrial Visits.

Recommended Books

1. A.J. Chuter, 'Introduction to Clothing Prod. Mgmt.', Blackwell Series.
2. Gerry Cooklin, 'Garment Technology for Fashion Designers', Blackwell.

DESIGN COLLECTION

Subject Code – MFTE1-417 **L T P C** **Duration - 60 Hrs.**
3 0 2 4

1. Preparation of a Portfolio of illustrated innovative garment designs prepared using different themes picked from various sources (magazines, books, films, nature, surroundings, handicrafts, paintings, etc.) and presented using different presentation skills and mediums,
2. A portfolio will be prepared by each student; in which he / she shall display his collection of themes, using different presentation skills,
3. Each theme will be accompanied by a line of costumes designed using that particular theme as an inspiration,
4. Different mediums and presentation skills should be used,
5. The portfolio should have atleast 12 lines of costumes,
6. To justify the theme of the dress, the theme could be seen in the colour of the dress/ silhouette of the dress/ surface texture of the dress/surface ornamentation of the dress/accessories accompanying the dress,
7. Amongst these lines, the students will shortlist any two garments and construct the same,
8. Prior to the construction, the working sketch, layout, paper pattern of these two designs should be created.

Recommended Books

1. Dickerson, 'Fashion from Concept to Consumer', Pearson.

SURVEY AND PROJECT

Subject Code – MFTE1-418 **L T P C** **Duration - 72 Hrs.**
2 0 4 4

1. Students work on a Project Studying the Traditional aspects, culture, people, monuments, handicrafts etc. of an Indian state and form a report of their findings in the form of a thesis.
2. Garments are designed using the inspirational objects as the theme of the garment. These garments are illustrated and added to the report.
3. The student selects one of the garments, makes its working details, specification sheet, layout, and pattern and constructs that garment to be showcased along with the final thesis.
4. The report/ thesis should consist of:
   a) Objective of the report
   b) Acknowledgements
   c) Introduction of the report
   d) Detailed description of the traditional aspects
   e) Illustrations of the garments designed
   f) Specification sheet of the final garment
   g) Sketch/ Picture of the final garment
   h) Summary of the report
   i) Bibliography.

COMPUTER APPLICATIONS – IV LAB.

Subject Code – MFTE1-419 **L T P C** **Duration - 72 Hrs.**
2 0 4 4

Course Objectives

To teach the student to create a Computerized Technical Specification Sheet of any garment given to her / or as visualized by her. The Specification Sheet must contain both the Technical Illustration meant for the production / manufacturing of the garment and also the Fashion Illustration meant for the presentation / demonstration/display of the garment before production.

Software to be Used

1. Any spreadsheet application (like Microsoft Excel) for Creating the Technical Specification Sheet. (The Spreadsheet application should have graphic import capabilities).
2. Any Illustration Software having standard illustration tools, layer functionality and capability to export/save graphics in different file formats (jpeg, gif, bmp, tiff, psd etc.) and different resolutions. Preferably CorelDraw.

Taking a garment (from a good fashion magazine) as an inspiration create the following using the software mentioned above.

1. Technical Illustration (right measurement /proportions) (both front & back) meant for the production/manufacturing of the garment. This illustration should include basic
   a) Silhouette
   b) Stitch Lines
   c) Trims
   d) Other Fashion Details like Plackets, Pockets, Collars, and Cuffs etc.

The student must learn to export the graphics into different file formats of different dimensions and dpi (resolution) for use in digital/print portfolios/specification sheets/websites/emails etc. The student should also know to export each layer individually and combined.

2. Fashion Illustration meant for the presentation/demonstration/display of the garment before production. The student must learn to use Corel Draw to create the Fashion illustration of the garment taken above (As done on paper in previous semesters). This fashion illustration must include the following (on different layers that will depict different stages of the garment design):
   a) croqui
   b) croqui in motion,
   c) design silhouettes,
   d) color / texture / print on dress
   e) Accessories.
   f) Make swatch board

The student must learn to export the graphics into different file formats of different dimensions and dpi (resolution) for use in digital/print portfolios/specification sheets /websites /emails etc. The student should also know to export each layer individually and combined.

3. Creating a Computerized Specification Sheet (in Microsoft excel). The Specification Sheet must include,
   a) The necessary details like dress description, material to be used, color, trims etc.,
   b) Fashion Illustration of the selected garment,
   c) Technical Sketch of the selected garment (front & back),

d) Swatches,
e) Costing.

Saving, archiving (on CD Rom), emailing the files as attachments.
Study any Industrial Grade Fashion Design Software and prepare a report of it.

ENTREPRENEURSHIP INTERNSHIP

Subject Code – MFTE1-420 **L T P C** **Duration - 96 Hrs.**
0 0 8 4

1. Introduction to Entrepreneurship,
2. Study of various essential aspects of Entrepreneurship,
3. Identification and development of essential entrepreneurial skills,
4. Entrepreneurship Development,
5. 1-Month Entrepreneurship in the Garment Industry, working on Designing and finally forming a survey report on the industry, its type, its working, its departments and personnel, jobs undertaken, references, Observations, Precautions, etc.,
6. The report should have a detailed information about the industry the student joined for entrepreneurship, the type of industry (public sector/ private/partnership), the names of directors, the departments of the industry, its personnel, their working, the jobs being undertaken at the industry, the products being manufactured, the marketing of the products, the raw material being used, the clients, etc.,
7. The report should also include the work done by the student during his/her training, specifying what all new was learned during this period,
8. The report should be accompanied by the training certificate from the industry,
9. It should be signed by the student.

SEMESTER 1st		Contact Hrs. 32			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-101	Structure and Properties of Fibres, Fabrics and Garments	3	1	0	40	60	100	4
MFTE1-102	Modern Technology of Fabric and Apparel Production	3	1	0	40	60	100	4
MFTE1-103	Advanced Textile & Garment Designing Concepts	3	1	0	40	60	100	4
MFTE1-104	Apparel Testing and Quality Characterisation	3	1	0	40	60	100	4
Department Elective-1		3	1	0	40	60	100	4
MFTE1-156	Fashion Design Concepts							
MFTE1-157	High Performance Fibres							
MFTE1-158	Theory and Design of Garment Machinery							
MFTE1-159	Fabrics Properties and Textile Designing							
MFTE1-160	Structure and Properties of Fibres							
MFTE1-105	Garment Development Lab.-I	0	0	4	60	40	100	2
MFTE1-106	Textile and Apparel Testing Lab.	0	0	4	60	40	100	2
MFTE1-107	Independent Study	0	0	4	60	40	100	2
Total		**15**	**5**	**12**	**380**	**420**	**800**	**26**

SEMESTER 2nd		Contact Hrs. 32			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-208	Developments in Specialty Yarns & Texturing	3	1	0	40	60	100	4
MFTE1-209	Functional Textiles & Garments – I	3	1	0	40	60	100	4
MFTE1-210	Functional Finishes of Garments	3	1	0	40	60	100	4
MFTE1-211	Advances in Apparel Technology	3	1	0	40	60	100	4
Departmental Elective-II		3	1	0	40	60	100	4
MFTE1-261	Production Planning & Operation Management							
MFTE1-262	Technical Textiles and Smart Garments							
MFTE1-263	Environment Management & Eco-friendly Textiles							
MFTE1-264	Modern Methods of Apparel Merchandising & management							
MFTE1-212	Garment Development Lab.-II	0	0	4	60	40	100	2
MFTE1-213	Software Packages Lab.	0	0	4	60	40	100	2
MFTE1-214	Independent Study	0	0	4	60	40	100	2
Total		**15**	**5**	**12**	**380**	**420**	**800**	**26**

SEMESTER 3rd		Contact Hrs. 24			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MREM0-101	Research Methodology	4	0	0	40	60	100	4
Departmental Elective-III		3	1	0	40	60	100	4
MFTE1-365	Managing the Supply Chain							
MFTE1-366	Automation of Apparel Production							
MFTE1-367	Apparel Production CAD/CAM Systems							
MFTE1-368	Computer Aided Pattern Design							
MFTE1-369	Utility Properties of Cloth and Apparels							
Open Elective-I		3	1	0	40	60	100	4
MFTE1-315	Seminar on Advanced Topics	0	0	4	60	40	100	2
MFTE1-316	Minor Project	0	0	4	60	40	100	2
MFTE1-317	Advanced Garment Designing and Making Or Home Fashion Lab.	0	0	4	60	40	100	2
Total		**10**	**2**	**12**	**300**	**300**	**600**	**18**

SEMESTER 4th		Contact Hrs. 40			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFTE1-418	**Dissertation**	**0**	**0**	**40**	**Satisfactory/ Unsatisfactory**		**100**	**20**

Overall

Semester	Marks	Credits
1st	800	26
2nd	800	26
3rd	600	18
4th	100	20
Total	**2200**	**90**

STRUCTURE AND PROPERTIES OF FIBRES, FABRICS AND GARMENTS

Subject Code: MFTE1-101 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To introduce structure, properties of fibres, fabrics and garments.

Unit-I

Raw Material: Physical and chemical properties, manufacturing, process from polymer to fibers stage. Basic principles of fibre spinning, Spinning processes: Melt spinning. High speed spinning, spinning of microfibre, solution spinning process: Dry and wet spinning. Manufacture and specifications of raw materials and monomers. Heat-setting of fibres. Regenerated fibres: Viscose, Lyocell, high tenacity regenerated fibres, regenerated protein fibres, their methods of manufacture, physical & chemical properties and applications. Synthetic fibres: nylon 6 and 66, PET, PAN, their methods of manufacture, physical & chemical properties and applications.

Unit-II

High Performance Fibres: Introduction to PU, PTFE, aramid, carbon fibre, etc. their methods of manufacture, physical & chemical properties and applications. Brief idea on microdenier, bicomponent, hollow fibres and other developments in fibres.
Staple Yarns-Conventional ring spinning, open end spinning, friction spinning, self-twist spinning twist less spinning. Filament yarns- Wet, Dry and melt spinning.

Unit-III

Fabric Geometry: woven and other types of fabrics. Importance of fabric geometry and constructional parameters on the Bending, crease, Air permeability and handle and comfort properties.

Unit-IV

Structure of Garments: patterns, Draping and grading. Effect of fabric properties like GSM, Thickness on the Drape behaviour.

Recommended Books

1. R. Meredith, 'The Mechanical Properties of Textile Fibres', North Holland Publishing Co.
2. W.E. Morton and J.W.S. Hearle, 'Physical Properties of Textile Fibres', The Textile Institute, UK.
3. V.B. Gupta and V.K. Kothari, 'Manufactured Fibre Technology', Chapman and Hall, London.
4. Jacob Solinger, 'Apparel Manufacturing Handbook', Van Nostrand Reinhold Company, **1980**.
5. Tyler, 'Carr and Latham's Technology of Clothing Manufacturing', Blackwell.
6. Jones, Richard M., 'Apparel Industry', 2nd Edn., Blackwell.
7. Chuter, 'Introduction to Clothing Production Management', Blackwell.

MODERN TECHNOLOGY OF FABRIC AND APPAREL PRODUCTION

Subject Code: MFTE1-102 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To introduce various terms and techniques related to fabric and garment production, etc.

UNIT-I

Classification of non-woven fabrics. A survey of non-woven field – its uses and future growth. Principles of web formation. Properties of different type of webs.

Fibre properties and their influence on properties of non-woven fabrics. Web geometry – fibre orientation, curl-factor and web density their effect on properties of non-woven fabrics. Classification of binders and methods of binder application. Binder properties and effect of binder-fibre adhesion on properties of non-woven fabrics.

Needle Bonded Nonwovens: processing variables and their effects on properties.

Stitch bonded fabrics, their manufacture and properties. Spun bonded and split film fabrics.

UNIT-II

Knitting: Manufacturing of single jersey, rib, purl and interlock weft knit fabrics. Properties of these fabrics. Manufacturing of Tricot and Rashal fabrics and properties of these fabrics.

UNIT-III

Narrow Woven Fabrics: Manufacturing of Narrow woven fabrics, Braids, Ribbons, Tapes, Elastic webs, and other type of non-woven fabrics, Properties and application of narrow woven fabrics.

Nets and Laces: Manufacturing techniques of Nets and Laces, their properties and end-uses

UNIT-IV

Modern Apparel Production: Modern marker planning, Spreading, cutting, sewing, pressing and delivery techniques. Different types of Software used for modern apparel production techniques.

Recommended Books

1. Jacob Solinger, 'Apparel Manufacturing Handbook', Van Nostrand Reinhold Company, **1980.**
2. Tyler, 'Carr and Latham's Technology of Clothing Manufacturing', Blackwell.
3. Jones, Richard M., 'Apparel Industry', 2nd Edn., Blackwell.
4. Chuter, 'Introduction to Clothing Production Management', Blackwell.
5. Radko Krecma, 'Nonwoven Textiles'.
6. S. Russels, 'Handbook of Nonwovens'.
7. D.J. Spencer, 'Knitting Technology'.
8. D.B. Ajgaonkar, 'Knitting Technology'.

ADVANCED TEXTILE & GARMENT DESIGNING CONCEPTS

Subject Code: MFTE1-103 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

To impart knowledge of designing concepts of fabric and apparels, etc.

UNIT-I

Fashion Design Fundamentals: Basic concept of design, elements of art, of design: Definition of line shape, form size, space, texture and colour. Structural and decorative dress designing, creating varieties through designs. Principles of Design: Definition Harmony, Proportion, Balance, Rhythm, Emphasis, meaning types and application on apparel psychology of clothing.

UNIT-II

Anatomy for Designers: Effect of Human proportion and figure construction on garment construction. Methods of determining individual proportions. Aesthetic requirement of dress, sensory factors affecting aesthetics. Display of fashion materials: Definition and importance, source techniques and window display, classic fashion shows. Important fashion centers of the world and India.

UNIT-III

Advance fabric dyeing, printing and other surface ornamentation techniques: Resist printing, Ikat – tie and dye, mélange dyeing another painting medium. Knots. Towels: Tie-towels, basin towels, bath towels designing. Quilt designing, Wadding, geometrical ornamentation techniques: Bed-sheet designing: Bed-sheet fabric, designing, cut and spread techniques, pillows/cushion covers designing, appliqué designing.

UNIT-IV

Advanced Pattern Engineering of men's, women's and kid's wear. Geometrical Principles of Apparel construction: Simple shapes, triangle, bell and balloon, complex shapes and combining techniques, wrapping and tying techniques, pleats an flares to control fullness. Latest Ornamental techniques in garment designing.

Recommended Books

1. Erwin Model, 'Clothing for Moderns', Mac Millan Publications, New York.
2. Tate and Sharon Lee, 'Inside Fashion Design', Harper Publication Inc., U. Kng.
3. Navneet Kaur, 'Comdex Fashion Design; Fashion Concepts', Vol –I, Dreamtech Press, **2010**.
4. N. Gokarneshan, 'Fabric Structure and Design', New Age Publishers
5. Z.J. Groscicki, 'Watson Textile Design and Colour', Newnes Buttersworth.
6. Nisbet H, 'Grammer of Textile Design', D.B. Tarapore Wala Sons and Co.

APPAREL TESTING AND QUALITY CHARACTERIZATION

Subject Code: MFTE1-104 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of Testing and quality evaluation of fabrics and apparels, etc.

Unit-I

Introduction: Aim and scope of testing, Sample and Population, Sampling techniques. Fibre, yarn and fabric testing concepts, instruments and applications. Fabric comfort properties: water-vapour transmission through fabrics, Wicking properties, Air permeability and wettability. Fabric composition testing, fabric chemical testing.

Unit-II

Overview of low stress mechanical properties, FAST, Kawabatta Evaluation System. Analysis of KES, FAST data.

Garment testing concepts, instruments and applications: dimensions, seam strength, seam slippage, adhesion between interlining and fabric, shrinkage, zippers, buttons, snap fasteners and other general garment properties. Needle cutting/yarn severance.

Unit-III

Testing of specially designed fabrics and finishes: Flame resistance, Water repellency, etc. Computer colour matching: concept of colour measurement and applications. Different fastness (light, washing, perspiration, sublimation, chlorine, etc.) properties and their evaluation.

Unit-IV

International quality parameters and various standards such as AATCC, SDC, ASTM, etc. Salient features of different testing protocols for apparels, various essential standards and regulations associated with quality evaluation of apparels, safety aspects of childern's apparel, quality program of clothing sector, the role of retailer, agent, vendor and laboratory.

Recommended Books

1. B.P. Saville, 'Physical Testing of Textiles', Woodhead Publishing Ltd, Cambridge, **2002**.
2. V.K. Kothari, 'Testing and Quality Management', IAFL Publications, New Delhi, **1999**.
3. J.E. Booth, 'Principles of Textile Testing', CBS Publishers and Distributors, New Delhi, **1999**.
4. P. Angappan & R. Gopalakrishnan, 'Textile Testing', SSM Institute of Textile Technology, Komarapalayam, **2002**.
5. V.K. Mehta, 'Apparel Quality Control'.
6. A. Basu, 'Textile Testing', SITRA Coimbatore, **2002**.

GARMENT DEVELOPMENT LAB.-I

Subject Code: MFTE1-105 **L T P C**
0 0 4 2

Course Objectives

To practice developing different types of garments, etc.

Introduction and application of different aids, tools and equipment required in garment construction. Flat pattern technique: drafting, developing pattern. Drafting of child basic and adult bodic blocks. Drafting of collars and sleeves.

Preparation and construction of different types of seams, necklines, plackets, pockets, pleats and tucks. Dart manipulation and their applications.

TEXTILE AND APPAREL TESTING LAB.

Subject Code: MFTE1-106 **L T P C**
0 0 4 2

Course Objectives

To practice testing and evaluating different types of quality parameters of textile fabrics and garments, etc.

Applications of chemicals, dyes and functional finishes to make speciality garments and their evaluation. Fabric composition testing. Fabric shrinkage, Air-permeability, Limited Oxygen Index (LOI), flammability test, Water absorbency, Water repellency, Hydrostatic water proof test, Abrasion Resistance: flat and flex, Pilling resistance.

Fabric composition testing, fabric chemical testing, testing for fabric comfort. Determination light, washing, perspiration, sublimation, chlorine, etc. fastness properties of dyed samples.

Seam strength, Seam Slippage, Adhesion between interlining and fabric, shrinkage, zippers, buttons, snap fasteners and other general garment properties.

INDEPENDENT STUDY

Subject Code: MFTE1-107 **L T P C**
0 0 4 2

Course Objectives

To study and practice developing fabrics and garments depending upon individual study and research, etc.

Student has to study the particular topic as per their interest/ requirement of the project or suggested by the faculty under supervision.

FASHION DESIGN CONCEPTS

Subject Code: MFTE1-156 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of fashion, design concepts, etc.

Unit-I

Fashion terminology, cycle, influence, fashion: Introduction to fashion and apparel design. Origin of fashion, concept, analysis, trends and creations. Fashion Theories: Fashion of different eras. fashion promotion, style-fad-trends.

Unit-II

Fashion Design fundamentals: Basic concept of design, elements of art, of design: Definition of line shape, form size, space, texture and colour. Structural and decorative dress designing, creating varieties through designs.

Principles of Design: Definition Harmony, Proportion, Balance, Rhythm, Emphasis, meaning types and application on apparel psychology of clothing.

Unit-III

Introduction to colours and their theories. Colour harmony and colour contrast, modification of colours. Principle of colour measurement. Effect of colours on garment construction. Arrangement of figures such as unit repeating design, the drop device, drop reverse design, etc.

Unit-IV

Anatomy for designers: Effect of Human proportion and figure construction on garment construction. Methods of determining individual proportions. Aesthetic requirement of dress, sensory factors affecting aesthetics.

Display of fashion materials: Definition and importance, source techniques and window display, classic fashion shows. Important fashion centers of the world and India.

Recommended Books

1. Erwin Model, 'Clothing for Moderns', Mac Millan Publications, New York.
2. Tate and Sharon Lee, 'Inside Fashion Design', Harper Publication Inc., U. Kng.

HIGH PERFORMANCE FIBRES

Subject Code: MFTE1-157 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of fibres, high performance fibres, etc.

Unit-I

Introduction to fibres, their classification, important fibre properties. Natural fibres such as cotton, jute, wool, silk, etc., physical and chemical properties with applications. Advancement in production/cultivation of natural fibres such as BT cotton and their impact on ecology.

Unit-II

General definition of man-made or manufactured fibres, introduction to general principles of spinning and spinning processes. Basic principles of fibre spinning, Spinning processes: Melt spinning. High speed spinning, spinning of microfibre, solution spinning process: Dry and wet spinning. Manufacture and specifications of raw materials and monomers. Heat-setting of fibres.

Unit-III

Regenerated Fibres: Viscose, Liocel, high tenacity regenerated fibres, regenerated protein fibres, their methods of manufacture, physical & chemical properties and applications.
Synthetic fibres: nylon 6 and 66, PET, PAN, their methods of manufacture, physical & chemical properties and applications.

Unit-IV

High Performance Fibres: Introduction to PU, PTFE, Aramide, carbon fibre, etc. their methods of manufacture, physical & chemical properties and applications. Brief idea on microdenier, bicomponent, hollow fibres and other developments in fibres.

Recommended Books

1. A.A. Vaidya, 'Production of Synthetic Fibres', 1st Edn., Prentice Hall of India, New Delhi, **1988**.
2. V.B. Gupta and V.K. Kothari, 'Manufactured Fibre Technology', 1st Edn., Chapman and Hall, London, **1997.**
3. H.F. Mark, S.M. Atlas and E. Cernia,'Man Made Fibre Science and Technology', Vol. 1, 2, 3, 1st Edn., Willey Inter Science Publishers, New York, **1967**.
4. J.E. Macintyre, 'Synthetic Fibres', Woodhead Fibre Science Series, UK, **2003**.
5. F. Fourne, 'Synthetic Fibres: Machines and Equipment, Manufacture, Properties', Hanser Publisher, Munich, **1999**.

THEORY AND DESIGN OF GARMENT MACHINERY

Subject Code: MFTE1-158 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of garment machineries, etc.

Unit-I

Theory, measurement and control of yarn tension in unwinding from sewing thread packages during Sewing. Study of stitch formation during sewing operation. Relationship between sewing speed and stitches per inch on stitch formation. Stitch types and stitch geometry.: Various types of stitch types produced on different types of sewing machines. Properties of stitches and their

usefulness.

Unit-II

Seam Types and Seam Geometry: Various types of seams and their geometry. Application of different seams in producing different garments.

Feed Mechanisms: Different types of sewing feed mechanisms and their uses Control of differential feed.

Unit-III

Development in design and operation of modern sewing machines. Theory and design principles of latest automatic controls in stitch regulation in sewing.

Kinematics of drop feed mechanism. Design problems of conventional sewing machines.

Unit-IV

Principles Underlying Unorthodox Sewing Machinery System: Microprocessor and computer controls, Specialty sewing machines and their Kinematics.

Timings for sewing operations for needle and looper systems.

Recommended Books

1. Jacob Solinger, 'Apparel Manufacturing Handbook', Van Nostrand Reinhold Company, **1980.**
2. Tyler, 'Carr and Latham's Technology of Clothing Manufacturing', Blackwell.
3. Jones, Richard M., 'Apparel Industry', 2nd Edn., Blackwell.
4. Chuter, 'Introduction to Clothing Production Management', Blackwell.

FABRIC PROPERTIES AND TEXTILE DESIGNING

Subject Code: MFTE1-159 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of fabric and Textile Designing, etc.

Unit-I

Fabric formation technologies, Fabric properties-dimensional & structural, Mechanical, Comfort related properties, Low stress mechanical properties, properties related to aesthetic significance, other physical properties relevant to end use, Influence of fibres, yarn characteristics and fabric construction parameter on clothing comfort.

Unit-II

Concept of fabric designing through fabric structure, Importance of fabric structure, Basic Weaves: Plain, Twill, Sateen weaves, Theirs derivatives and ornamentation, Draft and Peg-plan for all simple weave. Other decorative weaves like Diamond, Mockleno, Corkscrew, Honey Comb, Huck-a-back, etc.

Unit-III

Knitting, comparison of knitting and weaving technology, Classification of knitting. Difference between woven and knitted fabric properties., Characteristics of warp knit and weft knit structure.

Knitting Elements: Knitting needles, sinkers, cam systems, etc. Knitting cycles, Weft knitting: properties and uses of basic weft knitted structures- Plain, Rib, Interlock and Purl.

Unit-IV

Fundamental Stitches: Knit, Tuck and float stitches and their uses. Ornamentation of knitted fabrics. Concept of loop length, production calculation,

Calculations for Tightness factor, fabric cover, stitch density, areal density and knitting machine production.

Recommended Books

1. Sabit Adanur, 'Handbook of Weaving', Technomic Publishing Company, Inc, U.S.A.
2. N. Gokarneshan, 'Fabric Structure and Design', New Age International, N. Delhi.
3. Azgaonkar, 'Knitting Technology', Universal Publishing Corp.

STRUCTURE AND PROPERTIES OF FIBRES

Subject Code: MFTE1-160 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of fibres and their properties, etc.

Unit-I

Structure of Fibres: Traditional view of fibre structure, Methods of investigation of fibre structure, Introductory idea about identification of chemical and physical structure by IR spectroscopy, X-ray, SEM.

Unit-II

Moisture Absorption: Fundamentals of moisture like humidity, Moisture regain and content, relation, equilibrium, Heat of sorption, swelling of fibres, factors influencing results of tensile experiment, creep and stress relaxation

Unit-III

Introduction to dielectric properties and static electricity, Measurement of static electricity, Optical properties: Refractive index and birefringence, Birefringence and orientation of fibres, reflection and lustre.

Unit-IV

Introduction to thermal Properties and fibre friction, technological importance, measurement of friction, Effect of load and area of contact, static and kinetic friction. General theory of friction and application to fibres.

Recommended Books

1. R. Meredith, 'The Mechanical Properties of Textile Fibres', North Holland Publishing Co.
2. W.E. Morton and J.W.S. Hearle, 'Physical Properties of Textile Fibres', The Textile Institute, UK.
3. V.B. Gupta and V.K. Kothari, 'Manufactured Fibre Technology', Chapman and Hall, London.

DEVELOPMENTS IN SPECIALTY YARNS & TEXTURING

Subject Code: MFTE1-208 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To introduce specialty yarns and texturing.

Unit-I

Types of Specialty Yarns: Novelty yarns, Grindle yarns, core-spun yarns, Chennile yarns, Corded yarns, Bulky yarns and other types of specialty yarns. Methods of production of novelty yarns, their properties and applications

Unit-II

Sewing Threads: Their manufacturing techniques, special finishes, properties and end-uses

Unit-III

Different Types of Texturing: Twist texturing, Air-jet texturing, edge crimping stuffer box crimping, gear crimping, knit-de-knit etc.

Detailed discussion on False Twist. texturing process, machine. Material, process and machine variables – their effect on properties of yarn. Recent developments.

Unit-IV

Air-jet Texturing: Detailed discussion of process. Different types of variables and their effect on properties of yarn. Recent developments of air-jet texturing machine, jets and process.

Methods of assessing and evaluation of textured yarns. Hi-bulk yarns – especially acrylic. Chemical texturing.

Recommended Books

1. A. Venkatasubramani, 'Spun Yarn Technology'.
2. Allan Fellingham, 'Air-jet Texturing'.
3. J. Hearle, L Hollick and D. Wilson, 'Yarn Texturing Technology'.
4. A. Laura and J. Bryant, 'Knitting with Novelty Yarn'.
5. Ali Demir, 'Synthetic Filament Yarn: Texturing Technology'.

FUNCTIONAL TEXTILES & GARMENTS – I

Subject Code: MFTE1-209 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To introduce various terms and techniques related to functional textiles and garments production and properties, etc.

UNIT- I

Introduction to functional garment and their applications. Medical Textiles**:** application of various polymers and textile materials in medical field such as artificial tandem and alignments, kidney, heart, surgical product, cardiovascular graft, sterilization, wound care, etc.

UNIT-II

Nanotechnology in apparels - Introduction and Definition of Nanotechnology. Understanding Nanotechnology. Nanotechnology and Today's World. Use of nanotechnology in the field of fibres and polymers and their application in apparels. Latest developments of nanomaterials in garment sectors.

UNIT-III

Protective clothing - Brief idea about different type of protective clothing, General requirement of protective clothing, cut resistant fabric, chemical protective clothing (CPC) - Areas of use, CPC items for air-born, liquid hazard, different chemicals used, parts of CPC, performance evaluation – permeation, solubility and diffusion theory, barrier effectiveness, structural integrity, water proof breathable fabrics.

UNIT-IV

Ballistic Protective clothing – Requirements, principle of mechanism, different fibres and fabrics, soft and hard armor, factors influencing performance.

Thermal Protective Clothing (TPC)– Combustion mechanism, fire governing parameters, Requirements, Designing of TPC, Construction, various parameters affecting flame retardency, performance evaluation,

Pesticide Protective Clothing – Requirements of protective clothing, different areas, different parts of PPC, Performance evaluation of PPC.

Recommended Books

1. R. Shishoo, 'Textiles in Sport', Woodhead Publisher.
2. X.M. Tao, 'Wearable Electronics and Photonics', Woodhead Publisher.
3. S. Adanur, 'Wellington Sears Handbook of Industrial Textiles', Woodhead Publisher.
4. A.R. Horrocks and S.C. Anand, 'Handbook of Technical Textiles', UK.
5. P. Brown and K. Stevens, 'Nanofibres and Nanotechnology in Textiles', Woodhead Publisher.
6. Y. Li, 'Nanofunctional Textiles and their Applications', Woodhead Publisher.
7. L Van Langenhove, 'Smart Textile for Medical and Healthcare', Woodhead Publisher.

FUNCTIONAL FINISHES OF GARMENTS

Subject Code: MFTE1-210 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of designing concepts of fabric and apparels, etc.

UNIT-I

Introduction to textile finishing. Aim and scope. Classification of finishes. Concept of permanent and temporary finishes. Various finishes in industrial practices such as raising and shearing, drying. Calendaring - its types, construction and function of various calendaring m/cs. Sanforizing – method and mechanism.

UNIT-II

Brief concept of finishing of wool: Crabbing, decatising, milling, shrink finishing, etc. General chemical finishes like softening, stiffening, delustering of rayon, polyester. organdy finish. Silky finish of polyester/ weight reduction of polyeste. Weighting of silk. Heat setting of synthetic fibres, concept and required machines.

UNIT-III

Introduction and preliminary concepts of specialty finishes such as durable press finish to textile and garments, anti-crease finish. Water repellent and water proof finish: concept, mechanism and their application. Flame-proof and flame-retardant finish: concept, mechanism and their application.

UNIT-IV

Introduction and preliminary concepts of specialty finishes such as Soil and oil repellent finish, anti-static finish, antimicrobial finish. Introduction to enzymes and their applications in finishing of textiles and garments. Finishing of denim: stone wash, enzyme wash, etc. enzyme wash and some other specialty finishes. UV protective finishes. Brief introduction and application of nanofinish, ultrasound, Laser, plasma Technology in textiles.

Recommended Books

1. E.P.G. Gohl and L.D. Vilensky, 'Textile Science', CBS Publishers.
2. J.T. Marsh, 'An Introduction to Textile Finishing'.
3. V.A. Shenai , 'Textile Finishing'.
4. J.N. Chakarverty, 'Fundamental and Practices in Colouration of Textiles'.

ADVANCES IN APPAREL TECHNOLOGY

Subject Code: MFTE1-211 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of advancements in apparel technology, etc.

Unit-I

Innovation in seams, stitches, sewing thread, needles, marker, planning and cutting technology. Understanding the need and use of various construction types for sewing machinery in regards to quality and performance improvement and ease to operate,

Unit-II

Advancement in Sewing Machinery: Directive for operating special purpose sewing machinery. Various bed types of machine and their applications in manufacturing processes: Flat Bed, large area Raised Bed, DNLS m/c, Over Lock m/c, Flat Lock m/c, Multi thread Chain Stitch m/c, Blind stitch machine and their developments.

Unit-III

Various types of feed mechanisms, their suitability for different fabrics and construction of components and their contribution towards quality and productivity. Application of programmable machines in garment industries. Developments and automation in garment manufacturing machines and industries.

Unit-IV

Scientific approach in sewing techniques. Ergonomic concepts and application in the sewing room, Introduction of time targets and quality aspects, Practical approach to achieve targets, understanding of different shaped sewing lines in actual garments, Material Handling, Postural Techniques, Work Study, Working Time Arrangement, Shift Work, Motion Economy, anthropometric, Basic Sewing Patterns, Convex sewing pattern, Curved sewing pattern, Angular sewing pattern, etc.

Recommended Books

1. 'Knitted Clothing Technology', Brackenburry.
2. Harold Carr, Barbara Latham, 'The Technology of Clothing Manufacture'.
3. Gerry Cooklin, 'Introduction to Clothing Manufacture'.

PRODUCTION PLANNING & OPERATION MANAGEMENT

Subject Code: MFTE1-261 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of production planning of apparel manufacturing & Operation management, etc.

Unit-I

Basic concept of production & operation, Macro and micro level planning with special reference to apparel industry, Production scheduling & control, PERT/CPM.

Unit-II

Application of Industrial Engineering in Apparel industry. Method of conducting Work study, Time study and method study with special reference to apparel industry. Ergonomics in garment industry.

Unit-III

Management Information system. Concept of ERP and its application.

Unit-IV

Social accountability and its impact. Implementation of SA-8000 in Industry.

Recommended Books

1. N.G. Nair, 'Production and Operation Management'.
2. S.N. Charry, 'Production and Operation Management'.
3. K.C. Batra, 'Production Management'.
4. E. Adams, 'Production and Operation Management'.
5. 'Concept, Model and Behaviour'.
6. Martland Telsang, 'Industrial Engineering & Production Management'.

TECHNICAL TEXTILES AND SMART GARMENTS

Subject Code: MFTE1-262 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of Technical Textiles and Smart garments, etc.

Unit-I

Introduction: Definition, Textile materials in technical applications.
Fibres: Natural and Man-made fibres suitable for technical applications and their relevant properties.

Unit-II

Geotextiles: Mechanics of reinforcement, filtration and drainage of soils by geotextiles. Typical applications. Determination of soil particle size and pore size distribution, relations between soil particle and size and pore size distribution for hydraulic applications.

Unit III

Medical Textiles: Textiles in various medical applications. Absorbency of textile materials & methods of sterilization; application oriented design of typical medical textiles (e.g. porous graft or trashed tube). Materials used and design procedure for protecting wounds, cardiovascular application, Sutures etc. Automotive Textiles: Fibres used for automotive applications-upholstery, carpeting, preformed parts, tyres, safety devices, filters and engine compartment items. Brief description for the manufacture and application of these devices or parts.

Unit-IV

Rigid Composites: Three dimensional fabrics and triaxially braided materials for composites. Filtration: Principles and some mathematical models of wet and dry filtrations. Characteristics properties of fibres and fabrics in selective examples of filtration. Ropes and Cordages: Methods of production. Application oriented structure and production of ropes, cordages and twines. Intelligent & Smart garments, Sportswear, Leisurewear, swimwear, Spacesuits. Protective clothing: Thermal protection. Ballistic protection. Protection from electromagnetic radiation and static hazards. Protection against micro-organisms, chemicals.

Recommended Books

1. W. Fung, 'Coated and Laminated Textiles'.
2. A.R. Horrocks and S.C. Anand, 'Handbook of Technical Textiles'.
3. W. Fung and J.M. Hardcastle, 'Textiles in Automative Engineering'.

4. X.M. Tao, 'Smart Fibres, Fabrics and Clothing'.
5. R.A. Scott, 'Textiles for Protection'.
6. R. Shishoo, 'Textiles in Sport'.
7. X.M. Tao, 'Wearable Electronics and Photonics'.

ENVIRONMENT MANAGEMENT & ECO-FRIENDLY TEXTILES

Subject Code: MFTE1-263 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of Environment management and Eco-friendly textiles, etc.

Unit-I

Concept of environment management and its importance in manufacturing industry. Sources of various kinds of pollution in textile & apparel industry.

Unit-II

Assessment of environmental impact and designing of environmental management program. Environment audit.

Unit-III

Air, water and noise pollution. Disposal of waste and effluents and related processes. Standard norms for effluent emissions in textile & apparel industry.

Unit-IV

Occupational, health and safety management.
Eco-friendly chemical processing, Natural dyes, Eco standards and their applications.
Eco-friendly Textiles: Organic cotton & wool- their production and processes

Recommended Books

1. A.R. Horrocks, 'Recycling Textile and Plastic Waste'.
2. A.R. Horrocks, 'Eco-textile 98'.
3. K. Slater, 'Environmental Impact of Textiles'.
4. Y. Wang, 'Recycling in Textiles'.
5. Y. Li and A.S. Wong, 'Clothing Biosensory Engineering'.
6. Y. Li, 'Biomedical Engineering of Textiles and Clothing'.
7. R.S. Blackburn, 'Biodegradable and Sustainable Fibres'.

MODERN METHODS OF MERCHANDISING & MANAGEMENT

Subject Code: MFTE1-264 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of Merchandising and management, etc.

Unit-I

Retailing Environment: Introduction to Retailing, Types of Retailing, Multi-channel Retailing, Retailing Strategy: Retail Audit, Retail Customer, Retail/Site Selection, Retail Organization and Human Resource Management, Customer Relationship Management, Pricing in Retailing, Retail Communication.

Unit-II

Merchandise Management: Developing and Implementing Merchandise Plans, Financial Management, Operations Management, Supply chain management.

Unit-III

Store Management: Store Layout, Design and Visual Merchandising, Customer Service

Unit-IV

Fashion Communications: Fashion shows, Portfolio, Mood board, Story board, Flat sketches, colour chart, Forecasting: Colour forecasting, Fabric forecasting, Fashion advertising, Fashion photography

Recommended Books

1. Levy and Weitz, 'Introduction to the World of Retailing', Berman and Evans.
2. Levy and Weitz, 'Retail Institutions and Multi-channel', Berman and Evans. ;
3. 'Strategic Planning in Retailing', Berman and Evans.
4. Levy and Weitz, 'Retail Market Strategy'.
5. 'Identifying and Understanding Consumers', Berman and Evans.
6. Levy and Weitz, 'Customer Buying Behavior'.
7. Levy and Weitz, 'Store Layout, Design and Visual Merchandising'.
8. 'Retail Image and Promotional Strategy', Berman and Evans.
9. Levy and Weitz, 'Pricing', Berman and Evans.

GARMENT DEVELOPMENT LAB.-II

Subject Code: MFTE1-212 **L T P C**
0 0 4 2

Course Objectives

To practice developing different types of garments, etc.

Construction of garment of children, men and women wear.
Techniques of draping and grading, their applications in dress construction. Line balancing system. Practice of pattern making and construction of selected kids, ladies and gents wear. Preparation functional/Specialty garment.

SOFTWARE PACKAGES LAB.

Subject Code: MFTE1-213 **L T P C**
0 0 4 2

Course Objectives

To practice application of tools and software packages related to pattern making and designing of textile fabrics and garments, etc.

Study and application of tools and software packages related to the topic and discipline of the study and department. Pattern making, grading and marker making and designing software's in Fashion and Technology.

INDEPENDENT STUDY

Subject Code: MFTE1-214 **L T P C**
0 0 4 2

Course Objectives
To study and practice developing fabrics and garments depending upon individual study and research, etc.

Student has to study the particular topic as per their interest/requirement of the project or suggested by the faculty under supervision.

RESEARCH METHODOLOGY

Subject Code: MREM0-101 **L T P C** **Duration: 45 hrs.**
4 0 0 4

UNIT–I (11 Hrs.)

Introduction to Research: Meaning, Definition, Objective and Process
Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental
Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature
Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.
Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT–II (10 Hrs.)

Sources of Data: Primary and Secondary, Validation of Data
Data Collection Methods: Questionnaire Designing, Construction
Sampling Design & Techniques – Probability Sampling and Non Probability Sampling
Scaling Techniques: Meaning & Types
Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability
Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT–III (13 Hrs.)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation
Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number
Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs.)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling
Report Writing: Essentials of Report Writing, Report Format
Statistical Software: Application of Statistical Soft wares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis

**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITs*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education, New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education, New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education, New Delhi.
6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

AUTOMATION OF APPAREL PRODUCTION

Subject Code: MFTE1-366 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Course Objectives

To introduce various terms and techniques related to automation in garments production, etc.

Unit-I

Concept of Automation: Base subject information, basic terms and definitions from mechanization area and automation area. Energy transfer in kinematic system, drive requests, types of drives, comparison, characteristics, fluid drives, characteristics, comparing, pneumatic drives, air properties as a medium for energy transfer. Hydraulic drives, schematic diagram, power packs, Proportional hydraulic system, servo-operated valves, circuits with PAS (power assisted steering). Electric drives, general view, characteristics, powers (outputs).

Unit-II

Automated elements in cutting of textile materials, cutting by water jet. Automated elements in clothing production- sewing and ironing process.

Unit-III

Overview of conceptions of "Work Robots" and "Manipulators". Kinematic of configurations, kinematic couples, application in textile and clothing industry, Effectors of "Work Robots" and "Manipulators", Vacuum grippers, control grippers, and special grippers of gripping of textile materials.

Unit-IV

Types of driving mechanism of sewing machines, automated sewing machines. Automation in area of handling and manipulation with textile material in clothing process. Conveyor systems.

Recommended Books

1. G.A. Berkstresser & E.M. Buchanan, 'Automation and Robotics in the Textile and Apparel Industries'.
2. H. Carr and B. Latham, 'The Technology of Clothing Manufacture'.
3. C.Y. Cheng and S.F. Yip, 'Introduction to Garment Manufacture'.
4. K.P. Lau, et al., 'Garment Manufacture - Basic Sewing Technology'.
5. G. Cooklin, 'Fusing Technology'.

6. N. Relis & G. Strauss, 'Sewing for Fashion Design'.
7. G. Stylios, 'Textile Objective Measurement and Automation in Garment Manufacture'.
8. J. Solinger, 'Apparel Manufacturing Handbook'.
9. R.J. Crum, 'Methods of Joining Fabrics'.

APPAREL PRODUCTION CAD/CAM SYSTEMS

Subject Code: MFTE1-367 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives

To impart knowledge of CAD/CAM systems in apparel production technology, etc.

Unit-I

Application of company information systems, ERP, PLM systems and a engineering methods (JIT, MRP, TOC) in aid of control and company process planning ERP system Helios Orange by LSC International.

Unit-II

Control and company process planning by means of CIM, General principles of CA (computer aided) systems.

I. (CAD, CAE, CAP,), Formats of video date storage, Data interchange among CA systems General principles of CA systems.

II. (CAM, CAD/CAM, CQM)

Unit-III

Application of CA technology in clothing production I. - point of software view Application of CA technology in clothing production II. - point of hardware view (principles of digitizer, plotter, scanner, cutter).

Unit-IV

Systems for 2D and 3D clothes designing - data communication between 2D CAD AccuMark system and 3D V-Stitcher, evaluation of clothes fitting to body, creation of virtual presentation. Body scanners - MaNescan system, MIT_MaNescan program, procedure for measuring and evaluation by 3D CAD CATIA program, application of these programs for production of made to order clothes Automatic contactless data capture in clothing production - application of RFID and bar codes.

Recommended Books

1. G.A. Berkstresser & Buchanan, 'Automation and Robotics in the Textile and Apparel Industries'.
2. H. Carr and B. Latham, 'The Technology of Clothing Manufacture'.
3. C.Y. Cheng and S.F. Yip, 'Introduction to Garment Manufacture'.
4. K.P. Lau, et al., 'Garment Manufacture - Basic Sewing Technology'.
5. N. Relis & G. Strauss, 'Sewing for Fashion Design'.
6. G. Stylios, 'Textile Objective Measurement and Automation in Garment Manufacture'.
7. J. Solinger, 'Apparel Manufacturing Handbook'.
8. Stephen Gray, 'CAD / CAM in clothing and Textiles'.
9. W. Aldrich, 'CAD in clothing and Textiles'.

COMPUTER AIDED PATTERN DESIGN

Subject Code: MFTE1-368 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of pattern design using CAD systems, etc.

Unit-I

Advanced 3D pattern design systems. Application of the MTM method (Made To Measure) for the production of individual and personalized garments.

Unit-II

Pattern modification for garment size and fit. A Good basic understanding of the variation in figure shapes and the appropriate pattern modification. Pattern alteration according to the wearer´s; bone structure, posture, body size and contour. Measurement pattern deformation. Choosing the material from a pre-defined library and defining your mechanical properties of fabrics for simulation.

Unit-III

Theory of design procedures for the automated design of garments using the CAD system PDS Tailor XQ. Using CAD technology for customization. Design Concept - software for developing templates from 3D shapes. Production of 2D templates from 3D designs for prototyping. The rational way to design clothes and the transition from 2D to 3D images of virtual body.

Unit-IV

Computer Graphics - theory, input and output devices, applications, product development. The principle of scanning the surface of the human body using a system MaNescan. Flattening the surface of 3D objects and their applications in the flattening human body surface in a 3D CAD program CATIA.

Recommended Books

1. Alison Beazley and Terry Bond, ‘Computer-Aided Pattern Design and Product Development’.
2. Sandra Burke, ‘Fashion Computing: Design Techniques and CAD’.
3. Stephen Gray, ‘CAD / CAM in clothing and Textiles’.
4. W. Aldrich, ‘CAD in clothing and Textiles’.
5. ‘Computer Aided Design’, Gerber Technology.
6. ‘Modaris, Diamino and Justprint for Apparel Design’.

UTILITY PROPERTIES OF CLOTH AND APPARELS

Subject Code: MFTE1-369 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Course Objectives
To impart knowledge of utility properties of textile and apparels, etc.

Unit-I

Characteristics of clothing materials, according to the function of a clothing product. Classification of clothing materials. Clothing materials demands for users and garments producers.

Unit-II

CSN, ISO standards for evaluation of clothing materials and garments.

Processing properties of clothing materials. Processing and utility properties of sewing threads evaluating methods

Unit-III

End-use properties- clothing materials durability, evaluative methods, Extent of care for garments

End-use properties- aesthetic properties of clothing materials, evaluative methods

End-use properties- Physiological properties of clothing materials, evaluative methods

Unit-IV

Clothing comfort, apparent temperatures.

Hand evaluation – subjective and objective methods of hand evaluation

End-use properties- Special properties of clothing materials for extreme conditions, evaluative methods.

Multifunction and semi-permeable clothing materials, Special protective clothing.

Recommended Books

1. Hassan M. Behery, 'Nonwovens-Theory, Process, Performance and Testing'.
2. V.K. Kothari, 'Testing and Quality Management'.
3. P.V. Mehta, 'An Introduction to Quality Control for Apparel Industry'.
4. J. Fan, and L. Hunter, 'Engineering Apparel Fabrics and Garments'.
5. B.P. Saville, 'Physical Testing of Textiles'.
6. 'Fabric Testing', Woodhead Publishers.

SEMINAR ON ADVANCED TOPICS

Subject Code: MFTE1-315 **L T P C**
0 0 4 2

Course Objectives

To deliver a talk on advanced topic in the form of power point presentation supported by documents like research papers, literatures, etc. To enable a student to be familiar with Communication skills.

Student is expected to learn

a. How to make a presentation
i. Verbal
ii. Non Verbal
iii. LCD based Power Point

b. How to write a report
i. Abstract
ii. Body
iii. Conclusions
iv. Executive Summary

c. Group Discussion
i. Share the work with a group
ii. Modularization of the work
iii. Shareware Development

d. Communication
i. Horizontal
ii. Vertical

Students will be given a topic of importance and are expected
a. To present the topic verbally in 30 minutes
b. To present the topic as a report in 30 pages

MINOR PROJECT

Subject Code: MFTE1-316 **L T P C**
0 0 4 2

Course Objectives
To make literature survey, research methods, project synopsis of the research project he/she is willing to carry out in the final semester and deliver a talk on the above research work in the form of power point presentation supported by documents like research papers, literatures, etc.
The term work under this, submitted by the student shall include –
1. Work diary maintained by the student and counter signed by his guide.
2. The contents of work diary shall reflect the efforts taken by candidate for
   (a) Searching the suitable project work
   (b) Visits to different factories or organizations
   (c) Brief report of journals and various papers referred
   (d) Brief report of web sites seen for project work
   (e) The brief of feasibility studies carried to come to final conclusion
   (f) Rough sketches
   (g) Design calculation etc. etc. carried by the student.

The student has to make a presentation in front of panel of experts in addition to guide as decided by department head.

ADVANCED GARMENT DESIGNING AND MAKING OR HOME FASHION LAB.

Subject Code: MFTE1-317 **L T P C**
0 0 4 2

Course Objectives
To practice developing different types of garments, Home fashion products, etc.
Generation of advanced garments with detailed fashion motivations e.g. Jackets/Coats, Evening gowns, Maternity wear and functional wear e.g. high visibility apparels, multilayered apparels etc.

or

Home fashion
Designing of bedding textiles including bed linens, pillow covers etc. Quilt designing for strip, pieced and painted quilts. Baby mattresses and quilt designing. Towel designing e.g. tie towels, basin towels etc. Curtain designing e.g. cafe, sarong, belly dancers' curtains etc. Hand loom article designing like rugs, bath mats etc.
Note: Students have to make 4-5 garments/products from designed fabrics of their choice. Garments (menswear/womenswear/kidswear)/products should be designed based on themes and seasons as projected by likes of the students, which will be assessed by the jury comprising of external experts from Academic Institution/Industry as well as Internal subject tutor(s). Showcasing of garments or products will be done on Dummies/models/display tables/racks supported by a Technical Report.

DISSERTATION

Subject Code: MFTE1-318 **L T P C**
0 0 40 20

Course Objectives

To carry out research work, display their work in the form of exhibition/fashion show**.**
The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held within two months' time. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose at the end of semester. Students should develop garments or Home Fashion products based on fashion trends/forecasting, using moodboard, storyboard and showcase their final products in the form of fashion show and exhibition supported by documents including Portfolio, Swatch book, colourboard, moodboard, storyboard and hard bound project thesis.

M. TECH. ECE (MICRO ELECTRONICS)

Total Contact Hours = 24 Total Marks = 600 Total Credits = 22

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MECE5-101	Hardware Description Languages and VLSI Design	4	0	0	40	60	100	4
MECE5-102	Microelectronics	4	0	0	40	60	100	4
MECE5-103	Advanced Semiconductor Physics	4	0	0	40	60	100	4
MECE5-104	Research Lab-I	0	0	4	60	40	100	2
Departmental Elective – I (Select any one)		4	0	0	40	60	100	4
MECE5-156	Nanoscale Devices and Systems							
MECE5-157	Electronic System Design							
MECE5-158	Information Theory and Coding							
MECE5-159	Digital Signal Processing							
Departmental Elective – II (Select any one)		4	0	0	40	60	100	4
MECE5-160	Sensors & Transducers							
MECE5-161	Optoelectronics							
MECE5-162	Materials Science & Engineering							
MECE5-163	Soft Computing							
Total		**20**	**0**	**4**	**260**	**340**	**600**	**22**

Total Contact Hours = 24 Total Marks = 600 Total Credits = 22

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MECE5-205	Micro & Nano Electromechanical Systems (MEMS and NEMS)	4	0	0	40	60	100	4
MECE5-206	CPLD and FPGA Architectures and Applications	4	0	0	40	60	100	4
MECE5-207	Research Lab -II	0	0	4	60	40	100	2
Departmental Elective – III (Select any one)		4	0	0	40	60	100	4
MECE5-264	Satellite Communication							
MECE5-265	Testing & Fault Tolerance							
MECE5-266	MOS Integrated Circuit Modelling							
MECE5-267	Parallel Processing							
Departmental Elective – IV (Select any one)		4	0	0	40	60	100	4
MECE5-268	CAD Tools for VLSI Design							
MECE5-269	Nano Electronics							
MECE5-270	Multimedia Communication System							
MECE5-271	Low Power VLSI Design							
Open Elective – I (Select any One)		4	0	0	40	60	100	4
Total		**20**	**0**	**4**	**260**	**340**	**600**	**22**

Total Contact Hours = 26 **Total Marks = 500** **Total Credits = 22**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MREM0-101	Research Methodology	4	0	0	40	60	100	4
MECE5-308	Project	0	0	10	100	0	100	8
MECE5-309	Seminar	0	0	4	100	0	100	2
Departmental Elective – V (Select any one)		4	0	0	40	60	100	4
MECE5-372	Digital Signal Processors and Architectures							
MECE5-373	Error Control and Coding							
MECE5-374	Measurement & Characterisation Techniques							
MECE5-375	CMOS VlSI Design							
Open Elective – II (Select any One)		4	0	0	40	60	100	4
Total		**12**	**0**	**14**	**320**	**180**	**500**	**22**

Total Credits = 24

SEMESTER 4th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Satisfactory/ Unsatisfactory**	
MECE5-410	Thesis	0	0	24		24

Overall

Semester	Marks	Credits
1st	600	22
2nd	600	22
3rd	500	22
4th	--	24
Total	**1700**	**90**

HARDWARE DESCRIPTION LANGUAGES AND VLSI DESIGN

Subject Code: MECE5-101 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (11 Hrs.)

MOS TRANSISTOR THEORY: Introduction, Ideal I-V Characteristics, Second Order Effects, CMOS Logic, CMOS Fabrication and Layout, VLSI Design Flow.

CIRCUIT CHARACTRIZATION AND PERFORMANCE ESTIMATION: CMOS Inverter, DC Transfer Characteristics, Delay Estimation, Logical Effort, Power Dissipation, Scaling and Latch-up.

UNIT-II (11 Hrs.)

COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN: Static CMOS, Ratioed Circuits, Differential Cascode Voltage Switch Logic, Dynamic Circuits, Domino Logic-Pass Transistor Circuits, CMOS D Latch and Edge Triggered Flip-flop and Schmitt trigger.

UNIT-III (12 Hrs.)

HDL PROGRAMMING USING BEHAVIORAL AND DATA FLOW MODELS: Verilog, Introduction, Typical Design Flow, Modules and Ports, Instances, Components, Lexical Conventions, Number Specification, Strings, Identifiers and Keywords, Data Types, System Tasks and Compiler Directives, Behavioural Modelling, Dataflow Modelling, RTL, Gate Level Modelling, Programs For Combinational and Sequential.

UNIT-IV (11 Hrs.)

HDL PROGRAMMING WITH STRUCTURAL AND SWITCH LEVEL MODELS: Tasks and Functions, Difference between Tasks and Functions, Switch Level, MOS Switches, CMOS Switches, Examples: CMOS NAND and NOR, MUX using Transmission Gate, CMOS Flip-Flop.

RECOMMENDED/REFERENCE BOOKS:

1. Neil H.E. Weste, David Harris and Ayan Banenjee, 'CMOS VLSI Design', 3rd Edn., Pearson, **2004.**
2. Sung Mu Kang and Yusuf Leblebici, 'CMOS Digital Integrated Circuits', 3rd Edn., Tata Mc-Graw Hill, **2002.**
3. Samir Palnitkar, 'Verilog HDL', 2nd Edn., Pearson, **2004.**

MICRO ELECTRONICS

Subject Code: MECE5-102 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (11 Hrs.)

CRYSTAL GROWTH AND WAFER PREPARATION:

Clean room concept, safety requirements, crystal growth techniques: czochralski and gradient freeze techniques, physics involved in CZ growth, Energy flow balance, pull rate-considerations, problems and solutions, defects involved in CZ method, effects due to carbon and oxygen impurities, modelling of dopant incorporation, float zone growth for high purity silicon, liquid encapsulated growth for GaAs, material characterization- wafer shaping, crystal characterization, wafer cleaning.

CURRENT ELEMENT CHARACTERISTICS:

Growth mechanism and kinetic oxidation, thin oxides, oxidation techniques and systems, oxide properties, characterization of oxide films, growth and properties of dry and wet oxidation, charge distribution during oxidation, oxide characterization, anomalies with thin oxide regime.

UNIT-II (10 Hrs.)

DIFFUSION:
The nature of diffusion, diffusion mechanisms – interstitial, substitution, interstitial-substitution combined, interstitially and grain boundary, Fick's law of diffusion, limited and constant source diffusion, models of diffusion in solid, diffusion equation, atomic diffusion mechanisms, diffusion system for silicon and gallium arsenide. Measurement techniques, experimental analysis of diffused profiles.

ION IMPLANTATION:
Introduction, physics of implantation, range theory, projected range, ion stopping mechanisms- channelling, nuclear stopping, electronic stopping, implantation damage, implantation equipment, annealing, shallow junction, application to silicon and gallium arsenide, RTA mechanism.

UNIT-III (12 Hrs.)

LITHOGRAPHY:
Pattern generation and mask making, exposure sources, photolithography, photoresists, optical lithography, electron lithography, X-ray lithography, ion lithography, mask defects, atomic force microscopy based lithography system, dip pen lithography system.

DEPOSITION:
Need for film deposition, film deposition methods- physical and chemical, deposition processes, CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal films, sputter deposition, sputter unit, Epitaxy –types, techniques, advantages, vapour phase epitaxy, molecular beam epitaxy.

UNIT-IV (12 Hrs.)

ETCHING:
Directionality and selectivity issues, wet chemical etching, wet etchants, dry physical etching, dry etchants, plasma etching, advantages and disadvantages, issues involved, dry etching systems, dry chemical etching, reactive ion etching, etching induced damage, cleaning.

METALLIZATION:
Introduction, metallization applications, metallization choices, physical vapour deposition, patterning, metallization problems.

RECOMMENDED BOOKS:
1. S.M. Sze, 'VLSI Technology', TMH.
2. S.K. Gandhi, 'VLSI Fabrication Principles'.

REFERENCE BOOKS:
1. S.M. Sze, 'Semiconductor Devices Physics and Technology'.
2. K.R. Botkar, 'Integrated Circuits'.

ADVANCED SEMICONDUCTOR PHYSICS

Subject Code: MECE5-103 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Preparation and Characterization of Semiconductors: Types of semiconductors, charge carrier statistics, crystal growth, preparation and doping techniques of elemental and compound semiconductors, Metallization, Lithography and Etching, Bipolar and MOS device fabrication characterization (electrical, thermoelectric, magnetic and optical properties) of semiconductor materials.

UNIT-II (10 Hrs.)

Optical Properties of Semiconductors: Dipolar elements in direct gap semiconductors, optical susceptibility of a semiconductor, absorption and spontaneous emission, bimolecular recombination coefficient, condition for optical amplification in semiconductors.

UNIT-III (12 Hrs.)

Electronic and Electric Properties of Semiconductors: Boltzmann equation, scattering mechanisms, hot electrons, recombination, transport equation in a semiconductor, Electronic and ionic conductivity, solid oxide fuel cells, ceramic semiconductors, linear dielectrics, dielectric properties, Ferroelectric materials, piezoelectrics, ferro-piezoceramics, actuators and electrostrictions, pyroelectrics, electro-optics photorefractives, thin film capacitors. Ferroic crystals, primary and secondary ferroics, proper ferroics, magnetoferroelectricity.

UNIT-IV (11 Hrs.)

Application in Semiconductor Devices: Ge, Si, GaAs, Semiconductor device: metal-semiconductor and semiconductor heterojunctions, physics of bipolar devices, fundamentals of MOS and field effect devices, basics of solar cell, photodiodes, photodetectors.

RECOMMENDED BOOKS:

1. S.M. Sze and Kwok. K. Ng, 'Physics of Semiconductor Devices', 3rd Edn., Wiley, **2008.**
2. J. Wilson and J.F.B. Hawkes, 'Optoelectronics: An Introduction'. Prentice-Hall, **1989.**
3. R.A. Smith, 'Semiconductors', Academic Press, **1963.**
4. M. Shur, 'Physics of Semiconductor Devices', Prentice Hall, **1990.**
5. A. Paul, 'Chemistry of Glasses', Chapman and Hall, **1982.**
6. Bishnu P. Pal, 'Fundamentals of Fibre Optics in Telecommunication and Sensor Systems', New Age International Publishers, **2005**.
7. Kwan Chi Kao, 'Dielectric Phenomena in Solids', Elsevier Academic Press, **2004.**
8. Vinod K. Vadhawan, 'Introduction to Ferroic Materials', Gordon and Breach Science Publications, **2000.**

RESEARCH LAB.-I

Subject Code: MECE5-104 **L T P C**
0 0 4 2

Every Subject In-charge will define atleast one project to each student of his/her (preferably different) concerned subject to be performed in Research- Lab.

NANOSCALE DEVICES AND SYSEMS

Subject Code: MECE5-156 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (10 Hrs.)

CMOS scaling challenges in nanoscale regimes: Moor and Koomey's law, Leakage current mechanisms in nanoscale CMOS, leakage control and reduction techniques, process variations in devices and interconnects.

UNIT-II (13 Hrs.)

Device and technologies for sub 100nm CMOS: Silicidation and Cu-low k interconnects, strain silicon – biaxial stain and process induced strain; Metal-high k gate; Emerging CMOS technologies at 32nm scale and beyond – FINFETs, surround gate nanowire MOSFETs, heterostructure (III-V) and Si-Ge MOSFETs.

UNIT-III (11 Hrs.)

Device scaling and ballistic MOSFET: Two dimensional scaling theory of single and multigate MOSFETs, generalized scale length, quantum confinement and tunnelling in MOSFTEs, velocity saturation, carrier back scattering and injection velocity effects, scattering theory of MOSFETs.

UNIT-IV (11 Hrs.)

Emerging nanoscale devices: Si and hetero-structure nanowire MOSFETs, carbon nanotube MOSFETs, Tunnel FET, quantum wells, quantum wires and quantum dots; Single electron transistors, resonant tunnelling devices.

Recommended Books:

1. M. Lundstrom, 'Nanoscale Transport: Device Physics, Modeling, and Simulation', Springer, **2005.**
2. Sandip Kundu, Aswin Sreedhar, 'Nanoscale CMOS VLSI Circuits: Design for Manufacturability', McGraw Hill, **2010.**
3. C.K. Maiti, S. Chattopadhyay and L.K. Bera, 'Strained-Si and Hetrostructure Field Effect Devices', Taylor and Francis, **2007.**
4. G.W. Hanson, 'Fundamentals of Nanoelectronics', Pearson India, **2008.**

ELECTRONIC SYSTEM DESIGN

Subject Code: MECE5-157 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (10 Hrs.)

MSI and LSI Circuits and Their Applications: Review of Digital electronics concept, Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR and AND OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

UNIT-II (12 Hrs.)

Sequential Machines: The Concept of Memory, The Binary Cell, The Cell And The Bouncing Switch, Set/Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.

UNIT-III (11 Hrs.)

Multi Input System Controller Design: System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

UNIT-IV (12 Hrs.)

Asynchronous Finite State Machines: Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method, Electromagnetic Interference And Electromagnetic Compatibility Grounding And Shielding of Digital Circuits. Interfacing digital system with different media like fiber cable, co-axial cable etc.

Recommended Books:

1. Fletcher, 'An Engineering Approach to Digital Design', PHI, **1990.**
2. 'Designing with TTL Circuits', Texas Instruments.
3. Related IEEE/IEE Publications.

INFORMATION THEORY AND CODING

Subject Code: MECE5-158 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (11 Hrs.)

Elements of information theory Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shenonfano theorem, entropy

UNIT-II (11 Hrs.)

Sampling Process Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM

UNIT-III (11 Hrs.)

Waveform Coding Techniques PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization.

UNIT-IV (12 Hrs.)

Digital Modulation Techniques Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signaling. Error Control Coding Rationale for coding Linbear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes.

Books Recommended:

1. J. Dass, S.K. Malik & P.K. Chatterjee, ,'Principles of digitals communication', Wiley-Blackwel, **1991**.
2. Vera Pless,'Introduction to the Theory of Error Correcting Codes', 3rd Edn., **1998.**
3. Robert G. Gallanger, 'Information Theory and Reliable Communication', Mc Graw Hill, **1992.**

DIGITAL SIGNAL PROCESSING

Subject Code: MECE5-159 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

DISCRETE TIME SIGNALS AND SYSTEMS

Signals, Classification of signals, Signal processing, Basic elements of a digital signal processing system, Advantages of digital signal processing over analog signal processing, Sampling, Aliasing, Discrete-time systems, Analysis of discrete-time linear shift-invariant systems, Linearity, Causality and stability criterion, Discrete-time systems described by difference equations, Convolution.

UNIT-II (13 Hrs.)

DISCRETE TRANSFORMS

The Fourier transform of discrete-time signals (DTFT), Properties of the DTFT, The frequency response of an LTI discrete-time system, Frequency domain sampling and DFT: Properties of DFT, Linear filtering using DFT, Frequency analysis of signals using DFT, radix 2, Goertzel algorithm, Efficient computation of the DFT: Decimation-in-time and decimation-in frequency, Linear convolution using DFT, Fast Fourier transform algorithms,

Applications of FFT algorithm, Introduction to the Z-transform & the inverse Z-transform, Properties of the Z-transform, Relationship between the Fourier transform and the Z-transform, System function, Analysis of linear time-invariant systems in the Z-domain.

UNIT-III (9 Hrs.)

IMPLEMENTATION OF DISCRETE TIME SYSTEMS:

Direct form, Cascade form, Frequency sampling and lattice structures for FIR systems. Direct forms, Transposed form, Cascade form, Parallel form. Lattice and lattice ladder structures for IIR systems.

UNIT-IV (11 Hrs.)

DESIGN OF FIR IIR FILTERS:

General considerations of digital filter design, Characteristics of practical frequency selective filters. Filters design specifications, Design of FIR filters using windows, Gibbs phenomenon, Design of FIR filters by frequency sampling method, Design of optimum equiripple FIR filters. Comparison of design methods for FIR filters. Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse invariance method, Bilinear transformation method, Characteristics of Butterworth, Chebyshev and Elliptical analog filters, Frequency transformation, Least square methods.

Recommended Books:

1. John G. Proakis & Dimitris G. Manolakis, 'Digital Signal Processing: Principles, Algorithms and Applications', 2nd Edn., Pearson Education.
2. A.V. Openheim & R.W. Schafer, 'Discrete Time Signal Processing', 2nd Edn., PHI, **1998**.

Reference Books:

1. Alan V. Oppenheim & Ronald W. Schafer; 'Digital Signal Processing', 1st Edn., PHI Publication, **2007**.

SENSORS & TRANSDUCERS

Subject Code: MECE5-160 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (9 Hrs.)

Sensors/Transducers: Principles, Classification, Parameters, Characteristics (Static and Dynamic), Environmental Parameters (EP), Characterization.

Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge (Resistance and Semiconductor), Inductive Sensors: Sensitivity and Linearity of the Sensor, Types-Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors.

UNIT –II (13 Hrs.)

Thermal Sensors: Introduction, Gas Thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index Thermosensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermoemf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry and Heat Flux Sensors.

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magnetoresistive Sensors (Anisotropic and Semiconductor), Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers (Synchros and Synchro-resolvers), Eddy Current Sensors, Electromagnetic Flowmeter, Switching Magnetic Sensors and SQUID Sensors.

UNIT-III (11 Hrs.)

Radiation Sensors: Introduction, Basic Characteristics, Types of Photosensistors/Photo Detectors, X-ray and Nuclear Radiation Sensors and Fiber Optic Sensors.

Electroanalytical Sensors: Introduction, The Electrochemical Cell, The Cell Potential, Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization (Concentration, Reactive, Adsorption and Charge Transfer), Reference Electrodes, Sensor Electrodes and Electroceramics in Gas Media.

UNIT-IV (12 Hrs.)

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication (Standards for Smart Sensor Interface) and The Automation

Sensor's Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing and Sensors for Environmental Monitoring.

RECOMMENDED/REFERENCE BOOKS:

1. D. Patranabis, 'Sensors and Transducers', 2nd Edn., PHI, **2003.**
2. W. Bolton, 'Mechatronics', 4th Edn., Pearson, **2011.**

OPTOELECTRONICS

Subject Code: MECE5-161 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I (11 Hrs.)

Nature of light, light sources, black body, colour temperature, units of light, radio metric and photometric units, basic semiconductors, PN junction, carrier recombination and diffusion, injection efficiency, heterojunction, internal quantum efficiency, external quantum efficiency, double hetero junction, fabrication of heterojunction, quantum wells and super lattices.

UNIT-II (11 Hrs.)

Optoelectronic devices, Optical modulators, modulation methods and modulators, transmitters, optical transmitter circuits, LED and laser drive circuits, LED-Power and efficiency, double hereostructure LED, LED structures, LED characteristics, laser modes, strip geometry, gain guided lasers, index guided lasers.

UNIT-III (11 Hrs.)

Modulation of light, birefringence, electro-optic effect, Electro-Optic materials and applications, Kerr modulators, scanning and switching, self-electro-optic devices, Magneto-Optical devices, Acousto-Optic devices, Acousto-Optic modulators.

UNIT-IV (12 Hrs.)

Display devices, Photoluminescence, cathodoluminescence, EL display, LED display, drive circuitry, plasma panel display, liquid crystals, properties, LCD displays, numeric displays.

Photo detectors, thermal detectors, photoconductors, detectors, photon devices, PMT, photodiodes, photo transistors, noise characteristics of photo-detectors, PIN diode, APD characteristics, Design of detector arrays, CCD, Solar cells.

RECOMMENDED BOOKS:

1. John Wilson and J.F.B. Hawkes, 'Optoelectronics: An Introduction', Prentice-Hall India, **1996.**
2. J.M. Senior, 'Optical Fibre Communication', Prentice Hall India, **1985.**
3. J. Gowar, 'Optical Fibre Communication Systems', Prentice Hall, **1995.**
4. J. Palais, 'Introduction to Optical Electronics', Prentice Hall, **1988.**
5. Jasprit Singh, 'Semiconductor Optoelectronics', McGraw-Hill, **1995.**

6. P. Bhattacharya, 'Semiconductor Optoelectronic Devices', PHI, **1995.**
7. R.P. Khare, 'Fibre Optics and Optoelectronics', Oxford University Press, **2004.**

MATERIAL SCIENCE & ENGINEERING

Subject Code: MECE5-162 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Atomic Structure, Bonding Classifications, Seven Systems and Fourteen Lattices, Metal, Ceramic, Polymeric and Semiconductor Structures, X-ray Diffraction, and Defects (Point, Linear and Planar), Diffusion, Mechanical Behavior: Stress versus Strain, Elastic and Plastic Deformation, Hardness, Creep and Stress Relaxation, Viscoelastic Deformation. Thermal Behavior: Heat capacity, Thermal expansion, conductivity and shock, Failure Analysis & Prevention.

UNIT-II (13 Hrs.)

Phase Diagrams-Equilibrium Microstructural Development: Phase Rule and Diagram, Lever Rule, Heat Treatment, Metals, Ceramics and Glasses, Polymerization, Structural Features of Polymers, Thermoplastic and Thermosetting Polymers, Composites (Fiber Reinforced and Aggregate), Mechanical Properties and Processing of Composites, Electrical Behavior, Optical Behavior, Corrosion & Oxidation Semiconductor Materials, Magnetic Materials, Environmental Degradation.

UNIT-III (14 Hrs.)

Superconductivity, Band Structure, Carrier Concentration, Electrical, Mechanical and Optical properties of Gallium Nitride (GaN), Aluminum Nitride (AlN), Indium Nitride (InN), Boron Nitride (BN), Silicon Carbide (SiC), Silicon-Germanium(Si1-xGex).

UNIT-IV (6 Hrs.)

Materials of Special Applications viz. Cryogenic, High Temperature, High Frequency Application.

RECOMMENDED/REFERENCE BOOKS:

1. Michael E. Levinshtein, Sergey L. Rumyantsev and Michael S. Shur, 'Properties of Advanced Semiconductor Materials: GaN, AlN, InN, BN, SiC and SiGe', John Wiley & Sons, **2001**.
2. James F. Shackelford, 'Introduction to Materials Science for Engineers', 6th Edn., Prentice Hall, **2001**.
3. 'Fundaments of Semiconductors: Physics and Materials Properties by Yu and M Cardona', Springer, **1996.**
4. K.M. Gupta, 'Materials Science & Engineering', 5th Edn., Umesh Publications, **2012**.

SOFT COMPUTING

Subject Code: MECE5-163 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT – I (12 Hrs.)

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Fuzzy Logic: Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation,

Fuzzy rule base system: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS) – Mamdani Fuzzy Models –

Sugeno Fuzzy Models – Tsukamoto Fuzzy Models, Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic.

UNIT – II (13 Hrs.)

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. Learning rules and equations: Perceptron, Hebb's, Delta, winner take all and out-star learning rules. Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Associative memory networks, Unsupervised Learning Networks: Competitive networks, Adaptive Resonance Theory, Kohnen Self Organizing Map

UNIT – III (12 Hrs.)

Genetic Algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modelling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA.

UNIT – IV (8 Hrs.)

Hybrid Soft Computing Techniques: An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems

Recommended Books

1. S. Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications', PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, 'Principles of Soft Computing', Wiley Publications.

Reference Books

1. Michael Negnevitsky, 'Artificial Intelligence', Pearson Education, New Delhi, **2008**.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley, **2010**.

MICRO & NANO ELECTRO MECHANICAL SYSTEM (MEMS & NEMS)

Subject Code: MECE5-205 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

The course aims to give the students a basic knowledge about state-of-the-art MEMS including technology, device architecture, design and modelling, scalability, figures of merit and RF IC novel functionality and performance.

Course Outcomes:

Students will attain analytical and design oriented feature knowledge about NEMS and MEMS. Reliability and packaging are also considered as key issues for industrial applications.

Unit-1 (12 Hrs.):

Micro Electro Mechanical System (MEMS) Origins. MEMS Impetus / Motivation. Material for MEMS. The toolbox: Processes for Micro machining.

Unit-II (12 Hrs.)

MEMS Fabrication Technologies. Fundamental MEMS Device Physics: Actuation.

Unit-III (12 Hrs.)

Fundamental MEMS Devices: The Cantilever Beam. Microwave MEMS Applications: MEM Switch

Unit-IV (12 Hrs.)

Design Considerations. The Micromachined Transmission Line. MEMS-Based Microwave Circuit and System.

Recommended Books

1. Hector J. De Los Santos, 'Micro-Electromechanical (MEM) Microwave Systems', Artechhouse.
2. Nadim Maluf, 'An Introduction to Micro-Electromechanical System', Artechhouse.

CPLD AND FPGA ARCHITECTURE AND APPLICATIONS

Subject Code: MECE5-206 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Learning Objectives:

1. To learn fundamentals of Programmable Logic Devices.
2. To enrich the ideas of field programmable gate arrays.
3. To explore the ideas of SRAM programmable FPGAs
4. To facilitate the knowledge of anti-fuse programmed FPGAs.

Learning Outcomes:

1. Understanding of Programmable logic devices and its architecture.
2. Knowledge of FPGAs and its applications.
3. Fundamental understanding of SRAM and anti-fuse programmed FPGAs

UNIT-I (12 Hrs.)

Introduction to Programmable Logic Devices:
Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II (12 Hrs.)

Field Programmable Gate Arrays:
Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT –III (12 Hrs.)

SRAM Programmable FPGAs:
Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT –IV (12 Hrs.)

Anti-Fuse Programmed FPGAs:
Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

RECOMMENDED BOOKS

1. Stephen M. Trimberger, 'Field Programmable Gate Array Technology', International Edition Springer.
2. Charles H. Roth Jr, Lizy Kurian John, 'Digital Systems Design', Cengage Learning.

REFERENCE BOOKS:

1. John V. Oldfield, Richard C. Dorf, 'Field Programmable Gate Arrays', Wiley India.
2. Pak K. Chan/Samiha Mourad, 'Digital Design Using Field Programmable Gate Arrays', Pearson Low, Price Edition.
3. Ian Grout, 'Digital Systems Design with FPGAs and CPLDs', Elsevier, Newnes.

4. Wayne Wolf, 'FPGA based System Design', Prentice Hall Modern Semiconductor Design Series.

RESEARCH LAB. - II

Subject Code: MECE5-207 **L T P C**
0 0 4 2

Students will be made familiar with maximum available softwares like optisystem, optsim, Matlab, Virtual instrumentation, Network simulator, HFSS etc.so that student can opt any one as per his/her interest for thesis work. Students will be advised to go through maximum research papers and conclude a particular domain to work further.

SATELLITE COMMUNICATION

Subject Code: MECE5-264 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Learning Objectives

This course provides an introduction to the fundamentals of orbital mechanics and launchers, link budgets, modulation, coding, multiple access techniques, propagation effects, and earth terminals. This course provides an understanding how analog and digital technologies are used for satellite communications networks.

Learning Outcomes:

The students will gain teaching skills in this area. They will gain skills for performance improvement for different available satellites by calculating power Budgets

UNIT I (12 Hrs.)

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on linkdesign, complete link design, interference effects on complete link design, earth station
parameters.

UNIT II (12 Hrs.)

Satellite analog & digital communication Baseband analog (voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques TDMA frame structure, burst structure, frame efficiency, superframe, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

UNIT III (12 Hrs.)

Laser & Satellite Communication Link analysis, optical satellite link Tx& Rx, Satellite, beam acquisition, tracking & pointing, cable chaanel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fibre CATV system.

UNIT IV (12 Hrs.)

Satellite Applications Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Books

1. Timothy Pratt, 'Satellite Communication', Addison Wesley, **2010**.
2. D.C Aggarwal 'Satellite Communication', Willey Sons, **2010**.

TESTING & FAULT TOLERANCE

Subject Code: MECE5-265 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objective: The objective of this course is to familiarize with concept of reliability. The course provides introduction to fault tolerant so that students will able to understand the testable combinational circuits.

Course Outcomes:

#1. Able to differentiate between fault, error and failure.
#2. Able to calculate reliability of a system and can use tools for reliability modelling.
#3. Comparative analysis of different tolerant design tests.
#4. Analysis of fault tolerant design for VLSI chips.

UNIT I (12 hrs)

Basic concepts of Reliability: Failures and faults, Reliability and failure rate, Relation between reliability & mean time between failure, Maintainability & Availability, reliability of series and parallel systems, Modelling of faults, Test generation for combinational logic circuits: conventional methods (path sesitisation,Boolean difference), Random testing, transition count testing and signature analysis.

UNIT II (14 hrs)

Fault Tolerant DesignI: Basic concepts,static,(NMR,use of error correcting codes), dynamic, hybrid and self-purging redundancy, Siftout Modular Redundancy (SMR), triple modular redundancy, SMR reconfiguration.

Fault Tolerant DesignII: Time redundancy, software redundancy, failsoft operation, examples of practical fault tolerant systems, introduction to fault tolerant design of VLSI chips.

UNIT III (12 hrs)

Self-checking circuits: Design of totally self-checking checkers, checkers using m-out of acode, Berger codes and low cost residue code, selfchecking sequential machines, partially selfchecking circuits. Fail safe Design: Strongly fault secure circuits, failsafe design ofsequential circuits using partition theory and Berger codes, totally self checkingPLA design.

UNITIV (10 hrs)

Design for testable combination logic circuits: Basic concepts of testability, controllability and observability, The Read Muller expansion technique, level OR-AND-OR design, use of control and syndrometesting design, Built-in-test, built-in-test of VLSI chips, design for autonomous self-test, design in testability into logic boards.

Recommended Books:

1. Parag K. Lala, Fault Tolerant & Fault Testable Hardware Design, PHI,**1985**
2. Parag K. Lala, Digital systems Design using PLD's, PHI**1990**.
3. N.N. Biswas, Logic Design Theory, PHI**1990**.
4. Konad Chakraborthy & Pinaki Mazumdar, Fault tolerance and Reliability Techniques for high – density random – access memories Reason, **2002.**

MOS INTEGRATED CIRCUIT MODELLING

Subject Code: MECE5-266 **L T P C** **Duration: 48 Hrs.**

4 0 0 4

Learning Objectives

1. To provide students with a comprehensive understanding on design of MOSFET devices.
2. To enable students to understand modelling and design of bipolar devices.
3. To understand the concept of CMOS and its characteristics.

Learning Outcomes

After successful completion of this course the students will be able to:

1. Demonstrate understanding of basic characteristics such as scaling, threshold voltage, drain current etc. of MOSFET.
2. Compute and evaluate CMOS performance factor.
3. Understand design of bipolar devices.

Unit-I (12 Hrs.)

Basic Device Physics: Energy bands in solids, p-n Junctions, MOS Capacitors, Metal-Silicon Effects, MOSFET Devices Design: Long Channel MOSFET, Short-Channel MOSFETS, MOSFET Scaling, Threshold Voltage. MOSFET DC Model: Drain Current Calculations, Pao-Sah Model, Charge Sheet Model, Piece-Wise Drain Current Model for Enhancement Devices

Unit-II (12 Hrs.)

CMOS Performance Factors: Basic CMOS Circuit Elements, Parasitic Elements, Sensitivity of CMOS delay to device parameters, Performance Factors of Advanced CMOS Devices.

Unit-III (12 Hrs.)

Bipolar Devices Design: npn & pnp Transistors, Ideal Current-Voltage Characteristics, Bipolar Device Models for Circuit and Time-Dependent Analyses, Modern Bipolar Transistor Structures, Figures of Merit of a Bipolar Transistors, Digital Bipolar Circuits.

Unit-IV (12 Hrs.)

MOSFET DC Model: Drain Current Calculations, Pao-Sah Model, Charge Sheet Model, Piece-Wise Drain Current Model for Enhancement Devices.

Recommended Books

1. M.S. Tyagi, 'Introduction to Semiconductor Materials and Devices', Wiley.
2. Ben G. Streetman, 'Solid State Electronic Devices', Pearson Prentice-Hall.
3. Yuan Taur and T.H. Ning, 'Fundamentals of Modern VLSI Devices', Cambridge.

PARALLEL PROCESSING

Subject Code: MECE5-267 **L T P C** **Duration: 48 Hrs.**

4 0 0 4

Learning Objectives

This course will help students to achieve the following objectives:

1. Describe the principles of computer design and classify instruction set architectures.
2. Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, caches, and vector processors.
3. Describe the operation of virtual memory, modern architectures such as RISC, Super Scalar, VLIW (very large instruction word), and multi-core and multi-CPU systems.

Learning Outcomes

Students will have skills in RISC as well as CISC architures and can design or analyses different problems associated with this domain

Parallel computer models: The state of computing, Classification of parallel computers,

Multiprocessors and multicomputer, Multivector and SIMD computers. Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Unit II (12 Hrs.)

System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

Unit III (12 Hrs)

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines.

Unit III (12 Hrs)

Multiprocessor Architectures: Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

Recommended Books

1. Kai Hwang, 'Advanced Computer Architecture', 18th Reprint, TMH, **2003**.
2. D.A. Patterson and J.L. Hennessey, 'Computer Organization and Design', 4th Edn., Morgan Kaufmann.
3. J.P. Hayes, 'Computer Architecture and Organization', 2nd Edn., MGH, **1988**.
4. Harvey G. Cragon, 'Memory System and Pipelined Processors', Narosa Publication, **1996**.
5. V. Rajaranam & C.S.R. Murthy, 'Parallel Computer', PHI.
6. R.K. Ghose, Rajan Moona & Phalguni Gupta, 'Foundation of Parallel Processing', Narosa Publications.

CAD TOOLS FOR VLSI DESIGN

Subject Code: MECE5-268 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

UNIT 1 (12 Hrs.)

An overview of OS commands. System settings and configuration. Introduction to Unix commands. Writing Shell scripts. VLSI design automation tools., Leonardo spectrum, ISE 8.1i, Quartus II, VLSI backend tools.

UNIT 2 (12 Hrs.)

Introduction to VLSI design methodologies and supporting CAD tool environment. Overview of C and Data structures, Graphics and CIF, concepts and structure and algorithm for some of the CAD tools, schematic editor, layout editor, Module generator, silicon compilers, placement and routing tools, Behavioural, functional, logic and circuit simulators, Aids for test vector generator and testing.

UNIT 3 (12 Hrs.)

Synthesis and simulation using HDLs-Logic synthesis using verilog and VHDL. Memory and FSM synthesis. Performance driven synthesis, Simulation- Types of simulation. Static timing analysis. Formal verification. Switch level and transistor level simulation.

UNIT 4 (12 Hrs.)

Circuit simulation using Spice - circuit description. AC, DC and transient analysis. Advanced spice commands and analysis. Models for diodes, transistors and opamp. Digital building blocks. A/D, D/A and sample and hold circuits. Design and analysis of mixed signal circuits.

Recommended Books

1. M.J.S. Smith, 'Application Specific Integrated Circuits,Pearson', **2002.**
2. M.H. Rashid, 'Spice for Circuits and Electronics using Pspice', 2nd Edn., PHI.
3. T. Grdtkeretal, 'System Design with System C', Kluwer, **2004**.
4. P.J. Ashendenetal, 'The System Designer's Guide to VHDL-AMS', Elsevier, **2005.**

NANO ELECTRONICS

Subject Code: MECE5-269 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives:

The main aim of this course is to introduce the students about Nano sciences. Actual chemistry involved in semiconductor physics will be discussed. How this will be helpful for Designing of different circuits.

Learning Outcomes:

Students learn skills for handling basic concepts of Nano sciences for different applications for various fields.

UNIT I (12 Hrs.)

Basics and Scale of Nanotechnology: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress, Misconceptions of Nanotechnology.

UNIT II (12 Hrs)

The carbon age and nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical vapor deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics:

Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs)

Nano-scale Devices:

Introduction: Quantum Electron Devices; High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing; Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books

1. C.P. Polle and F.J. Owens, "Introduction to Nanotechnology" Willey India Pvt. Ltd, Edition 2011.
2. Daniel Minoli 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd., **2011**.

MULTIMEDIA COMMUNICATION SYSTEM

Subject Code: MECE5-270 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Learning Objectives:
The objective of this course is to get aware the students about various multimedia systems, components associated and possibilities available for this particular domain.
Learning Outcomes:
Student will acquire teaching as well as analytical knowledge to design different Multimedia oriented systems.

Unit –I (12 Hrs.)

Introduction:
Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation.

Unit –II (12 Hrs.)

Components of multimedia: Text, Graphics, Audio, Video. Design & Authoring Tools, Categories of Authority Tools, Types of products.

Unit –III (12 Hrs.)

Animation: Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation.

Unit –IV (12 Hrs.)

Introduction to MAYA (Animating Tool): Fundamentals, Modelling: NURBS, Polygon, Organic, animation, paths & boxes, deformers. Working with MEL: Basics & Programming Rendering & Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.
Recommended Books:
1. David Hillman, 'Multimedia Technology & Applications', Galgotia Publications.
2. Rajneesh Agrawal, 'Multimedia Systems', Excel Books.
3. Nigel Chapman & Jenny Chapman, 'Digital Multimedia', Wiley Publications.
4. D.P. Mukherjee, 'Fundamentals of Computer Graphics and Multimedia', PHI.

LOW POWER VLSI DESIGN

Subject Code: MECE5-271 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Unit 1 (12 Hrs.)

Introduction
Hierarchy of limits of power, Sources of power consumption, power estimation

Unit 2 (12 Hrs.)

Analysis and Synthesis Approach
Synthesis for low power, Voltage scaling approaches, Design and test of low power circuits

Unit 3 (12 Hrs.)

Switching Techniques

Adiabatic switching, Minimizing switched. Capacitance, low power static RAM architecture, Low energy computing using energy recovery techniques,

Unit 4 (12 Hrs.)

Power Computation

Low power programmable computation, Software design for low power.

Recommended Books:

1. Kaushik Roy and Sharat Parsad, 'Low Power CMOS VLSI Circuit Design', John Wiley & Sons, **1998**.
2. A.P. Chandrakasan and R.W. Broadersen, 'Low power Digital CMOS Design', Kluwer Academic Publishers, **1995**.
3. J.M. Rabaey and M. Pedram, 'Low Power Design Methologies', Kluwer Academic Publishers, **2001**.
4. Dimitrios Soudris, Christian Piguet and Costas Goutis, 'Designing CMOS Circuits for Low Power', Kluwer Academic Publishers, **2000**.

RESEARCH METHODOLOGY

Subject Code – MREM0-101 **L T P C** **Duration – 45 Hrs.**
4 0 0 4

UNIT–I (11 Hrs)

Introduction to Research: Meaning, Definition, Objective and Process
Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental
Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature
Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.
Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT–II (10 Hrs)

Sources of Data: Primary and Secondary, Validation of Data
Data Collection Methods: Questionnaire Designing, Construction
Sampling Design & Techniques – Probability Sampling and Non Probability Sampling
Scaling Techniques: Meaning & Types
Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability
Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT–III (13 Hrs)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation
Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number
Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi Dimensional Scaling
Report Writing: Essentials of Report Writing, Report Format

Statistical Software: Application of Statistical Softwares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis

**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITs*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education New Delhi, Donald Cooper, 'Business Research Methods', Tata McGraw Hill New Delhi
3. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
4. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education New Delhi.
5. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

PROJECT

Subject Code: MECE5-308 **L T P C**

Learning Objectives

1. To propose engineering based project in a clear and concise manner.
2. Allow students to develop problem solving, analysis, synthesis and evaluation skills.

Learning Outcomes

1. Synthesis of knowledge.
2. To demonstrate the aptitude of applying the own knowledge to solve a specific problem.
3. To mature the knowledge.
4. Able to organize, compile and record all work details in an efficient manner.

Each student will be required to complete a Project and submit a Project Report on a topic on any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields.

SEMINAR

Subject Code: MECE5-310 **L T P C**
0 0 4 4

Learning Objectives

1. To identify, understand and discuss current advanced research topic.
2. To gain experience in the critical assessment of the available scientific literature
3. To practice the use of various resources to locate and extract information using offline & online tools, journals

Learning Outcomes:

1. An ability to utilize technical resources
2. An ability to write technical documents and give oral presentations related to the work completed.
3. To learn preparation and presentation of scientific papers in an exhaustive manner

Each student will be required to prepare a Seminar Report and present a Seminar on a topic in any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields.

DIGITAL SIGNAL PROCESSORS & ARCHITECTURES

Subject Code: MECE5-372 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Learning Objectives: The objective of this course is to familiarize the students with signal processing system. The students will study digital signal processors and will introduce about programming in digital signal processors.

Learning Outcomes

1. Design of digital filters.
2. Develop a programme for interfacing of external peripheral to digital processors.
3. Design and develop programme on different general purpose digital signal processors.
4. Develop a programme to interface external devices with signal processors.

UNIT-I (11 Hrs)

Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

UNIT-II (11 Hrs)

General purpose digital signal processors – fixed point DSP's, Architecture of first generation fixed point DSP processors, Architecture of second generation fixed point DSP's, Architecture of third generation fixed point DSP's, Architecture of fourth generation fixed point processors, floating point digital signal processors.

UNIT-III (10 Hrs)

Programmable Digital Signal Processors: Digital signal-processing Devices, TMS320C54XX DSP: Its Addressing modes, Memory space, Program Control, instructions and Programming, On-Chip Peripherals, Interrupts and Pipeline operation of processors.

UNIT-IV (13 Hrs)

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Recommended Books

1. Avtar Singh and S. Srinivasan, 'Digital Signal Processing', Thomson Publications, **2004.**
2. Ananthi, S.K. Padmanabhan, R. Vijayarajeswaran, 'A Practical Approach to Digital Signal Processing', New Age International, **2006/2009.**
3. B. Venkataramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and Applications', TMH, **2002**
4. John G. Proakis, Dimitris Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Pearson Education, **2006**.
5. R. Chassaing, D.W. Horning, 'Digital Signal Processing with the TMS320C2S', Wiley Publications, **1990.**

ERROR CONTROL AND CODING

Subject Code: MECE5-373 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Learning Objectives: The objective of this course is to familiarize the students with concept of Block Codes and Maximum Likelihood Decoding. They will be able to understand Generator Matrix, Parity-Check Matrix and Error-Correcting Capability of a Linear Code

Learning Outcomes

1. Describe the model and calculate the capacity of typical digital communication channels.
2. Analyze the encoding and decoding procedures of various error control codes.
3. Compare the error correction capability of different error control codes and their performances.
4. Apply error control coding to achieve error detection and correction in digital transmission systems
5. Design an error detecting and correcting system for semiconductor memory system to meet given system specification.

UNIT-I (11 Hrs.)

Review of Random Process: Review of Probability Theory, Basic concepts of random processes, random variables, basicconcepts from systems theory and stochastic processes, Stationary and non stationary process, correlation function, Ergodicity and power spectral density, transformation random process by linear system, Special random process: white Gaussian noise, Wiener levy, Shot noise, Markov Process

UNIT-II (11 Hrs.)

Hypothesis Testing: Simple binary hypothesis test, Decesion Criteria, Neyman Pearson tests, Bayes Criteria Multiple hypothesis testing, Composite hypothesis testing

UNIT-III (11 Hrs.)

Detection Theory: Sequential detection Walds test Detection of known signals in white noise, Detection of known signal in colored noise, Maximum SNR Criteria, Detection of signals with unknown parameters

UNIT-IV (12 Hrs.)

Coding: Error Control coding for wireless fading channels, Channel Estimation and Adaptive channel coding, Joint Source and Channel coding. Non binary Linear Block Codes, Hard and soft decision decoding, Coding and Decoding of BCH, Reed Solomon Codes, Convolution codes: Coding and Decoding , Distance bounds, Performance bounds Turbo codes: Coding, Decoding Algorithms, Performance comparison, Interleaver design Trellis coded Modulation, TCM Decoders, TCM for AWGN and Fading Wireless Channels, Performance comparison.

Recommended Books

1. C.W. Helstrom, 'Elements of Signal Detection and Estimation', Prentice Hall, NJ, **1995.**
2. H.L. Van Trees, 'Detection, Estimation, and Modulation Theory', Wiley, **1971.**
3. H.V. Poor, 'An Introduction to Signal Detection and Estimation'. 2nd Edn., Springer-Verlag, New York.
4. Stephen G. Wilson, 'Digital Modulation & Coding', Prentice Hall Inc.
5. Ranjan Bose, 'Information Theory Coding and Cryptography, TMH.
6. J.G. Proakis, 'Digital Communication', Pearson Education.

MEASUREMENT & CHARACTERISATION TECHNIQUES

Subject Code: MECE5-374 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Learning Objectives The objective of this course is to study about different measurement techniques and introduction to X-ray diffraction techniques.

Learning Outcomes

1. Analysis of UV and visible spectrum.
2. Determination of crystal structure.
3. Electron diffraction analysis using electron microscopy.
4. Differentiate between scanning tunneling microscope & atomic force microscope and their applications.

UNIT-I (11 Hrs.)

Spectroscopy: Basics of UV and visible Spectroscopy: Electronic transitions, Beer-Lambert Law, visible spectrum and colour; Infrared Spectroscopy: Instrumentation and sample handling, overtones, applications of FT-IR and IR Spectroscopy

UNIT-II (12 Hrs.)

X-ray Diffraction Techniques: Production of X-rays, its properties and hazards, X-ray Diffraction and Bragg's law, Laue techniques, Debye-Scherrer techniques. Determination of crystal structure of powder sample, line broadening, particle size, residual stress measurement, Phase identification, phase quantification, introduction to pole figure and texture analysis; chemical/elemental analysis by X-ray Fluorescence.

UNIT-III (12 Hrs.)

Electron Microscopy: Electron diffraction, Principles and operation of scanning electron microscope. Geometry of electron microscopes, Electron Sources, Production of Vacuum, Pressure measurement, Specimen Handling and preparation, Secondary electron image, Backscattered electron image,

UNIT-IV (10 Hrs.)

Scanning Probe Microscopy: Principles and operation of scanning probe microscopes: Scanning Tunnelling Microscope, Atomic Force Microscope

Recommended Books

1. Antony R. West, Solid State Chemistry & Its Applications, Wiley Student Edition.
2. V.A., 'Modern Metallographic Techniques and their Applications', Wiley Interscience, **1971.**
3. B.D. Cullity, 'Elements of X-ray Diffraction, 4th Edn., Addison Wiley, **1978.**
4. M.H. Loretto, 'Electron Beam Analysis of Materials', Chapman and Hall, **1984.**
5. Dawn Bonnell, 'Scanning Probe Microscopy and Spectroscopy: Theory, Techniques, and Applications', Wiley-VCH.

CMOS VLSI DESIGN

Subject Code: MECE5-375 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Learning Objectives in this course the students will be able to understand the MOS designing process. They will be familiarizing with MOS Combinational & Sequential Circuits and understand about semiconductor memories.

Learning Outcomes

1. Designing of CMOS Inverter logic and analysis of parameters like rise time, fall time etc.
2. Realization of Combinational circuits using MOS gates and its analysis
3. Analysis of sequential circuits using MOS gates.
4. Design & analysis of semiconductor memories.

UNIT-I (10 Hrs.)

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, output high voltage, Output Low voltage, gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II (11 Hrs.)

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, CMOS full adder

UNIT-III (12 Hrs.)

Sequential MOS Logic Circuits: Behavior of bistable elements, SR Latch, clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV (12 Hrs.)

Semiconductor Memories: Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, Flash Memory- NOR flash and NAND flash.

Recommended Books

1. Ken Martin, 'Digital Integrated Circuit Design', Oxford University Press, **2011**.
2. Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design, TMH, 3rd Edn., **2011.**
3. Ming-BO Lin, Introduction to VLSI Systems: A Logic, Circuit and System Perspective, CRC Press, **2011.**
4. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, Digital Integrated Circuits – A Design Perspective, 2nd Edn., PHI.

DISSERTATION

Subject Code: MECE5-411

Learning Objectives: To learn, practice, and critique effective scientific writing and to formulate the research objectives clearly, state claims and evidence clearly, assess validity of claims, evidence, outcomes, and results.

Learning Outcomes:

1. Design and execute a meaningful research project that demonstrates spatial thinking and uses the knowledge and skills.
2. Define and analyze a problem in latest research areas.
3. Formulate and write a research proposal.
4. Able to learn effectively record data and experiments so that others can understand them.
5. Communicate the findings by means of a thesis, written in the format specified by the department/institute.

Each student will be required to complete a Dissertation and submit a written Report on the topic on any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields in the Final semester of M.Tech. Course.

Papers accepted in UGC approved journals will be given 10 marks as special incentive. It will be mandatory to publish one paper in conference/journal.

M. TECH. ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

Total Contact Hours = 24 **Total Marks = 600** **Total Credits = 22**

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MECE1-101	Advanced Communication Systems	4	0	0	40	60	100	4
MECE1-102	Microcontrollers and Embedded Systems	4	0	0	40	60	100	4
MECE1-103	Electronics System Design	4	0	0	40	60	100	4
MECE1-104	Research Lab 1	0	0	4	60	40	100	2
Departmental Elective – I (Select any one)		4	0	0	40	60	100	4
MECE1-156	Advance Semiconductor Physics							
MECE1-157	Biomedical Electronics							
MECE1-158	Information Theory and Coding							
MECE1-159	Hardware Description Languages and VLSI Design							
Departmental Elective – II (Select any one)		4	0	0	40	60	100	4
MECE1-160	Micro and Nano Sciences							
MECE1-161	Sensors and Transducers							
MECE1-162	Speech and Audio Processing							
MECE1-163	Soft Computing							
Total	**Theory = 5 Lab = 1**	**20**	**0**	**4**	**260**	**340**	**600**	**22**

Total Contact Hours = 24 **Total Marks = 600** **Total Credits = 22**

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MECE1-205	Optical Communication System	4	0	0	40	60	100	4
MECE1-206	Advanced Digital Signal Processing	4	0	0	40	60	100	4
MECE1-207	Research Lab 2	0	0	4	60	40	100	2
Departmental Elective – III (Select any one)		4	0	0	50	100	150	4
MECE1-264	Digital Image Processing							
MECE1-265	Satellite Communication							
MECE1-266	Information Security							
MECE1-267	Parallel Processing							
Departmental Elective – IV (Select any one)		4	0	0	50	100	150	4
MECE1-268	Nano electronics							
MECE1-269	Multimedia Communication System							
MECE1-270	Advanced Network Synthesis and Analysis							
MECE1-271	Micro & Nano Electromechanical Systems MEMS and NEMS							
Open Elective – I (Select any One)		4	0	0	50	100	150	4
Total	Theory = 5 Lab = 1	**20**	**0**	**4**	**260**	**340**	**600**	**22**

Total Contact Hours = 26 **Total Marks = 500** **Total Credits = 22**

SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MREM1-101	Research Methodology	4	0	0	40	60	100	4
MECE1- 308	Project	0	0	10	100	0	100	8
MECE1- 309	Seminar	0	0	4	100	0	100	2
Departmental Elective – V (Select any one)		4	0	0	40	60	100	4
MECE1- 372	Antenna System Design							
MECE1- 373	Error Control and Coding							
MECE1- 374	Wireless and Adhoc Networks							
MECE1- 375	Speech And Audio Processing							
Open Elective – II (Select any One)		4	0	0	40	60	100	4
Total		**12**	**0**	**14**	**320**	**180**	**500**	**22**

Total Credits = 24

SEMESTER 4th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Satisfactory/ Unsatisfactory**	
MECE1 – 410	Thesis	0	0	20		24

Overall

Semester	Marks	Credits
1st	600	22
2nd	600	22
3rd	500	22
4th	--	24
Total	**1700**	**90**

ADVANCED COMMUNICATION SYSTEMS

Subject Code: MECE1-101 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Introduction: Digital Communication System (Description of different modules of the block diagram), Complex baseband representation of signals, Gram-Schmidt Orthogonalization procedure. M-ary orthogonal signals, bi-orthogonal signals, Simplex signal waveforms.

UNIT-II (10 Hrs.)

Band-limited channels: Pulse shape design for channels with ISI: Nyquist pulse, Partial response signaling (Duobinary and modified Duobinary pulses), demodulation, Maximum likelihood estimation technique.

UNIT-III (12 Hrs.)

Communication over fading channels: Characteristics of fading channels, Rayleigh and Rician channels, Receiver performance-average SNR, outage probability, Amount of Fading and Average Bit/Symbol Error Rate. Statistical channel modeling of Rayleigh and Rician fading channels.

UNIT-IV (11 Hrs.)

4G Technology /OFDM: Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, BER performance over AWGN and Rayleigh fading, OFDM Issues like PAPR, Frequency and Timing Offset.

Recommended Books:

1. G. Proakis and M. Salehi, 'Fundamentals of Communication Systems', Pearson Education, **2005**.
2. S. Haykins, 'Communication Systems', 5th Edn., John Wiley, **2008**.
3. M.K. Simon, S.M. Hinedi and W.C. Lindsey, 'Digital Communication Techniques: Signaling and detection', PHI, **1995**.
4. W. Tomasi, 'Advanced Electronic Communication Systems'. 4th Edn., Pearson Education, **1998**.
5. M.K. Simon and M.S. Alouini, 'Digital Communication over Fading Channels', **2000**.

MICROCONTROLLERS AND EMBEDDED SYSTEMS

Subject Code: MECE1-102 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components. Characteristics and Quality Attributes of Embedded Systems: Hardware Software Co-Design and Program Modelling: Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modelling Language, Hardware Software Trade-offs.

UNIT-II (10 Hrs.)

Embedded Hardware Design and Development: EDA Tools, how to Use EDA Tool, Schematic Design – Place wire, Bus, port, junction, creating part numbers, Design Rules check, Bill of materials, Netlist creation, PCB Layout Design – Building blocks, Component placement, PCB track routing.

UNIT-III (11 Hrs.)

ARM Architecture: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families. ARM Programming Model – I: Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions. ARM Programming Model – II: Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT-IV (12 Hrs.)

ARM Programming: Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops. UNIT –V: Memory Management: Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

RECOMMENDED BOOKS:

1. Andrew N. Sloss, Dominic Symes, Chris Wright, 'ARM Systems Developer's Guides-Designing & Optimizing System Software', 1st Edn., Elsevier, **2008**.
2. K.V. Shibu, 'Introduction to Embedded Systems', 1st Edn., Tata McGraw Hill Education Private Limited, **2009**.

REFERENCE BOOKS:

1. Jonathan W. Valvano – Brookes / Cole, 'Embedded Microcomputer Systems, Real Time Interfacing', 1st Edn., Thomas Course, **1999**.
2. James K. Peckol, 'Embedded Systems – A contemporary Design Tool', 2nd Edn., John Weily, **2008**.

ELECTRONICS SYSTEM DESIGN

Subject Code: MECE1-103 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (10 Hrs.)

MSI and LSI Circuits and Their Applications: Review of Digital electronics concept, Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR and AND OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

UNIT-II (12 Hrs)

Sequential Machines: The Concept of Memory, The Binary Cell, The Cell And The Bouncing Switch, Set/Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.

UNIT-III (11 Hrs.)

Multi Input System Controller Design: System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements,

MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

UNIT-IV (12 Hrs.)

Asynchronous Finite State Machines: Scope, Asynchronous Analysis, Design of Asynchronous Machines, Cycle and Races, Plotting and Reading the Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method, Electromagnetic Interference And Electromagnetic Compatibility Grounding And Shielding of Digital Circuits. Interfacing digital system with different media like fibre cable, co-axial cable etc.

Books Recommended:

1. Fletcher, 'An Engineering Approach to Digital Design', PHI, **1990.**
2. 'Designing with TTL Circuits', Texas Instruments.
3. Related IEEE/IEEP Publications.

RESEARCH LAB.-1

Subject Code: MECE1-104 **L T P C**
4 0 0 4

Every Subject In-charge will define atleast one project to each student of his/her (preferably different) concerned subject to be performed in Research- Lab.

ADVANCE SEMICONDUCTOR PHYSICS

Subject Code: MECE1-156 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Preparation and Characterization of Semiconductors: Types of semiconductors, charge carrier statistics, crystal growth, preparation and doping techniques of elemental and compound semiconductors, Metallization, Lithography and Etching, Bipolar and MOS device fabrication characterization (electrical, thermoelectric, magnetic and optical properties) of semiconductor materials.

UNIT-II (10 Hrs.)

Optical Properties of Semiconductors: Dipolar elements in direct gap semiconductors, optical susceptibility of a semiconductor, absorption and spontaneous emission, bimolecular recombination coefficient, condition for optical amplification in semiconductors.

UNIT-III (12 Hrs.)

Electronic and Electric Properties of Semiconductors: Boltzmann equation, scattering mechanisms, hot electrons, recombination, transport equation in a semiconductor, Electronic and ionic conductivity, solid oxide fuel cells, ceramic semiconductors, linear dielectrics, dielectric properties, Ferroelectric materials, piezoelectrics, ferro-piezoceramics, actuators and electrostrictions, pyroelectrics, electro-optics photorefractives, thin film capacitors. Ferroic crystals, primary and secondary ferroics, proper ferroics, magnetoferroelectricity.

UNIT-IV (11 Hrs.)

Application in Semiconductor Devices: Ge, Si, GaAs, Semiconductor device: metal-semiconductor and semiconductor heterojunctions, physics of bipolar devices, fundamentals of MOS and field effect devices, basics of solar cell, photodiodes, photodetectors.

RECOMMENDED BOOKS:

1. S.M. Sze and Kwok. K. Ng, 'Physics of Semiconductor Devices', 3rd Edn., Wiley, **2008.**
2. J. Wilson and J.F.B. Hawkes, 'Optoelectronics: An Introduction', Prentice-Hall, **1989.**

3. R.A. Smith, 'Semiconductors', Academic Press, **1963.**
4. M. Shur, 'Physics of Semiconductor Devices', Prentice Hall, **1990.**
5. A. Paul, 'Chemistry of Glasses', Chapman and Hall, **1982.**
6. Bishnu P. Pal, 'Fundamentals of Fibre Optics in Telecommunication and Sensor Systems', New Age International Publishers, **2005**.
7. Kwan Chi Kao, 'Dielectric Phenomena in Solids', Elsevier Academic Press, **2004.**
8. Vinod K. Vadhawan, 'Introduction to Ferroic Materials', Gordon and Breach Science Publications, **2000**.

BIOMEDICAL ELECTRONICS

Subject Code: MECE1-157 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (12 Hrs.)

Physiology & Human Nervous System: Cell, Bioelectricity, Sodium Potassium pump, Action and Resting potentials, Bioelectric Signals, Nervous System, Peripheral Nervous System, Autonomic Nervous System, SNS, PNS.

UNIT-II (12 Hrs.)

Electro-Physiological Measurements Basic components of biomedical electronics system, Electrodes: Micro, Needle and Surface electrodes, Electrical activity of heart, Generation and Recording of ECG signals, ECG Waves and Time Intervals, Heart Rhythms, Heart beat morphologies, Noise and artefacts, Respiratory system, EEG, EEG Rhythms and waveforms, Recording.

UNIT-III (11 Hrs.)

Non-Electrical Parameter Measurement: Blood pressure measurement, Cardiac output, Heart Sounds, Respiratory rate, Gas volume, Flow rate, pH value, ESR, GSR, Plethysmography.

UNIT-IV (10 Hrs.)

Assistive Restorative and Medical Imaging Equipment: Phonocardiography, Vectrocardiography, Defibrillators, Pacemakers, X-Ray, Ultrasonography, Computer Tomography, MRI.

RECOMMENDED BOOKS:

1. Joseph J. Carr and John M. Brown, 'Introduction to Biomedical Equipment Technology', 4th Edn., Pearson Education India, **2001.**
2. 'Biomedical Instrumentation and Measurements', Leslie Cromwell, J. Fred, Weibell and Erich A. Pfeiffer, Prentice Hall of India Pvt. Ltd, New Delhi, **1980.**
3. John G. Webster, 'Medical Instrumentation Application & Design', 3rd Edn., Wiley India.
4. R.S. Khandpur, 'Handbook on Biomedical Instrumentation', TMH.
5. Barbara Christe, 'Introduction to Biomedical Instrumentation: The Technology of Patient Care', Cambridge University Press, **2009.**

INFORMATION THEORY AND CODING

Subject Code: MECE1-158 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-1 (11 Hrs.)

Elements of information theory Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shenonfano theorem, entropy

UNIT-2 (11 Hrs.)

Sampling Process Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM

UNIT-3 (11 Hrs.)

Waveform Coding Techniques PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization.

UNIT- 4 (12 Hrs.)

Digital Modulation Techniques Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signalling. Error Control Coding Rationale for coding Linbear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes.

Recommended Books

1. J. Dass., S.K. Malik & P.K. Chatterjee, 'Principles of Digitals Communication', Wiley-Blackwel, **1991**.
2. Vera Pless,'Introduction to the Theory of Error Correcting Codes', 3rd Edn., **1998.**
3. Robert G. Gallanger, 'Information Theory and Reliable Communication', McGraw Hill, **1992**.

HARDWARE DESCRIPTION LANGUAGES AND VLSI DESIGN

Subject Code: MECE1-159 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (11 Hrs.)

MOS TRANSISTOR THEORY: Introduction, Ideal I-V Characteristics, Second Order Effects, CMOS Logic, CMOS Fabrication and Layout, VLSI Design Flow.

CIRCUIT CHARACTRIZATION AND PERFORMANCE ESTIMATION: CMOS Inverter, DC Transfer Characteristics, Delay Estimation, Logical Effort, Power Dissipation, Scaling and Latch-up.

UNIT-II (11 Hrs.)

COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN: Static CMOS, Ratioed Circuits, Differential Cascode Voltage Switch Logic, Dynamic Circuits, Domino Logic-Pass Transistor Circuits, CMOS D Latch and Edge Triggered Flip-flop and Schmitt trigger.

UNIT-III (12 Hrs.)

HDL PROGRAMMING USING BEHAVIORAL AND DATA FLOW MODELS: Verilog, Introduction, Typical Design Flow, Modules and Ports, Instances, Components, Lexical Conventions, Number Specification, Strings, Identifiers and Keywords, Data Types, System Tasks and Compiler Directives, Behavioural Modelling, Dataflow Modelling, RTL, Gate Level Modelling, Programs for Combinational and Sequential.

UNIT-IV (11 Hrs.)

HDL PROGRAMMING WITH STRUCTURAL AND SWITCH LEVEL MODELS: Tasks and Functions, Difference between Tasks and Functions, Switch Level, MOS Switches, CMOS Switches, Examples: CMOS NAND and NOR, MUX using Transmission Gate, CMOS Flip-Flop.

RECOMMENDED BOOKS:

1. Neil H.E. Weste, David Harris and Ayan Banenjee, 'CMOS VLSI Design', 3rd Edn., Pearson, **2004.**

2. Sung Mu Kang and Yusuf Leblebici, 'CMOS Digital Integrated Circuits', 3rd Edn., Tata Mc-Graw Hill, **2002.**
3. Samir Palnitkar, 'Verilog HDL', 2nd Edn., Pearson, **2004.**

MICRO AND NANO SCIENCES

Subject Code: MECE1-160 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-1 (10 Hrs.)

Introduction to semiconductor devices Introduction- material conductivity - Quantum mechanics - energy bands - crystalline structures - Density of states - band structures - Fermi - Dirac function - material classification - Band structure - electrons and holes - doping - Scattering - mobility - Diffusion transport - Einstein relation - Carrier generation and recombination- continuity equation.

UNIT-2 (13 Hrs.)

Crystal Growth, Wafer Preparation, Epitaxy and Oxidation Review of Semiconductor theory - Electronic Grade Silicon - Czochralski Crystal Growing - Silicon Shaping Processing consideration - Vapour Phase Epitaxy - Molecular Beam Epitaxy - Silicon on Insulators – Epitaxial Evaluation – Growth Mechanism and Kinetics – Thin Oxides – Oxidation Techniques and Systems – Oxide Properties. Lithography and Relative Plasma Etching Optical Lithography – Electron Lithography – X-Ray Lithography - Ion Lithography Plasma -Properties – Feature Size - Control and Anisotropic Etch Mechanism – Relative Plasma Etching Techniques and Equipment.

UNIT-3 (11 Hrs.)

Deposition, Diffusion, Lon Implementation and Metallization Deposition Processes – Polysilicon – Plasma Assisted Deposition – Models of Diffusion in Solids – Fick's One Dimensional Diffusion Equation – Atomic Diffusion Mechanism – Measurement Techniques – Range Theory – Implantation Equipment. Annealing Shallow Junction – High Energy Implantation – Physical Vapour Deposition – Patterning.

UNIT-4 (11 Hrs.)

VLSI Process Integration, Analytical, Assembly Techniques and Packaging Of VLSI Devices NMOS IC Technology – CMOS IC Technology – MOS Memory IC Technology – Bipolar IC Technology – IC Fabrication. Analytical Beams – Beams Specimen interaction – Chemical Methods – Package Types Baking Design Considerations – VLSI Assembly Technology – Package Fabrication Technology.

Recommended Books:

1. S.M. Sze, 'VLSI Technology', McGraw-Hill, 2nd Edn., **1988.**
2. Duoglas A. Pucknell and Kamaran Eshragian,'Basic VLSI Design', 3rd Edn., PHI, **1994**.
3. Wayne Wolf, 'Modern VLSI design', 2nd Edn., Prentice Hall Ptr, **1998**.
4. D.S. Grewal, 'Nanotechnology', Orient Longman's, **2008.**

SENSORS AND TRANSDUCERS

Subject Code: MECE1-161 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I (10 Hrs.)

Sensors/Transducers: Principles, Classification, Parameters, Characteristics (Static and Dynamic), Environmental Parameters (EP), Characterization.

Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge (Resistance and Semiconductor), Inductive Sensors: Sensitivity and Linearity of the Sensor, Types-Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors.

UNIT–II (13 Hrs.)

Thermal Sensors: Introduction, Gas Thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index Thermosensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermoemf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry and Heat Flux Sensors.

Magnetic Sensors: Introduction, Sensors and the Principles Behind, Magnetoresistive Sensors (Anisotropic and Semiconductor), Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers (Synchros and Synchro-resolvers), Eddy Current Sensors, Electromagnetic Flowmeter, Switching Magnetic Sensors and SQUID Sensors.

UNIT-III (12 Hrs.)

Radiation Sensors: Introduction, Basic Characteristics, Types of Photosensistors/Photo Detectors, X-ray and Nuclear Radiation Sensors and Fibre Optic Sensors.

Electroanalytical Sensors: Introduction, The Electrochemical Cell, The Cell Potential, Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization (Concentration, Reactive, Adsorption and Charge Transfer), Reference Electrodes, Sensor Electrodes and Electroceramics in Gas Media.

UNIT-IV (10 Hrs.)

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication (Standards for Smart Sensor Interface) and The Automation

Sensor's Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing and Sensors for Environmental Monitoring.

RECOMMENDED BOOKS:

1. D. Patranabis, 'Sensors and Transducers', 2nd Edn., PHI, **2003.**
2. W. Bolton, 'Mechatronics', 4th Edn., Pearson, **2011.**

SPEECH AND AUDIO PROCESSING

Subject Code: MECE1-162 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-1 (11 Hrs.)

Digital models for the speech signal - mechanism of speech production - acoustic theory - lossless tube models – digital models - linear prediction of speech - auto correlation - formulation of LPC equation - solution of LPC equations -Levinson Durbin algorithm - Levinson recursion - Schur algorithm - lattice formulations and solutions - PARCORcoefficients - Spectral analysis of speech - Short Time Fourier analysis - filter bank design. Auditory Perception: Psychoacoustics- Frequency Analysis and Critical Bands - Masking properties of human ear.

UNIT-2 (12 Hrs.)

Speech coding -sub band coding of speech - transform coding - channel vocoder - formant vocoder - cepstral vocoder -vector quantizer coder- Linear Predictive Coder. Speech synthesis - pitch extraction algorithms - gold rabiner pitch trackers - autocorrelation pitch trackers - voice/unvoiced detection - homomorphic speech processing – homomorphic systems for convolution - complex cepstrums - pitch extraction using homomorphic speech processing. Sound Mixtures and Separation - CASA, ICA & Model based separation.

UNIT-3 (11 Hrs.)

Speech Transformations - Time Scale Modification - Voice Morphing. Automatic speech recognition systems – isolated word recognition - connected word recognition -large vocabulary word recognition systems - pattern classification -DTW, HMM - speaker recognition systems - speaker verification systems - speaker identification Systems.

UNIT-4 (11 Hrs.)

Audio Processing : Non speech and Music Signals - Modelling -Differential, transform and sub-band coding of audio
signals & standards - High Quality Audio coding using Psychoacoustic models - MPEG Audio coding standard. Music
Production - sequence of steps in a bowed string instrument - Frequency response measurement of the bridge of a violin. Audio Data bases and applications - Content based retrieval.

Recommended Books

1. L.R. Rabiner & R.W. Schafer, 'Digital Processing of Speech Signals', Prentice Hall Inc.
2. D. O'Shaughnessy, 'Speech Communication, Human and Machine'. Addison-Wesley.
3. Thomas F. Quatieri , 'Discrete-Time Speech Signal Processing: Principles and Practice', Prentice Hall, Signal Processing Series.
4. J. Deller, J. Proakis and J. Hansen, 'Discrete-Time Processing of Speech Signals', Macmillan.
5. Ben Gold & Nelson Morgan, 'Speech and Audio Signal Processing', John Wiley & Sons, Inc.
6. F.J. Owens, 'Signal Processing of Speech', Macmillan New Electronics.
7. S. Saito & K. Nakata, 'Fundamentals of Speech Signal Processing', Academic Press, Inc.
8. P.E. Papamichalis, 'Practical Approaches to Speech Coding', Texas Instruments, Prentice Hall.
9. L.R. Rabiner & Gold, 'Theory and Applications of Digital Signal Processing', Prentice Hall of India.
10. N.S. Jayant and P. Noll, 'Digital Coding of Waveforms: Principles and Applications to Speech and Video. Signal Processing Series', Englewood Cliffs: Prentice-Hall.
11. Thomas Parsons, 'Voice and Speech Processing', McGraw Hill Series.

SOFT COMPUTING

Subject Code: MECE1-163 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT – I (12 Hrs.)

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.
Fuzzy Logic: Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation,

Fuzzy rule base system: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS) – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models, Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic.

UNIT – II (13 Hrs.)

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. Course rules and equations: Perceptron, Hebb's, Delta, winner take all and out-star Course rules. Supervised Course Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Associative memory networks, Unsupervised Course Networks: Competitive networks, Adaptive Resonance Theory, Kohnen Self Organizing Map

UNIT – III (12 Hrs.)

Genetic Algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modelling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA.

UNIT – IV (8 Hrs.)

Hybrid Soft Computing Techniques: An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems

Recommended Books

1. S. Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications', PHI Publication, **2011.**
2. S.N. Sivanandam & S.N. Deepa, 'Principles of Soft Computing', Wiley Publications, **2007.**

Reference Books

1. Michael Negnevitsky, 'Artificial Intelligence', Pearson Education, New Delhi, **2008**.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley, **2010.**

OPTICAL COMMUNICATION SYSTEM

Subject Code: MECE1-205 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

This Course provides knowledge about various types of optical sources and detectors available at receivers. It also imparts knowledge about communication system based on optical fibre and various techniques of multiplexing. Apart from this, various networking models for optical communication taught to complete all aspects of this subject.

Course Outcomes

Students will attain various skills to develop different optical networks for single user and multiusers and can also attain the maximum benefit of this domain w.t.t. maximum data rate and available bandwidth.

UNIT I (11 Hrs.)

Nature of light and basic fibre optic communication system, principle of light transmission through a fibre, Classification of optical fibres: Single Mode and Multi-Mode Fibres, Step Index and Graded Index Fibres, Losses in Optical Fibres; Absorption, Scattering and Dispersion, Optical Windows for Fibre Optic Transmission system.

Fibre Materials: Glass Fibres and Plastic Glass Fibres, Fibre Fabrication Methods: Outside Vapour Phase Oxidation & Vapour Phase Axial Deposition and Double Crucible Method, Optical Fibre Cables.

UNIT II (13 Hrs.)

Optical Sources: PN junction Diode Theory, Light Emitting Diode& Laser Diode: Structure, Materials, Quantum Efficiency and Modulation. Optical Detectors: Semiconductor Photodiodes &Avalanche Photodiodes and their characteristics, responsivity and quantum efficiency.

UNIT III (12 Hrs.)

Optical Fibre Splices: Fusion and Mechanical Splicing Technique and Fibre Connectors, Working Principle of OTDR and Applications of OTDR, Optical Fibre Measurements: Attenuation, Absorption, Dispersion and Scattering, Fibre Cut-Off Wavelength and Numerical Aperture Measurement.

UNIT IV (12 Hrs)

Optical Amplifiers: Semiconductor and Erbium Doped Fibre Amplifiers, Optical communication Techniques and Network Topologies: Wavelength division Multiplexing and SONET/SDH.

Recommended Books

1. Gerd Keiser, 'Optical Fibre Communications', 3rd Edn., McGraw-Hill International.
2. John M. Senior, 'Optical Fibre Communications, Principles & Practice', 3rd Edn., Pearson Publishers.

ADVANCED DIGITAL SIGNAL PROCESSING

Subject Code: MECE1-206 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

The Digital Signal Processing is a fundamental and immensely important signal processing course keeping in view the modern day technological advancements. The objective of this course is to provide fundamental background for digital signal processing which later on becomes basic building block of new upcoming technologies.

Course Outcomes:

The students will have knowledge to work in Time as well as frequency domain systems. They also can design high speed systems with the help of FFT/IFFT.

UNIT I (12 Hrs.)

Introduction to DSP, Time and Frequency domain description of different types of signals & systems, discrete time sequence systems, Linearity, unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems.

UNIT II (12 Hrs.)

Adaptive Filters: Adaptive signal processing-FIR adaptive filters – steepest descent adaptive filter – LMS algorithm – convergence of LMS algorithms – Application: noise cancellation – channel equalization – adaptive recursive filters – recursive least squares.

UNIT III (12 Hrs.)

Multirate Signal Processing: Multirate signal processing- Decimation by a factor D – Interpolation by a factor I – Filter Design and implementation for sampling rate conversion: Direct form FIR filter structures – Polyphase filter structure.

UNIT IV (12 Hrs.)

Wavelet Transforms and their Application: Wavelet Transform- Fourier Transform: Its power and Limitations – Short Time Fourier Transform – The Gabor Transform - Discrete

Time Fourier Transform and filter banks – Continuous Wavelet Transform – Wavelet Transform Ideal Case – Perfect Reconstruction Filter Banks and wavelets – Recursive multi-resolution decomposition–Haar Wavelet – Daubechies Wavelet

Recommended Books:

1. John G. Proakis, Dimitris G. Manobakis, 'Digital Signal Processing, Principles, Algorithms and Applications', 3rd Edn., PHI, **2000**.
2. Monson H. Hayes, 'Statistical Digital Signal Processing and Modelling', Wiley, **2002**.
3. Emmanuel C. Ifeachor and Barrie W. Jervis, 'Digital Signal Processing: A Practical Approach', Pearson Education, **2008.**
4. Robert J. Schilling and Sandra L. Harris, 'Fundamentals of Digital Signal Processing', Cengage Course, **2005**.

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RESEARCH LAB.-2

Subject Code: MECE1-207 **L T P C**
4 0 0 2

Students will be make familiar with maximum available softwares like optisystem, optsim, Matlab, Virtual instrumentation, Network simulator, FHSS etc.so that student can opt any one as per his/her interest for thesis work. Students will be advised to go through maximum research papers and conclude a particular domain to work further.

DIGITAL IMAGE PROCESSING

Subject Code: MECE1-264 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

Course Objectives

This course will provide students fundamentals of Digital Image Processing and its applications. This course incorporates the concepts of image enhancement, image restoration, segmentation and image compression. Students will be able to perform image manipulations and analysis in many different fields like object recognition, medical image processing, representation of images etc.

Course Outcomes

The student will have skills to deal with different operations on image processing. Different applications will be open for the students to work with.

UNIT I (12 Hrs.)

D**igital Image Fundamentals:** Digital Image Processing: Definition, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of visual perception – Image sampling and Quantization, Basic relationship between pixels – Basic geometric transformations - Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar.

UNIT II (09 Hrs.)

Image Enhancement Techniques: Spatial Domain methods: Basic grey level transformation, Histogram Equalization, Image Subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters – Laplacian filters, Frequency domain filters: Smoothing – Sharpening filters, Homomorphic filtering.

UNIT III (08 Hrs.)

Image Restoration: Model of Image Degradation/restoration process, Noise models, Inverse filtering, least mean square filtering, Blind image restoration, Singular value decomposition.

UNIT IV (11 Hrs.)

Image Compression and Segmentation: Lossless compression: Variable length coding, LZW coding, bit plane coding, Predictive coding-DPCM, Lossy Compression: Transform coding, Wavelet coding, Basics of Image compression standards: JPEG, MPEG, Edge detection, Thresholding, Region Based segmentation.

Recommended Books

1. R.C. Gonzalez and R.E. Woods, 'Digital Image Processing', Pearson Education, **2002**.
2. G.A. Baxes, 'Digital Image Processing', Indian Edn., John Wiley, **1994.**
3. R.J. Schalkoff, 'Digital Image Processing and Computer Vision', John Wiley, **1989**.
4. Sid Ahmed, 'Image Processing', McGraw Hill, **1994**.
5. William K. Pratt, 'Digital Image Processing', John Willey, **2001**.
6. Millman Sonka, Vaclav Hlavac, Roger Boyle, 'Image Processing Analysis and Machine Vision', Broos/colic, Thompson Course, **1999**.
7. A.K. Jain, 'Fundamentals of Digital Image Processing', PHI, **2002**.
8. Chanda Dutta Magundar, 'Digital Image Processing and Applications', Prentice Hall of India, **2000**.

SATELLITE COMMUNICATION

Subject Code: MECE1-265 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

This course provides an introduction to the fundamentals of orbital mechanics and launchers, link budgets, modulation, coding, multiple access techniques, propagation effects, and earth terminals. This course provides an understanding how analog and digital technologies are used for satellite communications networks.

Course Outcomes

The students will gain teaching skills in this area. They will gain skills for performance improvement for different available satellites by calculating power Budgets

UNIT I (12 Hrs.)

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on linkdesign, complete link design, interference effects on complete link design, earth station
parameters.

UNIT II (12 Hrs.)

Satellite Analog & Digital Communication Baseband analog (voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques TDMA frame structure, burst structure, frame efficiency, superframe, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

UNIT III (12 Hrs.)

Laser & Satellite Communication Link analysis, optical satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fibre CATV system.

UNIT IV (12 Hrs.)

Satellite Applications Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Books

1. Timothy Pratt, 'Satellite Communication', Addison Wesley, **2010**.
2. D.C. Aggarwal, 'Satellite Communication', Willey Sons, **2010**.

INFORMATION SECURITY

Subject Code: MECE1-266 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

UNIT-I

INTRODUCTION (12 Hrs.)

Introduction to various multimedia communication, Techniques, Applications, Networks, Protocols and Standards, Bandwidth and Compression issues. Source Encoding, Channel Encoding, Different types of multimedia information, Information representation. Encoding and decoding techniques

UNIT-II

COMPRESSION TECHNIQUES (12 Hrs.)

Text compression techniques, Image compression techniques, Audio and Video Compression, Standards for Multimedia Compression, Huffman, Run length, Variable length, Lossy/ Lossless compression.

Various files formats for multimedia and their applications, BMP, TIFF, JPEG, DFX, AVI, MPEG.

UNIT-III

NETWORK SECURITY (12 Hrs.)

Network and computer security issues. Security attacks, Security Services and Security Mechanisms. Network security models.

Cryptology: Introduction, Terminology, Cryptography and its objectives, Cryptanalysis, Classifications of cryptography; Basic concept of symmetric and asymmetric cryptography. Stream Ciphers versus Block Ciphers.

UNIT-IV

SYMMETRIC & ASYMMETRIC KEY CRYPTOGRAPHY (12 Hrs.)

Substitution and Transposition techniques. Block cipher principles. Study of DES Algorithm, its internal structure, f-function and its key schedule. Security of DES. Triple DES, IDEA, AES Algorithm.

Principles of public key cryptosystems. RSA algorithm. Distribution of public keys. Diffie-Hellman key exchange**.**

Recommended Books

1. Fred Halsall, 'Multimedia Communication', Prentice Hall.
2. Proakis, 'Digital Communication', Prentice Hall.
3. William Stallings, 'Cryptography and Network Security', Prentice Hall.
4. Bruce Schneier, 'Applied Cryptography', John Wiley & Sons.
5. W. Zeng, H. Yu and C. Lin, 'Multimedia Security Technologies for Digital Rights Management', Elsevier.
6. B. Furht and D. Kirovski (Eds.), 'Multimedia Security Handbook', CRC Press.

PARALLEL PROCESSING

Subject Code: MECE1-267 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

This course will help students to achieve the following objectives:

1. Describe the principles of computer design and classify instruction set architectures.
2. Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, caches, and vector processors.
3. Describe the operation of virtual memory, modern architectures such as RISC, Super Scalar, VLIW (very large instruction word), and multi-core and multi-CPU systems.

Course Outcomes

Students will have skills in RISC as well as CISC architectures and can design or analyses different problems associated with this domain

Unit-I (12 Hrs.)

Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multivector and SIMD computers. Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Unit-II (12 Hrs.)

System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

Unit-III (12 Hrs.)

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines.

Unit-III (12 Hrs.)

Multiprocessor Architectures: Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

Recommended Books

1. Kai Hwang, 'Advanced computer Architecture', 18th Reprint, TMH, **2003**.
2. D.A. Patterson and J.L. Hennessey, 'Computer Organization and Design', 4th Edn., Morgan Kaufmann.
3. J.P. Hayes, 'Computer Architecture and Organization', 2nd Edn., MGH, **1988**.
4. Harvey G. Cragon, 'Memory System and Pipelined Processors', Narosa Publication, **1996**.
5. V. Rajaranam & C.S.R.Murthy, 'Parallel Computer', PHI.
6. R.K. Ghose, Rajan Moona & Phalguni Gupta, 'Foundation of Parallel Processing', Narosa Publications.

NANO ELECTRONICS

Subject Code: MECE1-268 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives:
The main aim of this course is to introduce the students about Nano sciences. Actual chemistry involved in semiconductor physics will be discussed. How this will be helpful for Designing of different circuits.

Course Outcomes:
Students learn skills for handling basic concepts of Nano sciences for different applications for various fields.

UNIT I (12 Hrs.)

BASICS AND SCALE OF NANOTECHNOLOGY: Introduction – Scientific revolutions – Time and length scale in structures, Definition of a nano-system, Top down and bottom up approaches – Evolution of band structures and Fermi surface – introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, Dimensionality and size dependent phenomena – Fraction of surface atoms – Surface energy and surface stress, Misconceptions of Nanotechnology.

UNIT II (12 Hrs.)

The carbon age and nanotubes: New forms of carbon, Types of nanotubes, Formation of nanotubes, methods and reactants- Arcing in the presence of cobalt, Laser method, Chemical Vapour deposition method, ball milling, properties of Nanotubes Electrical properties, vibrational properties, Mechanical properties, applications of Nanotubes in electronics, hydrogen storage, materials, space elevators.

UNIT III (12 Hrs.)

Characterization Techniques in Nano-electronics:
Principle, construction and working: Electron microscopy (SEM and TEM), Infrared and Raman Spectroscopy, Photoemission and X-RD spectroscopy, AFMs, Magnetic force microscope.

UNIT IV (12 Hrs.)

Nano-scale Devices:
Introduction: Quantum Electron Devices; High Electron Mobility Transistor, Quantum Interference Transistor, Single Electron Transistor and Carbon Nanotube Transistor, DNA Computing; Structure of DNA, Basic Operation on DNA and DNA Computer.

Recommended Books

1. C.P. Polle and F.J. Owens, 'Introduction to Nanotechnology', Willey India Pvt. Ltd., **2011**.
2. Daniel Minoli, 'Nanotechnology Applications to Telecommunications and Networking', Willey India Pvt. Ltd., **2011**.

MULTIMEDIA COMMUNICATION SYSTEM

Subject Code: MECE1-269 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives:
The objective of this course is to get aware the students about various multimedia systems, components associated and possibilities available for this particular domain.

Course Outcomes:
Student will acquire teaching as well as analytical knowledge to design different Multimedia oriented systems.

Unit –I (12 Hrs.)

Introduction:
Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation.

Unit –II (12 Hrs.)

Components of Multimedia: Text, Graphics, Audio, Video. Design & Authoring Tools, Categories of Authority Tools, Types of products.

Unit –III (12 Hrs.)

Animation: Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation.

Unit –IV (12 Hrs.)

Introduction to MAYA (Animating Tool): Fundamentals, Modelling: NURBS, Polygon, Organic, animation, paths & boxes, deformers. Working with MEL: Basics & Programming Rendering & Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.

Recommended Books:
1. David Hillman, 'Multimedia Technology & Applications', Galgotia Publications.
2. Rajneesh Agrawal, 'Multimedia Systems', Excel Books.
3. Nigel Chapman & Jenny Chapman, 'Digital Multimedia', Wiley Publications.
4. D.P. Mukherjee, 'Fundamentals of Computer Graphics and Multimedia', PHI.

ADVANCED NETWORK SYNTHESIS AND ANALYSIS

Subject Code: MECE1-270 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

UNIT 1 (12 Hrs.)

Data Transmission
Overview of Data Communication and networking, Analog and Digital Data Transmission, Transmission Impairments, Various Transmission Media, Data Encoding.

UNIT II (12 Hrs.)

Switching and Computer Networks
Communication Networks, Circuit Switching, Message Switching, Packet Switching, X.25, Virtual circuits and Data gram's, LAN/MAN Technologies, Medium Access control protocols (CSMA/CD, Token ring, FDDI, DQDB)

UNIT III (12 Hrs.)

Network Security
Security issues, concept of firewalls, intrusion detection Systems

UNIT IV (12 Hrs.)

Advanced Network Analysis: Application analysis using the Application form (AAF) Binary-Hex-Decimal conversion, building test packets, Calculating the cost of network problems (Analysis ROI), Key network calculations: Throughput, Latency and Bandwidth, Unattended captures: Triggered starts/stops, Analysis ROI worksheet/calculation

Recommended Books:
1. Scott Empson, 'CCNA Portable Command Guide', 2nd Edn.,
2. Laura Chappell, 'Network Analysis'.

MICRO & NANO ELECTRO MECHANICAL SYSTEM (MEMS & NEMS)

Subject Code: MECE1-271 **L T P C** **Duration: 48 Hrs.**
4 0 0 4

Course Objectives

The course aims to give the students a basic knowledge about state-of-the-art MEMS including technology, device architecture, design and modelling, scalability, figures of merit and RF IC novel functionality and performance.

Course Outcomes

Students will attain analytical and design oriented feature knowledge about NEMS and MEMS. Reliability and packaging are also considered as key issues for industrial applications.

UNIT 1 (12 Hrs.)

Introduction:

Micro Electro Mechanical System (MEMS) Origins. MEMS Impetus / Motivation. Material for MEMS. The toolbox: Processes for Micro machining.

UNIT II (12 Hrs.)

MEMS Fabrication Technologies. Fundamental MEMS Device Physics: Actuation.

UNIT III (12 Hrs.)

Fundamental MEMS Devices: The Cantilever Beam. Microwave MEMS Applications: MEM Switch

UNIT IV (12 Hrs.)

Design Considerations. The Micromachined Transmission Line. MEMS-Based Microwave Circuit and System.

Recommended Books

1. Hector J. De Los Santos, 'Micro-electromechanical (MEM) Microwave Systems', Artechhouse.
2. Nadim Maluf, 'An Introduction to Micro-Electromechanical System', Artechhouse.

RESEARCH METHODOLOGY

Subject Code – MREM0-101 **L T P C** **Duration – 45 Hrs.**
4 0 0 4

UNIT–I (11 Hrs.)

Introduction to Research: Meaning, Definition, Objective and Process

Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental

Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature

Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.

Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT–II (10 Hrs.)

Sources of Data: Primary and Secondary, Validation of Data

Data Collection Methods: Questionnaire Designing, Construction

Sampling Design & Techniques – Probability Sampling and Non Probability Sampling

Scaling Techniques: Meaning & Types

Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability

Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT–III (13 Hrs.)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation

Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number

Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs.)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling

Report Writing: Essentials of Report Writing, Report Format

Statistical Software: Application of Statistical Softwares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis

**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITs*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education, New Delhi,
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education, New Delhi.
6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

PROJECT

Subject Code: MECE1-309 **L T P C**

Course Objectives

1. To propose engineering based project in a clear and concise manner.
2. Allow students to develop problem solving, analysis, synthesis and evaluation skills.

Course Outcomes

1. Synthesis of knowledge.
2. To demonstrate the aptitude of applying the own knowledge to solve a specific problem.
3. To mature the knowledge.
4. Able to organize, compile and record all work details in an efficient manner

Each student will be required to complete a Project and submit a Project Report on a topic on any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields.

SEMINAR

Subject Code: MECE1-310 **L T P C**
0 0 4 2

Course Objectives

1. To identify, understand and discuss current advanced research topic.
2. To gain experience in the critical assessment of the available scientific literature
3. To practice the use of various resources to locate and extract information using offline & online tools, journals

Course Outcomes

1. An ability to utilize technical resources
2. An ability to write technical documents and give oral presentations related to the work completed.
3. To learn preparation and presentation of scientific papers in an exhaustive manner

Each student will be required to prepare a Seminar Report and present a Seminar on a topic in any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields.

ANTENNA SYSTEM DESIGN

Course Code: MECE1- 372 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives

1. To study various types of antennas, antenna arrays and antenna parameters
2. Study of propagation of waves through different media.
3. Familiarize the students with different parameters to be considered while designing antennas.

Course Outcomes

1. Gain understanding of different parameters used to characterize antennas.
2. Know how to analyze wire and aperture radiating elements.
3. Be able to design various antennas and arrays for many communication systems.
4. Implementation of radio wave propagation mechanisms while designing an antenna.
5. An ability to understand basic terminology associated with antennas and calculation of power radiated from an antenna and array.

UNIT-I (10 Hrs.)

Review of electromagnetic fields, Displacement current, Maxwell's equations in free space, plane wave & uniform plane wave in free space. Electromagnetic radiations, Physical concept of radiation, Retarded potential, Radiation from a Hertizian dipole, monopole and a half wave dipole, Fields in the vicinity of an antenna and far field approximation.

UNIT-II (10 Hrs.)

Antenna Parameters: Radiation pattern, Gain, Directive gain, Directivity, Reciprocity theorem & its applications, effective aperture, radiation resistance, terminal impedance, noise temperature, elementary ideas about self & mutual impedance, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle, polarization, antenna temperature.

UNIT-III (13 Hrs.)

Antenna Arrays: Various forms of antenna arrays, arrays of point sources, non-isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing, Dolph-Tchebysceff arrays, continuous arrays, rectangular arrays.

UNIT-IV (12 Hrs.)

Broadband Antennas: Travelling wave antennas helical antennas, Biconical antennas Sleeve antennas, and Principles of frequency independent antennas, Spiral antennas, and Log - periodic antennas.

Aperture antennas, scanning antennas, smart antennas. Long Wire antenna, folded dipole antenna, Yagi-Uda antenna, Slot antenna, Micro Strip or Patch antennas, Antenna measurements.

Recommended Books

1. J.D. Krauss, 'Antennas', McGraw Hill Inc., New York, **1991.**
2. Balanis A. Constantine, 'Antenna Theory, Analysis and Design', Wiley, New York.
3. K.D. Prasad, 'Antenna and Wave Propagation', 3rd Edn., Satya Prakashan, New Delhi.
4. W.L. Stutzman, G.A. Thieele, 'Antenna Theory and Design', Wiley, New York.

ERROR CONTROL AND CODING

Subject Code: MECE1-373 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives: Students will be able to understand block codes, maximum likelihood decoding, generator matrix, parity-check matrix, error-correcting capability of a linear code and the importance of probability theory in error control & coding

Course Outcomes

1. Describe the model and calculate the capacity of typical digital communication channels
2. Demonstrate the encoding and decoding procedures of various error control codes
3. Compare the error correction capability of different error control codes and their performances
4. Apply error control coding to achieve error detection and correction in digital transmission systems
5. Design an error detecting and correcting system for semiconductor memory system to meet given system specification.

UNIT-I (11 Hrs.)

Review of Random Process: Review of Probability Theory, Basic concepts of random processes, random variables, basicconcepts from systems theory and stochastic processes, Stationary and non stationary process, correlation function, Ergodicity and power spectral density, transformation random process by linear system, Special random process: white Gaussian noise, Wiener levy, Shot noise, Markov Process

UNIT-II (11 Hrs.)

Hypothesis Testing: Simple binary hypothesis test, Decesion Criteria, Neyman Pearson tests, Bayes Criteria Multiple hypothesis testing, Composite hypothesis testing

UNIT-III (11 Hrs.)

Detection Theory: Sequential detection Walds test Detection of known signals in white noise, Detection of known signal in colored noise, Maximum SNR Criteria, Detection of signals with unknown parameters

UNIT-IV (12 Hrs.)

Coding: Error Control coding for wireless fading channels, Channel Estimation and Adaptive channel coding, Joint Source and Channel coding. Non binary Linear Block Codes, Hard and

soft decision decoding, Coding and Decoding of BCH, Reed Solomon Codes, Convolution codes: Coding and Decoding, Distance bounds, Performance bounds Turbo codes: Coding, Decoding Algorithms, Performance comparison, Interleaver design Trellis coded Modulation, TCM Decoders, TCM for AWGN and Fading Wireless Channels, Performance comparison

Recommended Books

1. C.W. Helstrom, 'Elements of Signal Detection and Estimation', Prentice Hall, NJ, **1995.**
2. H.L. Van Trees, 'Detection, Estimation, and Modulation Theory', Wiley, **1971.**
3. H. V. Poor, 'An Introduction to Signal Detection and Estimation', 2nd Edn., Springer-Verlag, New York.
4. Stephen G. Wilson, 'Digital Modulation & Coding'. Prentice Hall Inc.
5. Ranjan Bose, 'Information Theory Coding and Cryptography', TMH.
6. J.G. Proakis, 'Digital Communication', Pearson Education.

WIRELESS AND ADHOC NETWORKS

Subject Code: MECE1-374 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives: The objective of this course is to provide the concepts of sensor networks and to understand the MAC and transport protocols for adhoc networks.

Course Outcomes:

1. To understand the adhoc networks.
2. To learn the data transmission flow in adhoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

UNIT-I (11 Hrs.)

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

UNIT-II (10 Hrs.)

Data Transmission in MANETs: The Broadcast Storm, Multicasting, Geocasting, TCP over Ad Hoc Networks: TCP Protocol overview, TOP and MANETs, Solutions for TOP over Ad Hoc

UNIT-III (12 Hrs.)

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, Applications.

Data Retrieval In Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT-IV (12 Hrs.)

Security: Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems. Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms

Recommended Books

1. Car/os Corderlo Dharma R. Aggarwal, 'Ad Hoc and Sensor Networks — Theory and Applications', World Scientific Publications /Cambridge University Press, March **2006**
2. Feng Zhao, Leonidas Guibas, 'Wireless Sensor Networks: An Information Processing Approach', Elsevier Science imprint, Morgan Kauffman Publishers, **2005**, rp **2009.**

3. C. Siva Ram Murthy, B.S. Murthy, 'Adhoc Wireless Networks — Architectures and Protocols', Pearson Education, **2004.**
4. Fei Hu, Xiaojun Cao, 'Wireless Sensor Networks — Principles and Practice', CRC Press, Taylor & Francis Group, **2010.**
5. Subir Kumar Sarkar, et al., 'Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications', Auerbach Publications, Taylor & Francis Group, **2008.**

SPEECH AND AUDIO PROCESSING

Subject Code: MECE1-375 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Course Objectives

To introduce the fundamentals of speech & image processing and provide students the description of adaptive filters and filters in image and audio processing. Also study the filters in image& audio processing and wavelets along with its application in various fields

Course Outcomes:

1. Qualitatively describe the mechanisms of speech production.
2. Apply programming tools (such as Matlab) to analyze speech and audio signals in time and frequency domains.
3. Analyze, compare and implement methods and systems for filtering and coding of speech and audio signals.
4. Analyze the methods and systems for enhancement of speech and audio signals in environmental noisy conditions.

UNIT-I (10 Hrs.)

Introduction: Review of basic digital signal processing fundamentals, Parametric methods for power spectrum estimation-Relationship between the auto correlation and the model parameters – The Yule – Walker method for the AR Model Parameters – The Burg Method for the AR Model parameters – unconstrained least-squares method for the AR Model parameters – sequential estimation methods for the AR Model parameters – selection of AR Model order.

UNIT-II (13 Hrs.)

Adaptive Filters: Adaptive signal processing-FIR adaptive filters – steepest descent adaptive filter – LMS algorithm – convergence of LMS algorithms – Application: noise cancellation – channel equalization – adaptive recursive filters – recursive least squares.

Multirate Signal Processing: Multirate signal processing- Decimation by a factor D – Interpolation by a factor I – Filter Design and implementation for sampling rate conversion: Direct form FIR filter structures – Polyphase filter structure.

UNIT-III (11 Hrs.)

Speech Signal Processing: Speech signal processing-Digital models for speech signal: Mechanism of speech production – model for vocal tract, radiation and excitation – complete model – time domain processing of speech signal: Pitch period estimation – using autocorrelation function – Linear predictive Coding: Basic Principles – autocorrelation method – Durbin recursive solution.

UNIT-IV (11 Hrs.)

Wavelet Transforms and their Application: Wavelet Transform- Fourier Transform: Its power and Limitations – Short Time Fourier Transform – The Gabor Transform - Discrete Time Fourier Transform and filter banks – Continuous Wavelet Transform – Wavelet Transform Ideal Case – Perfect Reconstruction Filter Banks and wavelets – Recursive multi-resolution decomposition–Haar Wavelet – Daubechies Wavelet.

Recommended Books

1. John G. Proakis, Dimitris G. Manobakis, 'Digital Signal Processing, Principles, Algorithms and Applications' 3rd Edn., PHI, **2000.**
2. Monson H. Hayes, 'Statistical Digital Signal Processing and Modelling', Wiley, **2002**.
3. Emmanuel C. Ifeachor and Barrie W. Jervis, 'Digital Signal Processing: A Practical Approach', Pearson Education, **2008.**
4. Robert J. Schilling and Sandra L. Harris, 'Fundamentals of Digital Signal Processing', Cengage Course, **2005.**

DISSERTATION

Subject Code: MECE1-410 L T P C

Course Objectives: To learn, practice, and critique effective scientific writing and to formulate the research objectives clearly, state claims and evidence clearly, assess validity of claims, evidence, outcomes, and results.

Course Outcomes:

1. Design and execute a meaningful research project that demonstrates spatial thinking and uses the knowledge and skills.
2. Define and analyze a problem in latest research areas.
3. Formulate and write a research proposal.
4. Able to learn effectively record data and experiments so that others can understand them.
5. Communicate the findings by means of a thesis, written in the format specified by the department/institute.

Each student will be required to complete a Dissertation and submit a written Report on the topic on any of the areas of modern technology related to Electronics & Communication Engineering including interdisciplinary fields in the Final semester of M.Tech. Course.

Papers accepted in UGC approved journals will be given 10 marks as special incentive. It will be mandatory to publish one paper in conference/journal.

Semester 1st		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
PE-501	Metal Casting	4	0	0	50	100	150	4
PE-502	Metal Cutting	4	0	0	50	100	150	4
PE-503	Metal Forming	4	0	0	50	100	150	4
PE-504	Welding Technology	4	0	0	50	100	150	4
PE-505	Computer Aided Design & Manufacturing	4	0	0	50	100	150	4
PE-506	Lab.-I	0	0	4	100	0	100	2
Total		**20**	**0**	**4**	**350**	**500**	**850**	**22**

Semester 2nd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
PE-507	Non-Conventional Machining Processes	4	0	0	50	100	150	4
PE-508	Jig, Fixtures & Die Design	4	0	0	50	100	150	4
PE-509	Production Planning & Control	4	0	0	50	100	150	4
Departmental Elective-I		4	0	0	50	100	150	4
PE-510	Machine Tool Design							
PE-511	Cutting Tool Design							
PE-512	Industrial Tribology							
PE-513	Diagnostic Maintenance & Monitoring							
Departmental Elective-II		4	0	0	50	100	150	4
PE-514	Advanced Operations Research							
PE-515	Management of Production Systems							
PE-516	Simulation of Industrial Systems							
PE-517	Materials Technology							
PE-518	Lab. –II	0	0	4	100	0	100	2
Total		**20**	**0**	**4**	**350**	**500**	**850**	**22**

Semester 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
Departmental Elective-III		4	0	0	50	100	150	4
PE-619	Mechatronics							
PE-620	Robotics & Industrial. Automaton							
PE-621	Metrology & Industrial Inspection							
PE-622	Computer Aided Process Planning							
Departmental Elective-IV		4	0	0	50	100	150	4
PE-623	Methods Engineering & Ergonomics							
PE-624	Product Design & Development							
PE-625	Entrepreneurship							
PE-626	Statistics & Reliability Engineering							
PE-627	Project	0	0	10	50	50	100	10
PE-628	Seminar	0	0	4	100	0	100	4
Total		**8**	**0**	**14**	**250**	**250**	**500**	**22**

SEMESTER 4th		Contact Hrs			Evaluation Criteria	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Satisfactory/ Unsatisfactory**	
PE-629	**Thesis**	**0**	**0**	**24**		**24**

Overall

Semester	Marks	Credits
1st	850	22
2nd	850	22
3rd	500	22
4th	--	24
Total	**2200**	**90**

METAL CASTING

Subject Code: PE-501 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Structure of silica and different types of clays, bonding mechanism of silica – water-clay systems. Swelling of clays, sintering adhesion and colloidal clay; silica grain shape and size distribution standard permeability A.F.S. clay. Characteristics, Ingredients and additives of moulding sand, core sands.

UNIT-II

Solidifications of Metals, nucleation, free energy concept, critical radius of nucleus. Nucleation and growth in metals and alloys. constitutional super cooling. Columnar equiacquiesced and dendritic structures. Freezing of alloys centreline feeding resistance. Rate of solidification, time of solidification, mould constant. Fluidity of metals, volumes redistribution. Analysis of the process.

UNIT-III

Riser design shape, size and placement. Effect of appendages on risering. Effective feeding distances for simple and complex shapes. Use of chills, gating design, filling time. Aspiration of gases. Top, bottom and inside gating. Directional solidifications stresses in castings. Metal mould reactions. Expansion scale and metal penetration. Analysis of the process.

UNIT-IV

Various moulding and casting processes, hot box, cold box process, investment, shell moulding, full mould process, die casting, ceramic shell mould, vacuum moulding etc. Non-ferrous Die-casting of Aluminium and its alloys, brass and bronze.

Recommended Books

1. Flimm, 'Fundamentals of Metals Casting', Addison Wesley.
2. Heine Loper and Resenthal, 'Principles of Metal Casting', McGraw Hill.
3. Hielel and Draper, 'Product Design & Process Engineering', McGraw Hill.
4. Salman & Simans, 'Foundry Practice', Issac Pitman.
5. 'Metals Handbook- Metal Casting', ASME.

METAL CUTTING

Subject Code: PE-502 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: System of Tool nomenclature, Tool Geometry, Mechanism of Chip, formation and forces in orthogonal cutting, Merchant's force diagram.

Oblique Cutting: Normal chip reduction coefficient under oblique cutting, true shear angle, effective rake, influx region consideration for deformation, direction of maximum elongation, effect of cutting variables on chip reduction co-efficient, forces system in oblique cutting, effect of wear land on force system, force system in milling, effect of helix angle.

UNIT-II

Fundamentals of Dynamometry: Theoretical determination of forces, angle relations, heat and

temperature during metal cutting; distribution, measurement, analysis, theoretical estimation of work piece temperature, hot machining.

Fundamental Factors, which affect Tool Forces: Correlation of standard mechanized test. (Abuladze –relation), nature of contact and stagnant phenomenon, rates of strains, shear strain and normal strain distributions, cutting variables on cutting forces.

UNIT-III

Cutting Tools: Tools materials analysis of plastic failure (from stability criterion), Analysis failure by brittle fracture, wear of cutting tools, criterion, flank and crater wear analysis, optimum tool life, tool life equations, (Taylor's woxen etc.) Tool life test, machining optimization, predominant types of wear; abrasive, adhesive, diffusion wear models, wear measurements and techniques, theory of tool wear oxidative mathematical modelling for wear, test of machinability and influence of metallurgy on machinability. Economics of Metal machining.

UNIT-IV

Abrasive Machining: Mechanics of grinding, cutting action of grit, maximum grit chip thickness, energy and grit force temperature during grinding, wheel wear, grinding, process simulation, testing of grinding wheels, mechanics of lapping and honing, free body abrasion.

Recommended Books

1. Sen & Bhattacharya, 'Principles of Machine Tools', New Central Book Agency.
2. Brown, 'Machining of Metals', Prentice Hall.
3. Shaw, 'Principles of Metal Cutting', Oxford I.B.H.
4. Arshimov & Alekree, 'Metal Cutting Theory & Cutting Tool Design', MIR Publications.
5. Knowenberg, 'Machining Science & Applications', Longman Press.

METAL FORMING

Subject Code: PE-503 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Plasticity – True stress and true strain, true stress-strain curves, selection of stress-strain curves for cold and hot working, yield of isotropic plastic material, yield criteria. Tresca maximum sheer-strain energy criterion, plastic incompressibility, Poisson's ratio for plastic deformation flow rule, strain hardening function, heat generation and heat transfer in metal forming processes, temperatures in Quasi continuous forming operations. Examination of Metal forming processes.

UNIT-II

Prediction of working loads and maximum deformation analysis of the processes of wire drawing/tube drawing, strip drawing and extrusion. various parameters/variables affecting the processes of wire drawing, tube drawing, strip drawing and extrusion; various methods of tube drawing and their comparison. Working loads for plain strain forging of strip and disc under conditions of well lubrications and sticking of material with die and under mixed conditions, prediction of working loads under above approach (simple plain strain and axis symmetric problems).

UNIT-III

Lubrication in metal forming processes, principles and mechanism of lubrications, hydrodynamic and their film lubrication, boundary and extreme pressure lubricants, solid lubricants, lubricants used for rolling and cold drawing, forging, extrusion and deep drawing processes; defects in various metal forming processes like rolling, forging, extrusion, wire drawing and deep drawing and their causes and remedial measures.

UNIT-IV

Theory and deep drawing of circular blanks, analysis of the process, prediction of radial stress and punch load, ironing, wrinkling, blank holding and various parameters/variables affecting the deep drawing process.

Rolling: Classification of rolling mills, analysis of the process. Prediction of roll pressure for flat strip rolling in the leading and lagging zones, roll separating forces, torque on the roll, effect of front and back tensions, effect of support rolls, various factors which affect rolling force.

Recommended Books

1. Rowe, Arnold, 'An Introduction to the Principles of Metal Working'.
2. Avitzer, 'Metal Forming Analysis', McGraw Hill.
3. Johnson & Merlore, 'Plasticity for Mechanical Engineering', Van Northand.
4. 'High Velocity Working Metals', ASME; EEE.

WELDING TECHNOLOGY

Subject Code: PE-504 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Basic classification of welding processes, weldability, weld thermal cycle, metallurgy of fusion welds, solidification mechanism and microstructural products in weld metal, epitaxial, cellular and dendritic solidification, metallurgical changes in weld metal, phase transformation during cooling of weld metal in carbon and low alloy steel, prediction of microstructures and properties of weld metal. Heat affected zone, re-crystallization and grain growth of HAZ, gas metal reaction, effects of alloying elements on welding of ferrous metals.

Welding Arc: Arc efficiency, temperature distribution in the arc; arc forces, arc blow, electrical characteristics of an arc, mechanism of arc initiation and maintenance, role of electrode polarity on arc behaviour and arc stability, analysis of the arc.

UNIT-II

Coated Electrodes: Electrode coatings, classification of coatings of electrodes for SMAW, SAW fluxes, role of flux ingredients and shielding gases, classification of solid and flux code wires,

Fusion Welding Reviews: Critical reviews of manual metal arc welding (MMAW) GTAW, GMAW, FCAW and CO welding processes, plasma arc, submerged arc welding, electro gas and electro slag welding, analysis of the process.

UNIT-III

Welding Power Sources: Arc welding power sources basic charters tics of power sources for various arc welding processes, duty cycles, AC, DC welding power source, DC rectifiers, thyristor controlled rectifiers, transistorized units, inverter systems. Arc length regulation in mechanized welding processes.

Metal Transfer and Melting Rate: Mechanism and types of metal transfer, forces affecting metal transfer, modes of metal transfer, metal transfer in various welding processes, effective of polarity on metal transfer and melting rate.

UNIT-IV

Solid State Welding: Theory and mechanism of solid state welding. Techniques and scope of friction welding, diffusion welding, cold pressure welding and ultrasonic welding. High energy rate welding. Analysis of the Process.

Welding Techniques using Radiation Energy: Technique, scope and application of the electron beam and laser welding processes.

Recommended Books

1. R.S. Parmar, 'Welding Processes & Technology', Khanna Publishers.
2. R.S. Parmar, 'Welding Engineering & Technology', Khanna Publishers.
3. S.V. Nandkarni, 'Modern Arc Welding Technology', Oxford & IDH Publishing Co.
4. L.M. Gourd, 'Principles of Welding Technology', ELBS/Edward Arnold.
5. Lancaster, 'The Physics of Welding', Pergaman Press.
6. Lancster, 'The Metallurgy of Welding', George Allen & Unwin Ltd. U.K.
7. 'Welding Handbook', Vol. 1 & 2, 7th Edn., American Welding Society.
8. 'Metal Handbook', Vol 6, 73, ASME.
9. 'Procedure Handbook of ARC Welding', Lincoln Electric Co. USA.
10. Tylecote, 'The Solid Phase Welding of Metals', Edward Arnold Pvt. Ltd.
11. Richard L. Little, 'Welding & Welding Technology', McGraw Hill.
12. Rossi, 'Welding Technology', McGraw Hill.
13. Koenigsberger and Adaer, 'Welding Technology', Macmillan.

COMPUTER AIDED DESIGN AND MANUFACTURING

Subject Code: PE-505 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Introduction: CAD/CAM contents and tools; history of CAD/CAM development; CAD/CAM market trends; Definition of CAD/CAM tools, Industrial look at CAD/CAM.

CAD/CAM Hardware: Introduction; types of systems; CAD/CAM systems evaluation criteria; input devices; output devices, hardware integration and networking; hardware trends.

CAD/CAM Software: Introduction; graphics standards; basic definition and modes of graphic operations; user interface; software modules, modelling and viewing; software documentation; software development; efficient use of CAD/CAM Software; Software trends.

UNIT-II

Microprocessor based CAD/CAM: Introduction; several features, system implementation; hardware components and configuration; micro-based CAD software; file translation; operating systems, mechanical applications; micro-CAD trends; product distribution trends.

Mathematical Representation of Curves: Introduction; wire frame models; wire frame, entities, curves representation, parametric representation of analytical and synthetic curves, curve, manipulation; design and Engineering applications.

UNIT-III

Mathematical Representation of Surfaces: Introduction, surface models, surface entities, surface representation, parametric representation of analytic and synthetic surfaces, surface manipulation.

Mathematical Representation of Solids: Introduction, solid models, solid entities, solid representation, fundamentals of solid modelling, half –spaces; boundary representation; constructive solid geometry sweep representation, solid modelling based applications; design and engineering applications.

UNIT-IV

Geometric Transformations: Introduction; transformation of geometric models, mappings of geometric models; inverse transmission and mappings; projections of geometric models; design and Engineering applications.

Mechanical Assembly and Tolerance: Introduction; assembly modelling, representative schemes, generation of assembling sequences; tolerance concepts.

Part Programming and Manufacturing: NC, CNC and DMC machines, part programming, manufacturing processes, process planning, tool path generation; design and Engineering applications.

Recommended Books

1. Mikell P. Groover Mecry Wo Elimmers, Jr., 'CAD/CAM', **1991**.
2. Bedford Masa Chusetles, 'The CAD/CAM Hand Book'.
3. Mikell P. Groover, 'Automation, Production Systems and Computer Aided Manufacturing', Prentice Hall.
4. R.N. Pressman, J.E. William, 'Numerical Control and Computer Aided Manufacturing', John Wiley & Sons, New York.
5. Ibrahim Zeid, 'CAD/CAM Theory and Practice', Tata McGraw Hill, New Delhi, **1998.**

LAB.-I

Subject Code: PE-506 **L T P C**
0 0 4 2

One lab./field/industrial oriented project /problem will be allocated to each student related to the subjects related to the subjects taught in 1st semester.

NON-CONVENTIONAL MACHINING PROCESSES

Subject Code: PE-507 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

New Technology, Introduction, Mechanical Processes, Abrasive jet Technology, Ultrasonic machining, whirling jet machining. Fundamental principles, process parameters, characteristics, Tool design, Metal removal rate-analysis, important part design, Analysis of the Process.

UNIT-II

Chemical and Electro-chemical machining –Introduction. Principles & scheme, Process parameters, metal removal rate, dynamic and hydro-dynamic & hydro-optimization, electrolytes.

UNIT-III

EDM: Introduction-basic principles & scheme, circuitry controls, metal removal rate, machining accuracy, optimization, selection of tool material and tool design, Di-electric, Analysis.

UNIT-IV

Laser Beam Machining & Electron beam machining back ground, production of Laser, machining by Laser and other applications, Electron beam action, Dimensionless analysis to establish correlation, behaviour EBM parameters.

High Velocity forming of metals, explosive forming principles and applications, Electro-hydraulic and other applications, Analysis of the process.

Recommended Books

1. 'Non-traditional Machining Methods', ASME.
2. Bhattayacharya, 'New Technology', I.E., India.
3. Rozenberg, 'Ultrasonic Cutting', Consultants Bureau, N.Y.
4. Lazarenko, 'Electro-spark Maching of Metals', Vol. 2, Consultant Bureau, N.Y.
5. D.E. Baar 'Electro chemical maching', McDonald.

JIG, FIXTURE & DIE DESIGN

Subject Code: PE-508 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Jigs and Fixtures: Elements of jigs and fixtures, costs calculations. Locating element, clamping elements, procedure in designing. Jig and fixtures: Fits and tolerances analysis.

Non-Standard clamping devices, centralizers, equalizers, actuators (Pneumatic, hydraulic electric and electronic).

UNIT-II

Automatic loading and unloading devices.

Types of Frunions: Single, double and multi-axis and indexers.

UNIT-I

Transfer line jigs & fixtures for the operation of Multi-drilling, boring, milling and grinding. Assembly line fixtures. Universal Jigs and Fixtures.

UNIT-IV

Transfer-devices, transfer machine, modulation-design concept, in process gauging.

Design of Dies: Elements of Dies and Punch. Types and design procedure, progressive dies, drawing die, bending die etc. Analysis.

Recommended Books

1. Franklin-d-jones, 'Jigs and Fixtures Design',.
2. F.H. Colovin, 'Jigs and Fixtures', Massachusettes Institute of Technology.
3. H.W. Hardy, 'Jigs and Fixtures Design'.
4. P.S. Haughton, 'Jigs and Fixtures Design'.
5. Parson, 'Jigs and Fixtures'.

PRODUCTION PLANNING & CONTROL

Subject Code: PE-509 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

Introduction; Pre-planning, market survey, machine and process capacity, capacity analysis; Effects of cyclic and random variations; Routing route sheets, common charts; Scheduling; various techniques of scheduling; Production order, dispatching of production orders, job card Inventory control, inventory costs, lot size models, back orders and last sales, quantity discounts, safety, stock, elementary control under risk; Materials purchasing, quotations; Rate controls; Introduction to value analysis.

Recommended Books

1. Eilon Macmillan, 'Elements of Production Planning and Control'.

MACHINE TOOL DESIGN

Subject Code: PE-510 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Classification of machine tools, elements of machine tools, selection of speed and feed, gear box design various types of clutch systems, Sohopke and Report drives, double bond gears analysis, Lohr criterion for optimizing double bond gear.

Step less drives, mechanical step less drive analysis, hydraulic step less drive & circuit analysis, design features, throttle valves, tracer controlled hydraulic circuit, hydraulic servo controls, electrical step less drive circuits and charters tics.

UNIT-II

Strength and rigidity consideration, process capability and compliance, design of lathe bed, use of stiffness in bed, design of radial drill column and milling machine column.

Analysis of spindle bearings, slides and guides, design of spindle/arbor, antifriction and journal bearings, hydro-dynamic action in slides, analysis of hydrostatic bearings, roller guides, recirculating ball analysis, stick slip motion in guides-models, force analysis of lathe guide ways.

UNIT-III

Vibrations of Machine Tools and Dynamic Rigidity: Effects of vibrations, source of vibrations, self-excited vibration, single degree of freedom chatter, velocity principle and related models, regenerative principles, chatter in lathe, drilling milling and grinding. Tlusty and palace model, Peters model, elimentation of machine tool structures matrix, finite elements and lumped constant models.

UNIT-IV

Automation: Automation drives for machine tools, degree of automation, semi-automatics, analysis of collect action, design, of collet, bar feeding mechanism, tooling layout, single spindle, multispindle automatic, transfer machine, indexing Geneva mechanism, analysis, Swiss type automatic machine loading and unloading. Transfer-devices, modular –design concept in process gauging.

Control System of Machine Tools: Control: Mechanical, electrical, hydraulic, numerical, fluidic, basic principle of cam control, hydraulic controls, fluid controls, numerical controls, feedback systems, primary systems programming. Basic Devices, adaptive control.

Recommended Books

1. Mehta, 'Machine Tool Design', Tata McGraw Hill.
2. Sen & Bhattacharya, 'Principles of Machine Tools', New Central Book Agency.
3. Basu & Pal, 'Machine Tool Design', Oxford & IBH.
4. Acherkan, 'Machine Tool Design', Vol. I to IV, Mir Publishers.
5. Koerigsberger, 'Design Principles of Metal Cutting Machine Tools', Pergaman Press.

CUTTING TOOL DESIGN

Subject Code: PE-511 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Fundamentals of Cutting tools design, cutting tools and their principal elements, Tool geometry, system of nomenclatures and their interrelations, setting for the grinding of various basic cutting tool (turning, drilling, milling).

UNIT-II

Tool materials, developments of various tool materials, their relative characteristics, modern trend in tool development, concept of tool life.
Single point tools; purpose and principle types and their characteristics, design procedure of single point tools, design of various high production tools, design of carbide tools.

UNIT-III

Form tools; purpose and types, design procedure and sharpening.
Drills; purpose and principal types and their construction and geometry, development in the shape of twist drills analysis.

UNIT-IV

Milling Cutters; Purpose and types and their construction procedure of profile sharpened and form relieved cutters, design of hobs, analysis.
Broaches: Purpose and types, design features of various broaches.
Introduction of numerically controlled tools and their applications.

Recommended Books

1. Sen & Bhattacharya, 'Principles of Machine Tools', New Central Book Agency.
2. Arshinov & Alekreev, 'Metal Cutting Theory and Cutting Tool Design', Mir Publishers.
3. Shah, 'Principles of Metal Cutting', Oxford, IBH.

INDUSTRIAL TRIBOLOGY

Subject Code: PE-512 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Friction, wear and lubrication, types of egg. Contacts: conforming and non-conforming. Types of motion; rubbing sliding. Oscillating. Rolling. and Surface of interactions: elastic and plastic deformations. Properties of materials. Surface energy and flash temperature theory.

UNIT-II

Friction: Laws of sliding friction, concept of adhesion, Tabor's mode off friction elastic thermo friction, rolling friction, measurement of friction.

Wear: Laws of wear. Types of wear such as adhesive, delamination, abrasive, fatigue, corrosive, fretting, erosive, electrical and oxidative. Measurement of wear in dry at me sphere and different environments. Prevention and control of wear and friction in machines, wear of cutting tool and dies, study of abrasion in grinding, lapping and honing.

UNIT-III

Lubrication: Mechanisms of lubrication, Boundary. Squeeze film hydrodynamic and elasto hydro-dynamic and hydro static lubrications plasto hydrodynamic lubrication, solution of Reynolds's equation in two and three-dimensional flow. Pressure distribution load carrying capacity friction forces in oil film and Co-efficient of friction in joumal bearing. Sold lubricants types and applications.

Bearing Design: Design of bearing: clearance in journal bearing. minimum film thickness, sommar-field Number, Oil grooves and flow of oil in axial and circumferential grooves ca vi tat ions and turbulence in oil bearings. Heat generation and cooling or bearing Hydrostatic and dynamic and their applications in machine Tools. Design of air bearing and other gas bearing.

UNIT-IV

Rolling Friction: Reynold's slip, Heathe cote concept selection of roller bearings and their methods of lubrication design aspects and modes of bearing failures and elasto hydro dynamic lubrication.

Solid Lubricants: Their applications in metal forming processes.

Recommended Books

1. Aggarwal Sharma, 'A Test Book', Kataria.
2. 'Main Engg. Hand Book, A M/c Desig.', McGraw Hill.
3. B.S. Prabhu, 'Industrial Tribology, Tribology Failures and their Analysis'.

DIAGNOSTIC MAINTENANCE AND MONITORING

Subject Code: PE-513 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Introduction to maintenance techniques. Preventive and predictive Maintenance. Observational and Estimation Techniques.

UNIT-II

Non-Destructive Testing. Malfunction Analysis of Materials.

UNIT-III

Wear Analysis through thermography and Ferrography. Application of Diagnostic Maintenance to Industrial Machines and plants such as Sugar Industry, Textile Mills, Thermal Power plants and Railways.

UNIT-IV

Maintenance planning and control of a large factory, work planning and work control. Replacement Analysis.

Recommended Books

1. A. Kelly, 'Maintenance Planning and Control', Butterworth & Co., **1984.**

2. G. Krishanan, 'Maintenance and Spare Parts Management', Prentice Hall, **1991**.

ADVANCED OPERATIONS RESEARCH

Subject Code: PE-514 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Linear Programming: The Theory of simplex solution, alternative optimal solution, unbounded solutions, infeasible solutions, formulation of LP models for Production scheduling, network planning, inventory Maintenance and capital budgeting and similar industrial problems. Two phase method, revised simpler method and dual simplex method sensitivity analysis. The dual problem and its role for post optimality analysis. The transportation and assignment models. Travelling salesman model, and their industrial applications.

UNIT-II

Dynamic Optimization Models: Formulation of dynamic optimization models for common Industrial problems. Optimization of non-linear objective function by dynamic programming.
Non-linear Optimization Models: Non-linear objective queuing function o f unconstrained variables, quadratic programming.

UNIT-III

Queues Models: Queuing with single and parallel channels with limited and unlimited service. Bulk input, bulk service, priority queue discipline.
Simulation Models: Generation of Random number. Use of Coeff. random numbers for system simulation. Use of computers for system simulation.

UNIT-IV

Heuristic Models: Need for heuristic programming, examples of heuristic models for travelling salesman problems, facilities design and assembly line balancing.
Optimization Techniques: Introduction, theory and algorithms; classical method; non-linear optimization, unconstrained optimization, constrained optimization; langrangian multiplier method.

Recommended Books

1. Ackoff & Sasieni, 'Fundamental of Operation Research', Wiley Eastern.
2. Wagner, 'Principles of OR with Applications to Managerial Decisions', Prentice Hall.
3. Hillier & Lieberman Holder Day, 'Introduction to OR'.
4. P.K. Gupta & D.S. Hira, 'Operation Research'.

MANAGEMENT OF PRODUCTION SYSTEMS

Subject Code: PE-515 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Systems Theory and Concepts: Systems defined, functional elements of a system, general system theory, systems theory and organization, systems concept and management. The systems approach, planning and systems concepts. Control and systems concepts, Information and systems concepts.

UNIT-II

Quantitative Techniques of System Analysis: Systems analysis, problem solving, scientific method, mathematical analysis, models, computer techniques of analysis. Linear programming input output analysis, queuing Monte-Carlo techniques, Simulation, Industrial dynamics.

UNIT-III

Behavioural Aspects of System Design: The motivation factors in System design, leadership factors in system design. The need for systematic human relationships, the need for systems change, resistance to change, behavioural consequences of system changes, Microanalysis of complex, man machine open systems, concept as a basis of human integration, meeting the human and social problems.

Flow System: Increasing complexity in distribution and production, increasing cost of a distribution, the total flow system, planning the transformation, service system, integrating systems.

UNIT-IV

Program Management: Impact of advancing Technology, large scale integrating system. Program Management, concept functional stages of program-management organizational modifications, matrix organization, applications of program Management.

Management Cybernetics: Management cybernetics in controlling a manufacturing firm, production and inventory control systems, production, inventory, and employment control systems, the enterprise control systems.

Recommended Books

1. Eilon, 'Elements of Production Planning and Control', Macmillan.
2. Groover, 'Automatic Production System and Computer Integrated Manufacturing', Prentice Hall.
3. Hitachi, Taylor & Francis, 'Manufacturing Systems Engineering', Hitogni.
4. Baudin, Yourdon, 'Manufacturing Systems and Analysis'.
5. R.N. Nauhria & Rajnish Parkash, 'Management of Systems'.
6. Elwood, S. Buffa, 'Modern Production Management', Wiley, Eastern, **1984.**
7. Rishards I. Koin, 'Production/Operations Management', TMH, **1979.**

SIMULATION OF INDUSTRIAL SYSTEMS

Subject Code: PE-516 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

1. **Introduction and Overview:** concept of system, system environment, elements of system, system modeling, types of models, Monte Carlo method, system simulation, simulation - a management laboratory, advantages & limitations of system simulation, continuous and discrete systems.
2. **Simulation of Continuous Systems:** characteristics of a continuous system, comparison of numerical integration with continuous simulation system. Simulation of an integration formula.

UNIT-II

3. **Simulation of Discrete System:** Time flow mechanisms, Discrete and continuous probability density functions. Generation of random numbers, testing of random numbers for randomness

and for auto correlation, generation of random variates for discrete distribution, generation of random variates for continuous probability distributions-binomial, normal, exponential and beta distributions; combination of discrete event and continuous models.

4. **Simulation of Queuing Systems:** Concept of queuing theory, characteristic of queues, stationary and time dependent queues, queue discipline, time series analysis, measure of system performance, Kendall's notation, auto covariance and auto correlation function, auto correlation effects in queuing systems, simulation of single server queues, multi-server queues, queues involving complex arrivals and service times with blanking and reneging.

UNIT-III

5. **Simulation of Inventory Systems:** Rudiments of inventory theory, MRP, in-process inventory. Necessity of simulation in inventory problems, forecasting and regression analysis, forecasting through simulation, generation of Poisson and Erlang variates, simulation of complex inventory situations.
6. **Design of Simulation Experiments:** Length of run, elimination of initial bias, Variance, Variance reduction techniques, stratified sampling, antipathetic sampling, common random numbers, time series analysis, spectral analysis, model validation, optimization procedures, search methods, single variable deterministic case search, single variable non-deterministic case search, regenerative technique.

UNIT-IV

7. **Simulation of PERT:** Simulation of - maintenance and replacement problems, capacity planning, production systems, reliability problems, computer time sharing problem, the elevator system.
8. **Simulation Languages:** Continuous and discrete simulation languages, block structured continuous languages, special purpose simulation languages, SIMSCRIPT, GPSS SIMULA importance and limitations of special purpose languages.

Recommended Books

1. Loffick, 'Simulation and Modelling', Tata McGraw Hill.
2. Deo Narsingh, 'System Simulation with Digital Computer', Prentice Hall.
3. D.S. Hira, 'System Simulation', S. Chand & Co.
4. Meelamkavil, 'Computer Simulation and Modelling', John Willey.
5. Gerden, 'System Simulation', Prentice Hall.

MATERIALS TECHNOLOGY

Subject Code: PE-517 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Material science fundamentals. Properties of single and multiphase. Materials. Fatigue, creep and fracture process. Ferrous materials and alloying properties. Engineering properties of non-ferrous and refractory materials-ceramics, plastics, fibre reinforced and composite materials. Environmental degradation of materials and surface modification techniques. Non-Destructive testing.

Recommended Books

1. R.E. Reed Hill, 'Physical Metallurgy Principles', Van Nostrand.
2. Y.U. Lakhtin, 'Engineering Physical Metallurgy & Heat Treatment', Mir Publishers.

3. D.S. Clark & W.R. Varney 'Physical Metallurgy for Engineers', CBS.
4. R.A. Higgins, 'Engineering Physical Metallurgy', Part – I.
5. V. Raghavan, 'Solid State Transformation', Prentice Hall.
6. A.K. Jena & M.C. Chaturvedi, 'Phase Transformations in Materials', Prentice Hall.
7. A. Cottrell, 'An Introduction to Metallurgy', ELBS.
8. V. Raghavan, 'Material Science & Engineering'.
9. James F. Shackelford, 'Introduction to Material Science for Engineers', Macmillan Publishing co. New York.
10. Shirvastav, 'Non-Destructive Testing Techniques'.
11. 'Non-Destructive Testing', Hand Books of American Society of Non-Destructive Testing.

LAB.-I

Subject Code: PE-518 **L T P C**
0 0 2 1

One lab./field/industrial oriented project /problem will be allocated to each student related to the subjects related to the subjects taught in 2nd semester.

MECHATRONICS

Subject Code: PE-619 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Control Engineering: Open loop and closed loop control system, system components, hydraulic, thermal, pneumatic processes and their electrical analogies.

UNIT-II

Process Control: Concept of measurement of electrical and non-electrical parameters, displacement, force, temperature, pressure etc. and related signal conditioning techniques. Valves, drives and actuators, PID controllers, multivariable and multi-loop processes, basic circuits using pneumatic and PLC's.

UNIT-III

Sensors and Signal Conditioners: Transducers for Industrial processes, signal conditioning, output devices and displays.

UNIT-IV

Microprocessors and Interfacing: Microprocessors/ Microcontroller architecture and programming memory, Input/output operations and interfacing, peripherals, typical applications of Microprocessors, system design concept through case studies.

Recommended Books

1. Koren, 'Computer Control of Manufacturing System', McGraw Hill.
2. Groover, 'Production Systems and CIM', PHI.
3. Maleki, 'Flexible Manufacturing Systems', Prentice Hall.
4. B.C. Kuo, 'Feedback Control Systems', PHI.
5. E.O. Doeblin, 'Measurement Systems', McGraw Hill.

ROBOTICS AND INDUSTRIAL AUTOMATION

Subject Code: PE-620 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction to Robot Technology: Robot Physical configuration, basic Robot motions.
Types of Manipulators: Constructional features, advantages and disadvantages of various kinematic structures, servo and Non- servo manipulator. Actuators and Transmission System: Pneumatic, Hydraulic and Electrical actuators and their characteristics and control systems.

UNIT-II

Feed Back Systems and Sensors: Encoders and other feedback systems, vision, ranging systems, textile sensors.
Programming Languages: Description of VAN, RAII and other Languages.
Artificial Intelligence: Logged Locomotion, Export system.

UNIT-III

Concept of Spatial Description and Transformations: Manipulator Kinematics; Inverse manipulator, Kinematics Jacobians; velocities and static forces; manipulator dynamics, position control of manipulators, force control of manipulators, robot programming languages and systems. Concept of automation in Industry, mechanization and automation classification of automation systems.
Air Cylinders: Their design and mountings, pneumatic and hydraulic valves, flow control valves metering valves, direction control valves, hydraulic servo systems, pneumatic safety and remote control circuits.

UNIT-IV

Basis of Automated Work Piece Handling: Working principles and techniques, job orienting and feeding devices. Transfer mechanisms automated feed out of components, performance analysis. Assembly automation, automatic packaging and automatic Inspection.

Recommended Books

1. Groover and Elimmers (Jr.), 'CAD/CAM'.
2. 'CAD/CAM Handbook', Bed Ford Masschusettes.
3. 'Automation Production Systems & Computer Aided Manufacturing'.
4. Royen, 'Robotics for Engineers', MIT Press.
5. Paul, 'Robot Manipulators', MIT Press.
6. Hall & Hall, 'Robotics'.
7. Brady, 'Robot Motion', MIT Press.
8. Press man and Elimmers, 'Numerical Controlled Computer Aided Manufacturing', John Wiley & Sons. New York.

METROLOGY & INDUSTRIAL INSPECTION

Subject Code: PE-621 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Standards of Measurement: Line, End and Wavelength standards. Primary secondary and working standards. Limits, Fits & tolerances, Interchangeability, design & manufacture of

gauges, use of slip gauges, dial indicators, sine bars, auto-collimators, taper gauges, optical projectors and microscopes, straightness, flatness and square ness testing.

UNIT-II

Instruments for Measuring Surface finish & Roughness: Classes of instruments, the Taylor-Hobson tele surf, plastic replica techniques, numerical assessment of roundness.

Calibration of Working Standards by Interferometry: Application of interferometry, calibration of gauges by interference, by interference method, the gauge length interferometer, obliquity correction the absolute length gauge interferometer.

UNIT-III

The Calibration of Working Standards by Direct Comparison in Series: Different types of comparators, such as, the pneumatic, optical, electrical and electronic comparators principle of amplification magnification, sensitivity and response, the calibrations of end gauges in sets, ruling and calibration of standard scales.

UNIT-IV

Measurement of Gear and Screw Threads: Measuring methods for run out, pitch, profile, lead, backlash, tooth thickness, composite elements, inspection equipment quality control screw thread terminology, measurement over wires, one wire measurement, three wire measurement, standard specifications and formulas, tolerances, thread gauge measurement, measurement, measuring equipment, application of thread gauges.

Management of Inspection and Quality Control: Communication of specifications, the nature of dimensions, selection of gauging equipment, kind of inspection, quality control Management

Recommended Books

1. Taher, 'Metrology and Measuring Instruments'.
2. Miller, 'Dimensional Metrology'.
3. Khare & Vajpayee, 'Dimensional Metrology'.
4. R.K. Jain, 'Engineering Metrology'.
5. I.C. Gupta, 'Engineering Metrology'.
6. Michelon, 'Industrial Inspection Methods', Leno C. Harper & Brothers, NY, **1950**.
7. 'The Science of Precision Measurement', The DoALL Co, Des Plaines Illinois.
8. 'Inspection & Gauging', The Industrial Press, New York, **1951**.

COMPUTER AIDED PROCESS PLANNING

Subject Code: PE-622 **L T P C** **Duration: 45 Hrs.**

4 0 0 4

UNIT-I

Introduction: Traditional process planning, process planning elements, product design evaluation; selection of tooling and process parameters; operation sequence evaluation.

UNIT-II

Group Technology: Production, advantages; part families; classification and coding systems, production analysis. Design of machine cells.

UNIT-III

Production Systems at Operation Level: Manufacturing support systems and concepts at the level of production processes; computer generated time standards; machinability data system; cutting condition optimization.

Production Systems at Plant Level: Communication oriented production information and control system (COPICS); material requirements planning_ capacity planning; shop floor control and operation scheduling.

UNIT-IV

Automated Process Planning: Advantages of automated process planning; Standardization of manufacturing process plans; variant process planning_ its features_ and different stages; different variant systems; advantages and limitations of variant process planning; generative process planning; its features; design strategies; planning; modeling and coding scheme; decision mechanism for software; decision trees for process; process, information; artificial intelligence; overview & application; search strategies for AI production systems; resolution and reduction systems; knowledge acquisition; machine selection; cutting tool selection; software; various generative process planning systems; advantages of generative process planning systems; case studies.

Recommended Books

1. Chand & Wysk, 'An Introduction to the Automated Process Planning', Prentice Hall.
2. Groover & Zimmers, 'Computer Aided Design & Manufacturing', Prentice Hall.
3. Gallagher & Knight Ellis Hosewood, 'Group Technology; Prod. Method in Manufacturing'.
4. 'Principle of Artificial Intelligence', Verlag.
5. 'Automation; Pro6uction System & Computer Integrated Manufacturing', Prentice Hall.

METHODS ENGINEERING AND ERGONOMICS

Subject Code: PE-623 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction to Industrial Engineering and Productivity Measurement of Productivity: Introduction to work study, methods-study principles and motion economy, filming techniques and micro-motion analysis, Introduction to work measurement. Time study, performance allowances, work sampling, predetermined motion system, standard data system, job evaluation of merit rating. Wage incentive plans, MTM (Methods Time Measurement).

Introduction of Ergonomics: Man/machine/environment systems concept. Development of ergonomics.

UNIT-II

Design Approach: A new design, modification, of existing design, assessment of design. Limitation of man and machine with respect to each other, posture-standing at work, seated at work, work station heights and seat geometry. Human anthropometry and its use in work place layout, Analysis.

Controls: Hand controls and foot controls, location of controls and work place envelope. Recommendation about hand and foot push buttons, rotary selector switches, hand wheels, crank levers etc. Instruments and displays.

UNIT-III

Work Load: Static and dynamic muscular work. Human motor activity, metabolism, physical work load, measurement of physical work load, mental work load, measurement of mental work load, repetitive and inspection work, work duration and rest pauses, principles of motion economy, Analysis.

UNIT-IV

Climates:

a) **Heat Humidity:** Body heat balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance.
b) **Vibration:** Terminology, Response of body to low frequency (LF) vibration, vibrations and discomfort, effect on health of worker, high frequency vibration, effect of H.F. vibrations, methods of reducing vibrations, analysis.
c) **Noise:** Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent thresh hold shift, effect of noise on performance, reduction of noise, personal noise protection. Analysis.

Recommended Books

1. E.V. Krick, 'Methods Engineering Study'.
2. H.S. Shah, 'Work Study and Ergonomics', Dhanpat Rai & Sons, **1992**.
3. Bridger, 'Introduction of Ergonomics', Tata McGraw Hill, **1995**.
4. O.P. Khanna, 'Work Study', Dhanpat Rai & Sons, **1995**.
5. Lyle, F. Yerges, 'Sound, Noise and Vibration Control', Van Nostrand, **1978**.

PRODUCT DESIGN AND DEVELOPMENT

Subject Code: PE-624 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Importance of product design in industry. Principal requirements of good product design. Factors and considerations affecting product design. Ergonomic factor in product design.

UNIT-II

Product design methodology and techniques. Basic elements and concepts of visual design.

UNIT-III

Materials, forms, function and color relationships. Product graphics, product development and testing. Packaging materials their characteristics and applications. Packaging design considerations.

UNIT-IV

Value engineering, concept, advantage and applications. Value, types of values. Analysis of function, using and evaluating functions. Value engineering techniques. Value control.

Recommended Books

1. Mayall, 'Industrial Design', McGraw Hill.
2. Niebel & Draper, 'Product Design & Process Engineering', McGraw Hill.
3. Asimov, 'Introduction to Design', Prentice Hall.
4. Mudge, 'Value Engineering', McGraw Hill.

ENTREPRENEURSHIP

Subject Code: PE-625 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Introduction: Factors leading to Industrial Development Entrepreneur definition and various concepts, self-awareness. Motivational aspects, attitude development, creativity, copying with uncertainties, resilience.

UNIT-II

Information: Industrial potential, environmental scanning, Identification of opportunities, dynamics of an opportunity, business opportunities recognition. Government policy for Industrial development. Choice of Technology Research for patents, product development.

UNIT-III

Planning: Planning of an Industrial unit, project planning, identification of market and demand for product, role of significant variables, execution of projects legal aspects, financial aspects and labour laws, feasibility studies, sectoral, Industrial and unit level feasibility, exposure to past, present and future.

UNIT-IV

Entrepreneurial Management: Business finance Management through elementary concept break even, working capital knowledge of various institutions and their mode of assistance. Elements of Production processes, quality control, Inspection methods. Production planning group dynamics.

Recommended Books

1. V.G. Patel, 'Entrepreneurship Development Programme in India and its Relevance to Developing Countries', EDI, Ahmedabad, India, **1987.**
2. 'Developing of New Entrepreneurship', EDI, Ahmedabad, India, **1987.**
3. G.R. Jain and M.A. Ansari, 'Self –made Impact making Entrepreneurship', EDI, Ahmedabad, India, **1988.**

STATISTICS AND RELIABILITY ENGINEERING

Subject Code: PE-626 **L T P C** **Duration: 45 Hrs.**
4 0 0 4

UNIT-I

Statistics: Introduction; Principal uses of Statistics, Sampling, Frequency Distributions; Normal Distribution; Logarithmic normal distribution; Poisson distribution; correlations; Probability, Tests of significance; the Chi-Square tests; Differences in means of large samples; Differences in means of small samples; The t-test; Confidence limits; Analysis of Variances; Time Series, Monte-Carlo Method.

UNIT-II

Reliability: Introduction, Reliability concepts and patterns of failure; Reliability Management; Reliability for system effectiveness.

Reliability and Hazard Rates: Failure data; Reliability function; Failure rate and hazard rate; Common distributions in failure Mechanisms-Exponential, Weibull, Gamma, Lognormal Extreme Value; Model selection for component failures; Failure analysis.

UNIT-III

Reliability Prediction and Analysis: Reliability prediction based on Exponential Distribution; System Reliability analysis- Block diagram method, fault tree and sconces tree methods, event tree method, failure mode, failure mechanisms.

UNIT-IV

Reliability Design: Design for Reliability, Design process, assessment methodology, Reliability allocation, Reliability improvements, Selection of Components to improve system Reliability.

Recommended Books

1. A.K. Gupta, 'Reliability Engg. & Terotechnology', Macmillan India Ltd., Delhi, **1996.**
2. E.E. Levis, 'Introduction to Reliability Engg.', Wiley & Sons, New York.
3. L.S. Shrinath, 'Reliability Engg.' Affiliated East West Press.
4. R.A. Johnson, 'Probality and Statisties for Engineers', Prentice Hall of India Pvt. Ltd., New Delhi, **1995.**

PG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

PG OPEN ELECTIVES-I 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
MITE0-F91	Software Project Management	M.Tech. IT, M.Tech. IT & CW, M.Sc. IT
MCSE0-F91	Soft Computing	M.Tech. CSE, M.Tech. CSE (Software Engineering), M.Tech. CSE (Computer Network and Information Security), M.Tech. CSE (E-Security), M.Sc. CSE
MCSE0-F92	Big Data Analytics Concepts	
MCSE0-F93	Management Information System	
MCSE0-F94	Advanced Data Structures	
MBAD0 - F91	Principles and Practices of Management	M.B.A.
MBAD0 - F92	Total Quality Management	
MBAD0 - F93	Human Resource Management	
MBAD0 - F94	Marketing Management	
MBAD0 - F95	Project Management	
MTEX0-F91	Textile Chemistry-I	M.Tech. Textile Engg.
MCAP0-F91	Computer Applications in Business	MCA, PGDCA
MPHY0-F91	Physics of Materials	M.Sc. Physics
MMAT0-F91	Statistical Methods	M.Sc. Mathematics
MMEE0-F91	Industrial Safety & Environment	M.Tech. Mech. Engg., M.Tech. ME (Automation & Robotics), M.Tech. ME (CAD/CAM), M.Tech. ME (Industrial & Production), M.Tech. ME (Production), M.Tech. ME (Thermal Engg.)
MMEE0-F92	Supply Chain Management	
MMEE0-F94	Industrial Automation & Robotics	
MCIE0-F91	Environment Management	M.Tech. Civil Engg., M.Tech. CE (Infrastructural Engg.), M.Tech. CE (Geotechnical Engg.), M.Tech. (Structural & Foundation Engg.), M.Tech. CE (Construction

		Technology Management), M.Tech. CE (Structure Engg.)
MCHM0-F91	Oils and Fats	M.Sc. Chemistry
MECE0-F91	Computer Networks	M.Tech. Electronics & Instrumentation, M.Tech. ECE (Microelectronics), M.Tech. ECE (Embedded System), M.Tech. ECE (Signal Processing)
MECE0-F92	Digital Signal Processing	
MECE0-F93	Sensors & Transducers	
MECE0-F94	Electronic System Design	
MECE0-F95	Digital Circuits & Logic Design	
MELE0-F91	Advanced Electrical Machines	M.Tech. Electrical Engg., M.Tech. EE (Power System), M.Tech. EE (Instrumentation and Control Engg.)
MELE0-F92	Load Forecasting and Load Management	
MELE0-F93	Neural Networks & Fuzzy Logic	
MELE0-F94	Engineering Optimization	
MBAD0-FX0	Managing Supply Chain	---
MMAT0-F94	Design of Experiments	M.Sc. Mathematics
	Enterprise Resource Planning (ERP)	
	Relational Database Management System (RDBMS)	

SOFTWARE PROJECT MANAGEMENT

Course Code: MITE0-F91 **L T P C** **Contact Hrs.**

3 0 0 3

Unit-1

Project Management Fundamentals- Basic Definitions, Project Stakeholders and Organizational, Influences on Project Management, Project Management Processes, Project Initiating Processes

Unit-2

Planning and Resourcing a Project - Identifying Requirements, Creating the Work Breakdown structure, Developing the Project Schedule, developing a Project Cost Estimate, Planning Quality, Organizing the Project Team, Planning for Potential Risks

Unit-3

Executing and Managing a Project - Project Executing Processes- Acquiring and Developing the Project Team, Managing the Project Team, Managing Stakeholder Expectations, Directing and Managing the Project while assuring Quality

Unit-4

Project Monitoring and Controlling Processes - Verifying and Controlling Scope, Managing Schedule and Cost, Controlling Quality, Monitoring and Controlling Risks. Integrated Change Control, Project Closing Process - Closing a Project

Recommended Books:

1. Software Engineering - Somerville (Addison Wesley)
2. Software Engineering-Pressmen.

SOFT COMPUTING

Subject Code-MCSE0-F91 **L T P C** **Duration – 45 hrs**

3 0 0 3

COURSE OBJECTIVES

The objective of this Course is to teach basic neural networks, fuzzy systems, Genetic Algorithms and optimization algorithms concepts and their relations**.**

COURSE OUTCOMES

CO1: Able to comprehend techniques and applications of Soft Computing in real world problems.

CO2: Able to follow fuzzy logic methodology and design fuzzy systems for various applications.

CO3: Able to design feed forward Artificial Neural Networks (ANN) and implement various methods of supervised COURSE.

CO4: Able to design feedback Artificial Neural Networks (ANN) and implement various methods of unsupervised COURSE

CO5: Able to appreciate the methodology of GA and its implementation in various applications.

COURSE CONTENT

UNIT-I (11 hrs)

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Fuzzy Logic: Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation.

Fuzzy rule base system: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS) – Mamdani Fuzzy Models – Sugeno Fuzzy

Models – Tsukamoto Fuzzy Models, Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic.

UNIT-II (12 hrs)

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. COURSE rules and equations: Perceptron, Hebb's, Delta, winner take all and out-star COURSE rules. Supervised COURSE Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Associative memory networks, Unsupervised COURSE Networks: Competitive networks, Adaptive Resonance Theory, Kohnen Self Organizing Map

UNIT-III (11 hrs)

Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA.

UNIT-IV (11 hrs)

Hybrid Soft Computing Techniques: An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems

RECOMMENDED BOOKS

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications', 1st Ed., PHI Publication, **2003**.
2. S.N. Sivanandam& S.N. Deepa, 'Principles of Soft Computing', 2nd Ed., Wiley Publications, **2008**.
3. Michael Negnevitsky, 'Artificial Intelligence', 2nd Edn., Pearson Education, New Delhi, **2008.**
4. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 3rd Edn., Wiley, **2011.**
5. Bose, 'Neural Network fundamental with Graph, Algoithm. & Application', TMH, **2004**.
6. Kosko, 'Neural Network & Fuzzy System', 1st Edn., PHI Publication, **2009.**
7. Klir &Yuan, 'Fuzzy sets & Fuzzy Logic: Theory & Application', PHI, **1995**.
8. Hagen, 'Neural Network Design', 2nd Edn., Cengage COURSE, **2008**.

BIG DATA ANALYTICS AND CONCEPTS

Subject Code: CSE0-F92 **L T P C** **Duration – 45 hrs**

3 0 0 3

UNIT-I (10 Hrs.)

Introduction to Big Data – Distributed File system – Big Data and Its importance, Traits of Big Data, Challenges of Conventional System, Web Data, Four V's, Drivers for Big data, Big Data Analytics, Applications of Big Data

Introduction to Map Reduce: The Map Tasks, grouping by Key, the reduce Tasks, Combiners, Details of Map Reduce Execution, Coping with Node Failures. Algorithms Using Map Reduce: Matrix-Vector Multiplication, Computing Selections and Projections, Union, Intersection, and Difference, Natural Join.

UNIT-II (12 Hrs.)

Introduction to Hadoop - Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

Hadoop Architecture - Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode,

Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT-III (9 Hrs)

HADOOP Ecosystem: Hadoop Ecosystem Components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features - Name Node High Availability, HDFS Federation, MRV2

YARN Architecture: Background of YARN, Advantages of YARN, Different Commands in YARN, Running MRVL in YARN

UNIT –IV (9 Hrs)

HIVE – HIVE Architecture and Installation, Comparison with Traditional Database,

HIVEQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Sub -queries

HBASE Concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBASE uses Zookeeper and how to Build Applications with Zookeeper.

Recommended Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, 'Professional Hadoop Solutions', Wiley Publications, **2015**
2. Chris Eaton, Dirk deroos et al., 'Understanding Big data', McGraw Hill, **2012**
3. Tom White, "HADOOP: The definitive Guide" , O Reilly **2012**
4. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing **2013**
5. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, **2014**

MANAGEMENT INFORMATION SYSTEM

Course Code: MCSE0-F93 **L T P C** **Contact Hrs. 45**

3 0 0 3

COURSE OBJECTIVES

The objective of this Course is to introduce the students to the Management Information Systems and its application in organizations. The Course would expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in Management Information Systems.

COURSE OUTCOMES

CO1 Students would be able to understand the usage of MIS in organizations and the constituents of the MIS.

CO2 Effectively using and administrating information Systems in different business settings **CO3** to illustrate how current technologies and decision- support tools can be utilized to the advantage of business operations

CO4 to explain fundamental concepts of data communications, computer networking and the related hardware

UNIT-I (10 Hrs.)

Introduction: Definition information system, role and impact of MIS, the challenges of Information system, Nature of MIS, Characteristics of MIS, Myths regarding MIS, Requirements of MIS, Problems & Solutions in implementing MIS, Benefits of MIS, Limitations of MIS, Significance of MIS, Components of MIS. Role of MIS, Major Management challenge to building and using information system in Organization, functions of management.

UNIT-II (12 Hrs.)

Information system and Organizations: The relationship between Organization and Information System, Information needs of different organization levels: Information concept as quality product, classification and value of information, methods of data and information collection. Strategic role of information system, Salient features of Organization, Information, management and decision making, How Organization affect Information Systems, How Information system affect Organization, Ethical and Social impact of information system.

UNIT-III (12 Hrs.)

Business application of Information System: Foundation Concepts Information systems in Business: Information system and technology, Business Applications, Development and Management. The internetworked E-business Enterprise: Internet, and Extranet in business. Electronic Commerce System: Electronics commerce Fundamentals, Commerce Application and issues. E-business Decision Support: Decision support in E-Business, Artificial Intelligence Technologies in business.

UNIT-IV (11 Hrs.)

Technical Foundation of Information System: Computers and information processing, Computer Hardware, Computer software, Managing data resources, Telecommunication, Enterprise: wide computing and networking.

Strategic and Managerial Implications of Information Systems: Strategic Information System: Introduction, Characteristics of Strategic Information Systems, Strategic
Information Systems (SISP), Strategies for developing an SIS, Potential Barriers to developing a Strategic Information System (SIS),
Decision Support System (DSS): Decision making concepts, methods, tools and procedures. Managing Information Resources: Introduction, IRM, Principal of Managing
Information Resources, IRM functions, Computer Security: Introduction, Computer Security, Types of Computer Security, Disaster Recovery Plan.

Recommended Books:

1. W.S. Jawadakar, 'Management Information System', 3rd Ed, McGraw Hill, **2006.**
2. J. O. Brien, 'Management Information System', 9th Edn., TMH, **2008**.
3. Uma G, Gupta, 'Management Information System', 5th Edn., TMH.
4. Kenneth C. Laudon, 'Management Information System Organization and Technology' 14th Edn., TMH, **2016**.
5. Jane P. Laudon, Kenneth C. Laudon, 'Essentials of Management Information System', 11th Edn., Pearson, **2017.**

ADVANCED DATA STRUCTURES AND ALGORITHMS

Subject Code-MCSE0-F94 **L T P C** **Duration – 45 Hrs.**
3 0 0 3

COURSE OBJECTIVES

To learn the advanced concepts of data structure and algorithms and its implementation. The Course has the main ingredients required for a computer science graduate and has all the necessary topics for assessment of data structures and algorithms.

COURSE OUTCOMES

CO1 Ability to apply and implement various data structures to algorithms and to solve problems.

CO2 Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
CO3 Ability to apply various traversing, finding shortest path and text pattern matching algorithm.
CO4 Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

UNIT-I (12 Hrs.)

Introduction to Basics: Significance and need of various data structures and algorithms, Arrays, linked lists, Stacks, Queues, Priority queues, Heaps; Strategies for choosing the appropriate data structures.

Advanced Data Structures: Binary Search Tree**,** AVL Trees, Red-Black Trees, Splay Trees, B-trees, Fibonacci heaps, Data Structures for Disjoint Sets, Augmented Data Structures.

UNIT-II (11 Hrs.)

Algorithms Complexity and Analysis: Probabilistic Analysis, Amortized Analysis, Competitive Analysis, Internal and External Sorting algorithms: Quick Sort, Heap Sort, Merge Sort, Counting Sort, Radix Sort.

UNIT-III (11 Hrs.)

Graphs & Algorithms: Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, bridges, Depth- and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Max flow: Ford-Fulkerson algorithm, max flow – min cut.

String Matching Algorithms: Suffix arrays, Suffix trees, Brute Force, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore algorithm.

UNIT-IV (11 Hrs.)

Approximation algorithms: Need of approximation algorithms: Introduction to P, NP, NP-Hard and NP-Complete; Deterministic, non-Deterministic Polynomial time algorithms; Knapsack, TSP, Set Cover, Open Problems.

Randomized algorithms: Introduction, Type of Randomized Algorithms, 2-SAT; Game Theoretic Techniques, Random Walks.

RECOMMENDED BOOKS

1. E. Horowitz, S. Sahni and Dinesh Mehta, 'Fundamentals of Data structures in C++', Galgotia, **1999**.
2. Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, 'Introduction to Algorithms', 3rd Ed., PHI, **2009**.
3. Adam Drozdex, 'Data Structures and algorithms in C++', 2nd Ed., Thomson COURSE – vikas publishing house, **2001**.
4. G. Brassard and P. Bratley, 'Algorithmics: Theory and Practice', Prentice –Hall, **1988**.

PRINCIPLES AND PRACTICES OF MANAGEMENT

Subject Code: MBAD0-F91 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: This Course aims to provide a thorough and systematic coverage of management theory and practice. The Course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management. It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals.

UNIT-I (10 Hrs.)

Introduction to Management: Definition, Nature, Significance and Scope. Functions of Manager, An Overview of Management Functions. Is managing a science or art? Evolution of Management Thought: Classical Approach, Scientific Management, General Administrative Theory, Quantitative Approach, Behavioral Approach, System approach and Contingency approach.

UNIT-II (10 Hrs.)

Planning and Decision Making: Types of Plans and Process of Planning, Nature of Objectives, Setting Objectives. Importance and Steps in Decision Making, Types of Decision and Decision Making Under Different Conditions. Group Decision Making. Decision Making Styles

Organizing: Nature and Significance, Process of Organizing, Bases of Departmentation, Delegation and Decentralization, Line & Staff relationship

Delegation: Concept and Elements. Authority, Responsibility, Accountability

UNIT-III (10 Hrs.)

Coordination: Concept and Importance, Factors which Make Coordination Difficult, Techniques or Methods to Ensure Effective Coordination.

Control: Concept, Planning-Control Relationship, Process of Control, Traditional & Modern Techniques of Control

UNIT-IV (10 Hrs.)

Management by Objectives: Concept, Benefits and Weaknesses, Comparative Study of Indian, Japanese and American Management Culture

Current Trends in Management Practices: Workforce Diversity, e-Business

Course Outcomes: After completing the Course student will be able to understand and explain the concept of management and its managerial perspective. It will equip students to map complex managerial aspect arise due to ground realities of an organization. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

Recommended Books

1. Heinz Weihrich, Cannice & Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Weihrich, 'Essentials of Management: An international Perspective', Tata McGraw Hill.
3. Stephen Robbins & Mary coulter, 'Management', Pearson Education
4. VSP Rao & VH Krishna, 'Managemen't', Excel Books
5. P. Subba Rao, 'Principles of Management', Himalaya Publishing

TOTAL QUALITY MANAGEMENT

Subject Code: MBAD0-F92 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

UNIT-I (10 Hrs.)

Quality and Total Quality Management: Excellence in manufacturing/service, factors of excellence, relevance of TQM. Concept and definition of quality: Total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM

UNIT-II (10 Hrs.)

Just-in-time (JIT): Definition: Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation.
Customer: Satisfaction, data collection and complaint, Redressal mechanism.

UNIT-III (10 Hrs.)

Planning Process: Policy development and implementation; plan formulation and implementation.
Process Management: Factors affecting process management, Quality function development (QFD), and quality assurance system.
Total Employees Involvement (TEI): Empowering employees: team building; quality circles; reward and Recognition; education and training, Suggestion schemes.

UNIT-IV (10 Hrs.)

Problems solving: Defining problem, Problem identification and solving process, QC tools.
Benchmarking: Definition, concept, process and types of benchmarking
Quality Systems: Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003.
Advanced techniques of TQM: Design of experiments: failure mode effect analysis: Taguchi methods.

Recommended Books

1. Sunder Raju, 'Total Quality Management', Tata McGraw Hill.
2. M. Zairi, 'TQM for Engineers', Aditya Books.
3. J.L. Hradeskym, 'Total Quality Management Handbook', McGraw Hill.
4. Dalela and Saurabh, ISO 9000 quality System, Standard Publishers.

HUMAN RESOURCE MANAGEMENT

Subject Code: MBAD0-F93 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

COURSE Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

UNIT-I (10 Hrs.)

Human Resources Management: Meaning, Scope, Objective, Functions, Roles and Importance. interaction with other functional areas. HRM & HRD a comparative analysis. Human Resource

Planning: Meaning, Process & Methods of Human Resources Planning, Importance of HRIS. Job Analysis, Job Description, Job Specification. Concept of Job Evaluation

UNIT-II (10 Hrs.)

Recruitment & Selection: Concept, Process & Methods. Concept of Induction & Placement. Training & Development: Concept & Methods, Difference Between Training & Development, Internal Mobility: Promotion, Transfer, Demotion, Separation.

UNIT-III (10 Hrs.)

Performance Appraisal: Concept, methods & Process. Compensation Management- Wage & Salary Administration, Elements & Methods of Wage & Salary, Incentive Plans & Fringe Benefits, Quality of work life (QWL): Meaning, Development and Various Approaches of QWL, Techniques for improving QWL.

UNIT IV (10 Hrs.)

Industrial Relations: Meaning and importance. Collective Bargaining, Participative Management, Employee Grievances and their Resolution, Quality Circles, HR Audit, Contemporary Issues in HRM, Trade Union in India, Safety Provisions under Factories Act 1948, Social Security, ESI Act 1948.

Outcomes: After completing this Course the students should be able to understand the concepts, principles and processes of HRM, understand the crucial role that HRM plays in helping organizations all over the world adapt to the endless change today.

Recommended Books

1. Edwin B. Flippo, 'Personal Management', Tata McGraw Hill.
2. Bohlander, Snell &Vohra, 'Human Resource Management', Cengage COURSE.
3. Gary Dessler, 'Human Resource Management', McMillan.
4. V.S.P. Rao, 'Human Resource Management', Excel Books.
5. C.B. Mamoria, 'Personal Management', Himalaya Publications.
6. T.N. Chabbra, 'Human Resource Management', Dhanpat Rai & Sons.
7. C.B. Gupta, 'Human Resource Management', Sultan Chand and Sons.
8. R.S. Dwivedi, 'HRD in India Companies', Himalaya Publications.

MARKETING MANAGEMENT

Subject Code: MBAD1-F94 **L T P C** **Duration: 40 Hrs.**

3 0 0 3

COURSE Objectives: The Course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm in turbulent business environment. This Course will provide better understanding of the complexities associated with marketing functions, strategies and provides students with the opportunity to apply the key concepts to practical business situations.

UNIT-I (10 Hrs.)

Understanding Marketing and Consumers: Definition, Importance, Scope, Various Marketing Concepts, Marketing Mix, Marketing vs Selling

Consumer Behaviour: Understanding Consumer Behaviour, Factors Influencing Consumer Buying Behaviour, Business Buying Process, Understanding Business Buyer Behaviour.

UNIT-II (10 Hrs.)

Creating and Managing Product: Market Segmentation, Differentiation, Targeting and Positioning, Competitors Analysis.
Product Decisions: Product Mix, New Product Development, Product Life Cycle and Strategies.
Pricing Decisions: Objectives, Factors Affecting Pricing Decisions, Pricing Methods, Pricing Strategies

UNIT–III (10 Hrs.)

Delivering and Promoting Product: Supply Chain Decisions: Nature, Types, Channel Design and Channel Management Decisions, Retailing, Wholesaling, Managing Logistics and Supply Chain.
Promotion Decisions: Communication Process, Promotion Mix

UNIT–IV (10 Hrs.)

Emerging Trends in Marketing: Green Marketing, Network Marketing, Direct Marketing, Social Marketing, Viral Marketing, Customer Relationship Management (CRM), Rural Marketing
E-Commerce: Marketing in The Digital Age.
Note: Relevant Case Studies should be discussed in class.

Recommended Books

1. Kotler & Koshy, 'Marketing Management', Pearsons Education.
2. Ramaswamy & Nama kumari, 'Marketing Management', McMillan.
3. Etzel, Walker, Stanton, and Pandit, 'Marketing Management', Tata McGraw Hill.
4. Kurtz & Boone, 'Principles of Marketing', Cengage COURSE.
5. Kotler & Armstrong, 'Principles of Marketing', Prentice Hall.
6. Biplab S. Bose, 'Marketing Management', Himalaya Publications.
7. Subhash c. Jain, 'Marketing Management', Cengage COURSE.
8. Rajan Saxena, 'Marketing Management', Tata McGraw Hill.

PROJECT MANAGEMENT

Subject Code: MBAD0- F95 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

COURSE Objectives: To acquaint the students with the steps involved in the planning, implementation and control of projects.

UNIT-I (10 Hrs.)

Project Management Concepts Attributes of a Project, Project Life Cycle, The Project management Process, Benefits of Project Management, Needs Identification,

UNIT-II (10 Hrs.)

Project Selection, preparing a Request for Proposal, Soliciting Proposals, Project organization, the project as part of the functional organization, pure project organization, the matrix organization, mixed organizational systems.

UNIT-III (10 Hrs.)

Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure, project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT/ CPM)/GERT, Resource allocation, Crashing and Resource Sharing

UNIT-IV (10 Hrs.)

Project Monitoring and Control and Project Performance: Planning, Monitoring and

Control; Design of monitoring system, Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators.

Note: Relevant Case Studies should be discussed in class.

Recommended Books

1. Kanda, 'Project Management – A Life Cycle Approach', PHI.
2. Gido, 'Project Management', Cengage COURSEs.
3. Vasant Desai, 'Project Management' Himalaya Publications.
4. Maylor, 'Project Management', Pearson Education.
5. Prasanna Chandra, 'Projects, Preparation, Appraisal Budgeting & Implementation', Tata McGraw Hills.

TEXTILE CHEMISTRY – I

Subject Code: MTEX0-F91 **L T P C** **Contact Hrs.-40**

3 0 0 3

UNIT-I (10 Hrs.)

Introduction: Process line for pretreatment, colouration and finishing of textiles

Singeing: Object of the process, types of singeing, details of various singeing methods, drawbacks and advantages. Process and quality control aspects involved.

Desizing: Object, types, method details and mechanism of removal of starch in various methods. Efficiency of desizing.

Scouring: Objectives, mechanism of removal of impurities, recipe and controlling parameters involved. Scouring of coloured textiles. Scouring of natural, man-made and blended textiles. Evaluation of scouring efficiency.

UNIT-II (10 Hrs.)

Bleaching: Objectives of bleaching. Hypochlorite, peroxide, chlorite and peracetic acid bleaching methods and their effectiveness on various textiles. Controlling parameters and mechanism involved in each method. Efficiency of bleaching.

Mercerization: Objectives, mechanism related to various physical and chemical changes in cotton during mercerization. Process parameters and operation details. Causticization. Wet and hot mercerization. Ammonia treatment of cotton. Performance of various mercerization /alkali treatment processes. Assessment of efficiency of mercerization: Barium activity number, its determination and interpretation.

Pretreatment machineries: Singeing m/c, J-box, kier, mercerizing machine,

UNIT-III (10 Hrs.)

Heat setting: Objectives and mechanism of setting. Different methods of heat setting and their effectiveness on various man made textiles and blends. Heat setting conditions and controls. Heat setting of polyester, nylon, acetate and their blends. Evaluation of degree of heat setting.

Mechanical Finishes: Physical and chemical softening processes, selection of chemical and evaluation of softening. Calendaring - its types, construction and function of various calendaring m/cs. Sanforizing - method, mechanism and machineries involved. Evaluation of sanforizing.

UNIT-IV (10 Hrs.)

Carbonization: Objectives, selection of chemical, process details, trouble shoots, precautionary measures and efficiency of carbonization.

Functional finishes: Problem of creasing, anti-crease finish on cotton. Choice of chemical, catalyst and process parameters. Drawback and advantages associated with use of various anti-crease chemicals. Measures to reduce release of formaldehyde. Water repellency and water repellent finishes on cotton. Evaluation of water repellency.

Recommended Books

1. A.K. Roy Choudhary, 'Textile Preparation & Dyeing', Science Publishers USA, **2006**.
2. R.H. Peters, 'Textile Chemistry', Vol - II, Elsevier Publishing Company, London, **1967**.
3. R.M. Mittal and S.S., Trivedi, 'Chemical Processing of polyester / cellulosic Blends',
4. Ahmedabad Textile Industries Research Association, Ahmedabad, India, **1983.**
5. S.R. Karmakar, 'Chemical Technology in the Pretreatment Processes of Textiles', Textile
6. Science & Technology Series, Vol-12, 1st Edn., Elsevier, **1999**.
7. A.J. Hall, 'Textile Finishing', Haywood Books, London, **1996.**
8. V.A. Shenai, 'Technology of Bleaching& Mercerization'.
9. Vaidya, 'Textiles Auxiliaries& Finishing Chemicals'.
10. V.A. Shenai and N.M., Saraf, 'Technology of Textile Finishing', Sevak Publications, Mumbai, **1990.**

COMPUTER APPLICATIONS IN BUSINESS

Subject Code: MCAP0-F91 **L T P C** **Contact Hrs.-40**

3 0 0 3

Course Objectives: The objective of this Course is to provide an insight into basic features of computer systems and their applications in Managerial Decision Making. It also provides technical framework to students for understanding the emerging world of e-Business.

UNIT-I (10 Hrs.)

Introduction to Computers: Types of Computers, Storage Devices and Memories, Input/Output devices. Introduction to Software, Types of software – Software: its nature and qualities. Operating System: Types of Operating System, WINDOWS XP: Basic Operations, utilities and features.

UNIT-II (10 Hrs.)

MS Applications: MS Word **–** Basics, formatting text and documents, Mail Merge, Macros
MS Excel – Introduction, Creating a List, Graphs and Charts, Sorting, Filtering Data, Goal seek, Pivot tables, Freezing Panes, What-if Analysis, Splitting Windows, Basic Formulae in Excel.
MS PowerPoint – Basics, Creating effective presentation, Animations and Templates.
MS Access – Designing of Forms, Report generation using wizard.

UNIT-III (10 Hrs.)

Internet and E-Business: Introduction to internet and its applications, Intranet and Extranet, World Wide Web, Internet, Architectures, Internet Applications. E – business - E-Business framework, Infrastructure for E-Business, E - Shopping, Electronic Data Interchange, Components of Electronic Data Interchange, Creating Web Pages using HTML, Electronic Payment System.

UNIT-IV (10 Hrs.)

Computer Networks and Security: Overview of a Network, Types of Network, Network Topologies, Firewall, Encryption v/s Decryption, Cryptography, Public Key and Private Key, Digital Signatures.

COURSE Outcomes: Students will able to understand the concepts of computer and various software related to it. The use of MS Office (Excel, Access & Power point) helps in different

type of analysis and projection of reports related to the business management. The software helps in planning & coordinating the supply chain of the company.

Recommended Books:

1. Rainer and Potter, 'Introduction to Information Technology', John Wiley and Sons.
2. Roger Jennings, 'Microsoft Access 2010', Pearson Education.
3. Forouzan, 'Basics of Computer Science', Cengage COURSE.
4. Joseph Brady & Ellen F Monk, 'Problem Solving Cases in Microsoft, Excel Thomson COURSE'.
5. K. Saini & Pradeep Kumar, 'Computer Applications in Management', Anmol Publications.
6. Deepak Bharihoke, 'Fundamentals of Information Technology', Excel Books.

PHYSICS OF MATERIALS

Subject Code: MPHY0-F91 **LT P C** **Contact Hrs.-48**

3 0 0 3

UNIT-1 (12 Hrs.)

Polymer Materials

Polymer Structure: Molecular Weight, Shape, Structure and Configuration; Thermoplastic and Thermosetting, Mechanical Behavior of Polymers-stress strain behavior, Macroscopic and Viscoelastic deformation, Fracture of polymers, Mechanical Characteristics-Fatigue, Tear Strength and Hardness, Mechanisms of Deformation and strengthening of polymers. Crystallization, Melting and Glass Transition Phenomena in Polymers.

UNIT-II (12 Hrs.)

Composite Materials

Introduction, Particle-Reinforced Composites-Large, Fiber-Reinforced Composites: Influence of Fiber Length, Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic-Matrix Composites.

UNIT-III (11 Hrs.)

Nano-Materials

Emergence of Nanotechnology, Micro to Nanoscale materials, Characteristics of Nanomaterials-Band gap, surface to volume ratio, Electron confinement for zero, one and two dimensional nanostructures, synthesis of nanomaterials with top down and bottom up approach, Methods of Synthesis- ball milling, sol-gel, Electro-spinning and Lithography techniques, Carbon nanotubes (synthesis and properties), applications of nanomaterials.

UNIT-IV (13 Hrs.)

Electrical, Magnetic and Thermal Properties of Materials

Electrical properties of materials: Conduction in ionic materials, Dielectric behavior, Field vectors and polarization types, Frequency dependent dielectric constant, Other Electrical characteristics of materials and its applications: Ferroelectricity, Piezoelectricity.

Magnetic Properties of Materials: Magnetic materials and its classifications, Domain and Magnetic Hysteresis, Magnetic storage, Magnetic Anisotropy, Soft and Hard magnetic materials.

Thermal properties of materials: Heat capacity, Thermal expansion, Thermal conductivity and Thermal stresses.

Recommended Books:

1. William D. Callister, 'Materials Science and Engineering: An Introduction', 4th Edn., John

Wiley & Sons, Inc.
2. G.M. Chow & K.E. Gonsalves, 'Nanotechnology - Molecularly Designed Materials', 2nd Edn, American Chemical Society
3. K.P Jain, 'Physics of Semiconductor Nanostructures', Narosa Publishing House, **1997**.
4. G. Cao, 'Nanostructures and Nanomaterials: Synthesis, Properties and Applications', Imperial College Press, **2004.**

STATISTICAL METHODS

Subject Code: MMAT0-F91 **LT P C** **Contact Hrs.-36**
3 0 0 3

UNIT–I (12 Hrs.)

Statistics:
Introduction, Importance and Scope of Statistics, Mean, Median, Mode, Mean Deviation and Standard Deviation.

Correlation and Regression:
Correlation: Introduction, Types of Correlation, Measurement of Correlation: Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation
Regression: Introduction, Utility, Method of Least Squares, Coefficient of Regression, Coefficient of Determination.

UNIT -II (12 Hrs.)

Random Variables:
Definition, Probability distribution, Distribution functions, probability distribution function (pdf) and cumulative distribution function (cdf), Expectation and Variance.

UNIT -III (7 Hrs.)

Theory of Probability:
Additive and multiplicative law of probability, conditional probability and Bayes theorem.

Probability distributions:
Binomial, Poisson, Normal Distribution

UNIT -IV (5 Hrs.)

Sampling Distribution:
Concept of sampling distribution and its standard error, Tests of significance: Tests based on Normal Distribution, Chi-square, t and F statistic.

Recommended Books:

1. H. Morris, DeGroot and J. Mark Schervish, 'Probability and Statistics', Pearson Education; 4th Edn.
2. Vijay K. Rohatgi, A.K. Md. Ehsanes Saleh, 'An Introduction to Probability and Statistics', 2nd Edn., Wiley,
3. Jay L. Devore, 'Probability and Statistics for Engineering and the Sciences', Cengage', 8th Edn'.
4. S.C. Kapoor, V.K. Gupta, 'Fundamentals of Mathematical Statistics', 11th Edn., S. Chand,

INDUSTRIAL SAFETY AND ENVIRONMENT

Subject Code: MMEE0-F91 **L T P C** **Contact Hrs.-45**
3 0 0 3

UNIT-I (9 Hrs.)

Meaning & Need for Safety. Relationship of safety with plant design, equipment design and work environment. Industrial accidents, their nature, types and causes. Assessment of accident costs; prevention of accidents. Industrial hazards, Hazard identification techniques, Accident investigation, reporting and analysis.

UNIT-II (11 Hrs.)

Planning for Safety & its Measures: Definition, purpose, nature, scope and procedure. Range of planning, variety of plans. Policy formulation and implementation of safety policies. Safety measures in a manufacturing organization, safety and economics, safety and productivity. Employees participation in safety. Safety standards and legislation.

UNIT-III (11 Hrs.)

Meaning of Environment and Need for Environmental Control: Environmental factors in industry. Effect of temperature, Illumination, humidity noise and vibrations on human body and mind. Measurement and mitigation of physical and mental "fatigue" Basics of environment design for improved efficiency and accuracy at work. Environment Standards: Introduction to ISO 14000; Environment standards for representative industries.

UNIT-IV (14 Hrs.)

Ventilation and Heat Control Purpose of Ventilation, Lighting, Noise & Vibrations. Physiology of heat regulation. Thermal environment and its measurement. Thermal comfort. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning Process ventilation. Control of heat exposures: control at source, insulation, and local exhaust ventilation. Control of radiant heat, dilution ventilation. Local relief. Industrial Lighting: Purpose of lighting, benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Design of lighting installation. Maintenance standards relating to lighting and colour. Noise & Vibrations: Continuous and impulse noise. The effect of noise on man. Noise measurement and evaluation of noise. Noise isolation. Noise absorption techniques. Silencers vibrations: Effect, measurement and control measures.

Recommended Books

1. H.W. Heinrich, 'Industrial Accident Prevention,' McGraw Hill.
2. Joselin, Edward Arnold, 'Ventilation'.
3. Beranek, 'Noise Reduction', McGraw Hill.
4. D.C. Reamer, 'Modern Safety and health Technology,' R. Wiley.
5. Firenze, R.J. Kendale, 'The Process of Hazard Control'.

SUPPLY CHAIN MANAGEMENT

Course Code: MMEE0-F92 **L T P C** **Contact Hrs. 42**
3 0 0 3

Unit-I (10 Hrs.)

Understanding the Supply Chain: Process view, Decision phases and importance of supply chain, Supply chain management and logistics, supply chain and the value chain, Competitive advantage, supply chain and competitive performance, changing competitive environment, Supply Chain drivers and obstacle.

Unit-II (12 Hrs.)

Matching supply and demand: The lead-time gap, Improving the visibility of demand, supply chain fulcrum, forecast for capacity, execute against demand, Demand management and aggregate planning, Collaborative planning, forecasting and replenishment.

Creating the Responsive Supply Chain: Product 'push' versus demand 'pull' The Japanese philosophy, Foundations of agility, Route map to responsiveness.

Strategic Lead-time Management: Time-based competition, Lead-time concepts, Logistics pipeline management.

Unit-III (10 Hrs.)

Planning and Managing Inventories in a Supply Chain: managing economies of scale in supply chain cycle inventory, managing uncertainty in supply chain, determining optimal level of product availability.

Transportation, Network Design and Information Technology in a Supply Chain: transportation, facility design network design in a supply chain, extended enterprise and the virtual supply chain, role of information and information technology in the supply chain, Laying the foundations for synchronization, 'Quick response' logistics, Production strategies for quick response, Logistics systems dynamics.

Unit-IV (10 Hrs.)

Managing Risk in the Supply Chain: Vulnerability in supply chains, Understanding the supply chain risk profile, managing supply chain risk, Achieving supply chain resilience.

Overcoming the Barriers to Supply Chain Integration: Creating the logistics vision, Problems with conventional organizations, Developing the logistics organization, Logistics as the vehicle for change, Benchmarking.

Recommended Books:

1. S. Chopra, and P. Meindl, 'Supply Chain Management', Prentice Hall, **2010**.
2. M. Christopher, 'Logistics & Supply Chain Management', FT Prentice Hall, **2011**.
3. John T. Mentzer, J. T., 'Supply Chain Management', Illustrated Edn., SAGE Publications, **2001**.
4. Michael Hugos, M.H., 'Essentials of Supply Chain Management', John Wiley, **2011**.
5. D. Simchi-Levi, P. Kaminsky, E. Simchi-Levi, 'Designing and Managing the Supply Chain', McGraw Hill Higher Education, **2011.**

ENVIRONMENT MANAGEMENT

Subject Code: MCIE0-F91 **L T P C** **Duration – 45 Hrs.**
3 0 0 3

UNIT-I (12 Hrs.)

Global Environmental Problems: Global warming, green-house effect, ozone depletion, acid rain, oil pollution, radiation hazard and control, global climate change. Main clauses and basic steps for Environmental Management System certification. Environmental Laws/Acts.

UNIT-II (10 Hrs.)

Cleaner Production Technologies Need and benefits, cleaner production techniques and options, zero impact manufacturing initiatives CDM and carbon credits/case studies.

UNIT-III-(11 Hrs.)

Environment Impact Assessment: Definition and its importance for environment management, constituents of environment impact assessment, project data for EIA study, prediction of impacts, EIA methodologies, constraints in implementation of EIA, impact prediction on water resources projects and other relevant case studies. Environment pollution.

UNIT IV (12 Hrs.)

Degradation of Land Resources: Deforestation: Forest land, deforestation and its effects on land use and Environmental quality, wetland and their importance in environment, causes and extent of wasteland, Soil degradation problems, erosion, salinization, water logging, land use management & planning.

Recommended Books

1. Peavy, Rowe, 'Techobanoglous, Environmental Engg.', Tata McGraw-Hill.
2. Mackenzie L. Davis, 'Environmental Engg.', Tata McGraw-Hill.
3. Baljeet S. Kapoor, 'Environmental Engg. An overview', Khanna Publishers.
4. Glbert H. Masters, 'Environmental Engineering and Science', Prentice Hall of India Pvt. Ltd.
5. G.N. Panday, G.C. Carney, 'Environmental Engineering', Tata McGraw-Hill.
6. P.D. Sharma, 'Ecology and Environment', Rastogi Publications.
7. P.A. Ray, 'Lcances Environmental Impact Assessment', Hand National Environmental Protection Council, Manile.

OILS AND FATS

Subject Code: MCHM0-F91 **L T P C** **Contact Hrs.**

Unit-I (10 Hrs.)

Lipids: Classification, role of lipids, synthesis of fatty acids. Introduction to edible oils, Methods of extracting vegetable oils, Edible oil, chemistry of edible fats; vegetable-oil separation technology; and water- and heat-promoted fat separation from animal and plant "fatty tissues". Differences between vegetable and mineral oil

Unit-II (10 Hrs.)

Rancidity, reversion, polymerization, saponification, refining process; the fat-modification processes(Hydrogenation), addition, phospholipids, lipid metabolism; intermediary metabolism of fatty acids, Physical properties - polymorphism, reactions of fats.

Unit-III (10 Hrs.)

Estimation of oil in oil seeds, Estimation of free fatty acids, Saponification value of oils, Identification and quantification of fatty acids. The technologies applied to specialty fats; the storage and transport of oils and fats; and energy demands of the oil-milling and edible-fat processing operations.

Unit-IV (10 Hrs.)

Analysis of Oils and Fats: Softening point, Congent point, Titre point, cloud point, Iodine, Saponification, acid, hyroxyl, R-M and Polenske value, peroxide value of oil, Elaiden test.

Recommended Books:

1. M. Kolthoff, 'Treatise on Analytical Chemistry', Vol. I and I 4.
2. D. Pearson, 'Laboratory Techniques in Food Analysis'.
3. S. Ranganna, 'Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd Edn., McGraw Hill.
4. Nicholls, 'Aids to the analysis of Foods and Drugs'.
5. Karamer Twig, 'Quality Control for Food Industry', (AVI) 9.
6. C.B. Catodo, R.R. Sharon and N.W. Eleanor, 'Understanding Clinical Nutrition', 2nd Edn., Belmont CA: West/ Wadsworth-An International Thomson Publishing Company, **1988**.
7. R. Passmore, M.A. Eastwood, 'Human Nutrition and Dietetics', Edinburgh: Churchill Livingstone, **1990**.
8. H. Robinson Corinne, R.L. Marilyn, Wanda La and E.G. Ann, '19900 Normal and Therapeutic Nutrition', 17th Edn., Scotland: Macmillan Publishing.
9. M. Swaminathan, 'Food Science, Chemistry and Experimental Foods'.
10. G.F.F.J. Welcher, 'Standard Methods of Chemical Analysis', Vol I & II, 6th Edn.
11. S.N. Mahendru, 'Analysis of Food Products', Swan Publishers.
12. C.B. Catodo, R.R. Sharon and N.W. Eleanor, 'Understanding Clinical Nutrition', 2nd Edn., **1988**.

COMPUTER NETWORKS

Subject Code: MECE0-F91 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

COURSE Objectives

This Course provides an In-depth knowledge on computer networks and provides a good background for advanced studies in communication networks.

COURSE Outcomes:

The students will be able to design different networks based on different Internet protocols and also able to work for different OSI layers.

Unit 1 (12 Hrs.)

Introduction and Overview: The need of Internet, TCP/IP Internet, Internet services, History& scope, Protocol standardization.

Review of Underlying Technologies: LAN, WAN, MAN, Ethernet Topology, Token Ring, ARPANET, PRO net technology, FDDI. Internetworking concepts and architectural model, application level Internet connection, Interconnection through IP gateway, users view.

Unit II (12 Hrs.)

Internet Addresses: Universal Identifiers, Three Primary Classes of IP Addresses, Structure of IP packets, network and broadcast addresses, class less addressing, supernet/ subnet addressing,

Addressing Conventions, Mapping Internet Addresses to Physical Addresses (ARP/RARP), Determining Internet Addresses at Startup (DHCP, Bootp).

Unit III (12 Hrs.)

Internetworking: Internet as a virtual network, Internetworking devices (routers, bridges, gateways), Protocol layering, routing algorithms, congestion control techniques, ICMP, IP Fragmentation, difference between X.25 and Internet layering, Gateway to Gateway Protocol (GGP), OSPF, Exterior Gateway Protocol (EGP), Managing Internet.

Unit IV (12 Hrs.)

Security Issues: Reliable Transactions and Security on Internet, Data encryption, IPsec, SSL, Concept of Firewalls, Intrusion Detection Systems, Denial of Service Attacks.

Recommended Books:

1. Comer, 'Internetworking with TCP/IP', vol-1, PHI.
2. Stevan, 'TCP/IP Illustrated', Pearson.
3. Forouzan 'TCP/IP Suite', TMH.
4. Related IEEE/IEE Publications.

DIGITAL SIGNAL PROCESSING

Subject Code: MECE0-F92 **L T P C** **Duration: 48 Hrs.**

3 0 0 3

UNIT I (12 Hrs.)

Introduction to DSP, Time and Frequency domain description of different type of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems.

UNIT II (12 Hrs.)

Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, Sampling of continuous time signal, Reconstruction of continuous time signal from sequences, Z-Transform and its properties, complex Z-plane, ROC. Relationship between Fourier Transform and Z-Transform, Inverse Z-Transform.

UNIT III (12 Hrs.)

Discrete Time Fourier Transform and its properties, Linear convolution, Circular convolution, convolution from DFT, FFT, Inverse Fast Fourier Transform, Decimation in time and frequency algorithm.

UNIT IV (12 Hrs.)

Filter categories, Finite impulse response filters, various design techniques of FIR filters, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window, Kaiser window. Design of IIR by Approximation of derivatives, Impulse invariant method and Bilinear Transformation method. Steps in Filter Design of Butter worth, Elliptic filter, Chebyshev filters, Frequency Transformation, Applications of DSP. Introduction to DSP Processor.

Recommended Books

1. Oppenhavm & Scheffer, 'Discrete Time Processing', PHI.
2. Proakis& D.G. Monolakis, 'Digital Signal Processing', PHI.
3. S.K. Mitra, 'Digital Signal Processing', PHI.
4. Roman Kuc, MC, 'Digital Signal Processing', MGH Pub.
5. E.C. Ifeacher, B.W. Jervis, 'Digital Signal Processing', Addison Wesely.

SENSORS AND TRANSDUCERS

Subject Code: MECE0-F93 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

COURSE Objectives:
The main aim of this Course is to understand the role of sensors and transducers for different communication systems. In this different transducers for Temperature, pressure, Liquid level measurement will be discussed in detail.

COURSE Outcomes:
For different process control industries sensors and transducers play a vital role. For DCS, SCADA or PLC operation basic idea about measurement will be boosted in the students.

UNIT-I (12 Hrs.)

Sensors/Transducers: Principles, Classification, Parameters, Characteristics (Static and Dynamic), Environmental Parameters (EP), Characterization.

Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge (Resistance and Semiconductor), Inductive Sensors: Sensitivity and Linearity of the Sensor, Types-Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors.

UNIT –II (12 Hrs.)

Thermal Sensors: Introduction, Gas Thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index Thermosensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermo-emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry and Heat Flux Sensors.

Magnetic Sensors: Introduction, Sensors and the Principles Behind, Magnetoresistive Sensors(Anisotropic and Semiconductor), Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers (Synchros and Synchro-resolvers), Eddy Current Sensors, Electromagnetic Flowmeter, Switching Magnetic Sensors and SQUID Sensors.

UNIT-III (12 Hrs.)

Radiation Sensors: Introduction, Basic Characteristics, Types of Photosensistors/Photodetectors, X-ray and Nuclear Radiation Sensors and Fibre Optic Sensors.

Electroanalytical Sensors: Introduction, The Electrochemical Cell, The Cell Potential, Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization (Concentration, Reactive, Adsorption and Charge Transfer), Reference Electrodes, Sensor Electrodes and Electroceramics in Gas Media.

UNIT-IV (12 Hrs.)

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication (Standards for Smart Sensor Interface) and The Automation

Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors),Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing and Sensors for Environmental Monitoring.

Recommended Books

1. D. Patranabis, 'Sensors and Transducers', 2nd Edn., PHI, **2003.**
2. W. Bolton, 'Mechatronics', 4th Edn., Pearson, **2011.**

ELECTRONIC SYSTEM DESIGN

Subject Code: MECE0-F94 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

UNIT-I (12 Hrs.)

MSI and LSI Circuits and Their Applications: Review of Digital electronics concept, Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR and AND OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

UNIT-II (12 Hrs.)

Sequential Machines: The Concept of Memory, The Binary Cell, The Cell and The Bouncing Switch, Set/Reset, D, Clocked T, Clocked JK Flip Flop, Design of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps for Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design of Out Put Decoders, Counters, Shift Registers and Memory.

UNIT-III (12 Hrs.)

Multi Input System Controller Design: System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

UNIT-IV (12 Hrs.)

Asynchronous Finite State Machines: Scope, Asynchronous Analysis, Design of Asynchronous Machines, Cycle and Races, Plotting and Reading the Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches to Asynchronous Design, Hazards in Circuit Developed by MEV Method, Electromagnetic Interference and Electromagnetic Compatibility Grounding and Shielding of Digital Circuits. Interfacing digital system with different media like fibre cable, co-axial cable etc.

Recommended Books:

1. Fletcher, 'An Engineering Approach to Digital Design', PHI, **1990.**
2. 'Designing with TTL Circuits', Texas Instruments.
3. Related IEEE/IEE Publications.

DIGITAL CIRCUITS AND LOGIC DESIGN

Subject Code: MECE0-F95 **L T P C** **Duration: 48 Hrs.**
3 0 0 3

COURSE Objectives

The use of digital circuitry is present in virtually all aspects of our lives and its use is increasing rapidly. Thus, this Course aims to introduce postulates of Boolean algebra; methods for

simplifying Boolean expressions and also outline the formal procedures for the analysis and design of combinational and sequential circuits. Next focus is to get student familiarize with concepts of digital logic families, D/A & A/D converters, memories and programmable logic devices.

COURSE Outcomes:

After going through this subject in detail student will be able to understand Digital devices and in turn can learn and operate Microprocessor/Microcontroller more easily.

UNIT I (12 Hrs.)

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

UNIT II (12 Hrs.)

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification. Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

UNIT III (12 Hrs.)

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

UNIT IV (12 Hrs.)

A/D and D/A converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs. Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs. Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

Recommended Books:

1. R.P. Jain, 'Modern Digital Electronics', 3rd Edn., TMH.
2. R.P. Jain,'Modern Digital Electronics', 4th Edn., TMH, **2011**.
3. Malvino& Leach, 'Digital Principals & Applications', 4th Edn., TMH, **1991**.
4. Fletcher, 'An Engg. Approach to Digital Design', Indian Edn., PHI, **2011**.
5. Digital Electronics by Sanjay Sharma', S.K. Kataria & Sons, 1st Edn., **2011**.

ADVANCED ELECTRICAL MACHINES

Subject Code: MELE0-F91 **L T P C**

3 0 0 3

COURSE Objectives:

1. To give a systematic approach for modeling and analysis of all rotating machines under both transient and steady state conditions.

COURSE Outcomes:

1. The students will be able to model all types of rotation machines including special machines.
2. They will have complete knowledge about electromagnetic energy conversion and application of reference frame theories for modeling of machines.

UNIT-I

1.Polyphase Synchronous Machines: Mathematical: Basic Synchronous machine parameters, Voltage, Flux linkage and inductance relations, Park's transformation – its physical concept, equations of performance.

2.Balanced steady state analysis: Phasor equations and phasor diagrams, Power-angle characteristics, cylindrical rotor and Salient pole machines, Short circuit ratio

UNIT-II

3.Transient analysis & machine dynamics: Three phase short-circuits, Armature and field transients, Transient torque, Sudden reactive loading and Unloading. Transient Analysis-a qualitative approach, Reactance and Time –Constants from equivalent circuits, Measurement of reactance, Transient Power-angle characteristics, The basic electromechanical equation, Linearized analysis, Large Angular/oscillation, Non-linear analysis.

UNIT-III

4.Transformers & its transients: Multi-Circuit Transformers: General theory, Equivalent circuits, Three winding transformer as a multi-circuit transformer, Determination of parameters. In-rush current phenomena, Qualitative approach, Analytical approach, In-rush current in 3-phasetransformers.

UNIT-IV

5.Excitation phenomena in transformers: study of excitation and its effect on transformer performance, Harmonics in: Single phase transformers, three-phase transformers, Disadvantages of harmonics, Suppression of harmonics.

6.Unbalanced operation of three-phase transformers: Single-phase load on three-phase transformers, Single-Phasing in 3-phase transformers, Effect of using tertiary winding.

RECOMMENDED BOOKS

1. B. Edikins, 'Generalized Theory of Electrical Machines'.
2. Concordia, 'Synchronous machines'.
3. E.W. Kim bark, 'Power System Stability', Vol. III., Wiley.
4. P.S. Bimbhra., 'Generalized Theory of Electrical Machines', **2010**.
5. E.W. Kimbark, 'Power System Stability', Vol. III, **1998**.
6. A. Draper, 'Electrical Machines', **2011.**

LOAD FORECASTING AND LOAD MANAGEMENT

Subject Code: MELE0-F92 **L T P C**

3 0 0 3

COURSE Objectives:

1. To give a systematic approach for load management and forecasting.
2. To analysis of all trend coming related to recent case studies conditions.

COURSE Outcomes:

1. The students will acquire skills of load related energy management and tariff structure.
2. They will have complete knowledge about annual and monthly peak demands.

UNIT-I

1.Load Forecasting: Classification and characterization of loads, Approaches to load forecasting, Forecasting methodology, Energy forecasting, Peak demand forecasting, Non-weather sensitive forecast and Weather sensitive forecast, Total forecast, Annual and monthly peak demand forecasts, Applications of state estimation to load forecasting.

UNIT-II

2.Load Management: Introduction to Load management, Electric energy production and delivery system structure (EEPDS), Design alternatives for EEPD systems, Communication/control techniques for load management, Tariff structure and load management, principles of macro and microeconomics and energy pricing strategies, Assessing the impacts of load management.

UNIT-III

3. Energy Demand Forecasting:

Static and dynamic analysis of energy demand, Elements of energy demand forecasting, Methodologies and models for energy demand forecasting, Techno economic approach in energy demand forecasting, Energy auditing, Energy management, Power Pools and Energy Banking.

UNIT-IV

4. Trends and Case Studies:

Energy management strategy, Symbiotic relation between information, Energy models and decision making, Case studies like industrial energy forecasting, Transportation energy forecasting, Residential, Commercial and agricultural energy forecasting.

RECOMMENDED BOOKS

1. J. Martino, 'Technological Forecasting for Decision Making', Elsevier Press, **1972**.
2. C.W. Gellings, P.E. Penn Well, 'Demand Forecasting in the Electric Utility Industry', Fairmount Press.
3. S. Makridakis, 'Forecasting Methods and Applications', John Wiley and Sons, **1997**.
4. R.G. Brown, 'Smoothing, Forecasting and Prediction of Discrete Time Series', PHI Int., **1963**.

NEURAL NETWORKS & FUZZY LOGIC

Subject Code: MELE0-F93 **L T P C**
3 0 0 3

COURSE Objectives:

1. To apply artificial neural networks in various electrical and electronics engineering applications.
2. To expose students to fuzzy methods of analyzing problems which involve incomplete or vague criteria rather than crisp values.
3. To investigates requirements analysis, logical design, and technical design of components for fuzzy systems development.

COURSE Outcomes:

1. The students acquire the skills required to innovate and build, smart and intelligent applications in electrical and electronics engineering.

2. They will understand review of Neural Networks: models of a neuron, various activation functions, Threshold function, piecewise – linear function, stochastic model of a neuron, feedback.
3. They will be able to take up fuzzy systems approach to solve applications in engineering.

UNIT-I

Review of Neural Networks: models of a neuron, various activation functions: Threshold function, piecewise – linear function, stochastic model of a neuron, feedback.

UNIT-II

Network Architecture: Single layer feed forward network, multiplayer feed forward network, recurrent network, knowledge representation.

UNIT-III

COURSE Processes: Memory Based COURSE Hebbian COURSE, Competitive COURSE, Boltzmann COURSE, COURSE with a teacher, COURSE without a teacher, adaptation, single layer perceptions, multi-layer perceptions.

UNIT-IV

Introduction to fuzzy logic: membership function, rule generation, fuzzy concept, fuzzification, defuzzification, time dependent fuzzy logic, temporary fuzzy logic, fuzzy artificial neural network, neuro fuzzy control, fuzzy neural nets, Fuzzy Based ABS system, applications.

RECOMMENDED BOOKS

1. Simon Haykin, 'Neural Networks'.
2. Eleine Rich, Kevin Knight, 'Artificial Intelligence'.
3. Stamatios V. Kartalopoulos, 'Understanding Neural Networks and Fuzzy Logic'.
4. Hungenahally Jain, 'Neural Intelligent System'.

ENGINEERING OPTIMIZATION

Subject Code: MELE0-F94 **L T P C**
3 0 0 3

COURSE Objectives:

- To learn essential optimization techniques for applying to day to day problems.
- To study of genetic algorithms with relation to application in power system.
- To acquire knowledge of dynamic programming.

COURSE Outcomes:

- After COURSE the techniques, they can apply to engineering and other problems.
- They can get skills to optimize the variety of programming.

UNIT I

Introduction: Definition, Classification of optimization problems, Classical Optimization Techniques, Single and Multiple Optimization with and without inequality constraints.

UNIT II

Linear Programming (LP) and Non Linear Programming (NLP): Simplex method of solving LP, revised simplex method, duality, Constrained Optimization, Theorems and procedure, linear programming, mathematical model, solution technique, duality. Steepest descent method, Conjugate gradient method, Newton Method, Sequential quadratic programming, Penalty function method, augmented Lagrange multiplier method.

UNIT III

Dynamic Programming (DP): Multistage decision processes, concept of sub-optimization and principle of optimality, Recursive relations, Integer Linear programming, Branch and bound algorithm.

UNIT IV

Genetic Algorithm (GA): Introduction to Genetic Algorithm, working principle, coding of variables, fitness function, GA operators; Similarities and differences between GA and traditional methods; Unconstrained and constrained optimization using genetic Algorithm, real coded GA, Advanced GA, global optimization using GA, Applications to power system.

Recommended Books:

1. D.A. Pierre, 'Optimization Theory with Applications', Wiley Publications.
2. H.A. Taha, 'Operations Research: An Introduction' 7th Edn., Pearson Education Edition, Asia, Delhi.
3. S.S. Rao, 'Optimization –Theory and Applications', Wiley-Eastern Limited.
4. D.P. Kothari & J.S. Dhillon, 'Power System Optimization', PHI Publishers.
5. Donald E. Kirk, 'Optimal Control Theory', Dover Publications, New York.
6. Kalyanmoy Deb, 'Optimization for Engineering Design: Algorithms and Examples', PHI Publishers.

DESIGN OF EXPERIMENTS

Subject Code: MMAT0-F94 **L T P C**
3 0 0 3

Course Objectives

To impart knowledge of statistical tools, designing of experiments, etc.

UNIT-I

General introduction about various statistical tools and their usefulness. Objectives and principles of experimental design. Experimental design terminology. Increasing accuracy on experiments.

UNIT-II

Completely randomized designs. Blocking designs. Latin square designs. Analysis of variance (ANOVA). Correlation and regression. Principles of experimental design. Typical application of experimental design. Simple comparative experiments. Experiment with single factor.

UNIT-III

Introduction to factorial designs. Concept of fractional factorial design. Two level design. Three level design, Response surface designs. Central composite and Box-Behnken designs. Concept of Split-plot design.

UNIT-IV

Fitting regression models. Multiple regression and correlation analysis, Partial correlation. Test of significance and model lack of fit. Use of replicates. Orthogonal design and Taguchi Approach. Use of computers and software packages.

Recommended Books

1. W.G. Cochran and G.M. Cox, 'Experimental Design', John Wiley and Sons, Inc.
2. D.C. Montgomery, 'Design and Analysis of Experiments', John Wiley and Sons.
3. G.A.V. Leaf, 'Practical Statistics for the Textile Industry', Part-I, II, The Textile Institute, UK.
4. A.I. Khuri and J. Cornell, 'Response Surface: Design and Analyisi', Marcel Dekker, New York.

5. Diamond William J., 'Practical Experiment Designs', 1st Indian Edn., CBS Publishers and Distributors, New Delhi.
6. D.C. Montgomery, E.A. Peck, G.G. Vinning, 'Introduction to Linear Regression Analysis', John Willey and Sons, Inc.

MANAGING SUPPLY CHAIN

Subject Code: MBAD0-X0 **L T P C**
3 0 0 3

Course Objectives
To impart knowledge of statistical tools, designing of experiments, etc.

Unit-1
Supply Chain, Supply Chain Concepts: flow of materials, Wastes in the pipeline, flow of Information, Supply Chain Drivers, Supply chain Management: Concept, frame work and need for study.

Unit-2
Planning & Managing Inventories in a Supply Chain: Safety Inventory, Benchmarking the supply chain. Quick Response, Vendor Managed Inventory (VMI), Postponement, Just in Time & QR Logistics, Introduction to Apparel/Textile Supply Chain, Distribution & Procurement and various Procurement Channels in Supply Chain.

Unit-3
Reverse supply chain(RSC), difference with forward supply chain, cost considerations involved, industries participation, factors leading to application of concept of RSC in specific industries and its restricted application, benefits, cost effectiveness of RSC.

Unit-4
Supply chain in apparels, Introduction to sampling, understanding quality procedures in sampling and sample development, different stages of samples and their requirements from Proto to Shipment sample Proto, fit, Size set, Pre production, TOP, Sealer, important Industry Inputs

Recommended Books

1. Martin Christopher, 'Logistics & Supply Chain Management: Strategies for Reducing Cost and Improving Service'.
2. Sunil Chopra, 'Supply Chain Management: Strategy, Planning and Operation'.
3. Douglas Macbeth, 'Partnership Sourcing: An Integrated Supply Chain Management Approach'.

PG OPEN ELECTIVES-II 2016 BATCH ONWARDS		
Internal	External	Total
40	60	100

NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON

PG OPEN ELECTIVES-II 2016 BATCH ONWARDS		
COURSE CODE	**COURSE**	**NOT APPLICABLE FOR PROGRAMMES**
MITE0-F92	Network Security and Ethical Hacking	M.Tech. IT, M.Tech. IT & CW, M.Sc. IT
MCSE0-F95	Advanced Operating Systems	M.Tech. CSE, M.Tech. CSE (Software Engineering), M.Tech. CSE (Computer Network and Information Security), M.Tech. CSE (E-Security), M.Sc. CSE
MCSE0-F96	Enterprise Resource Management	
MCSE0-F97	Advanced Computer Networks	
MCSE0-F98	Digital Image processing	
MCSE0-F99	Database Management Systems	
MBAD0-F96	Accounting & Financial Management	M.B.A.
MBAD0-F97	Business Ethics	
MBAD0-F98	EEIM	
MBAD0-F99	Basic Accounting	
MCHM0-F92	Dyes, Soaps and Detergents	M.Sc. Chemistry
MMEE0-F93	Advanced Power Plant Engineering	ME (Automation & Robotics), M.Tech. ME (CAD/CAM), M.Tech. ME (Industrial & Production), M.Tech. ME (Production), M.Tech. ME (Thermal Engg.)
MPHY0-F92	Science of Renewable Energy Resources	M.Sc. Physics
MECE0-F96	Fundamentals of Electronic Communications	M.Tech. Electronics & Instrumentation, M.Tech. ECE (Microelectronics), M.Tech. ECE (Embedded System), M.Tech. ECE (Signal Processing)
MECE0-F97	Electronic Instrumentation	
MECE0-F98	Reliability Engineering	
MECE0-F99	Linear Control Systems	
MMAT0-F92	Ordinary Differential Equations	M.Sc. Mathematics
MMAT0-F93	Numerical Methods	
MELE0-F95	Advanced Transducer Technology	M.Tech. Electrical Engg., M.Tech. EE (Power System), M.Tech. EE (Instrumentation & Control Engg.)
MELE0-F96	Electric Traction System	
MELE0-F97	Power Electronic Devices & Controllers	
MBAD0-FX1	Intellectual Property Rights	---
MMAT0-F95	Operation Research and Statistics	---

NETWORK SECURITY AND ETHICAL HACKING

Course Code: MITE0-F92 **L T P C**
3 0 0 3

Introduction
Network Security, Functionality and ease of use Triangle, Essential Terminology and Elements of Security (Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit), Concept of ethical hacking Phases involved in hacking, Penetration Testing and Ethical Hacking

Foot Printing
Introduction to foot printing, Information gathering methodology of the hackers, Active and passive reconnaissance

Scanning
Scanning, Elaboration phase, active scanning. Enumeration, DNS Zone transfer. Detecting live systems on the target network, discovering services running /listening on target systems, understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting

System Hacking
Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Key (stroke) Loggers, Understanding Sniffers and their working, Comprehending Active and Passive Sniffing, Man-in-the-Middle Attacks, ARP Spoofing/Poisoning and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

Trojans and Backdoors
Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways of Trojan's entry into a system, Indications of a Trojan Attack

Session Hijacking
Understanding Session Hijacking, spoofing vs. hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session hijacking Tools.

Hacking Wireless Networks
Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Recommended Books:

1. Rajat Khare, 'Network Security and Ethical Hacking', Luniver Press, **2006**.
2. Thomas Mathew, 'Ethical Hacking', OSB Publisher, **2003**.
3. Stuart McClure, Joel Scambray and George Kurtz, 'Hacking Exposed: Network Security Secrets & Solutions', McGraw-Hill, **2005**.
4. 'Ethical Hacking and Network Defense', Cengage Course, **2009**.
5. Eric Core, 'Hackers Beware', EC-Council Press, **2003.**

ADVANCED OPERATING SYSTEM

Subject Code-MCSE0-F95 **L T P C** **Duration – 45 Hrs.**
3 0 0 3

COURSE OBJECTIVES:

To learn the fundamentals of Operating Systems and gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols

COURSE OUTCOMES:

CO1 Discuss the various synchronization, scheduling and memory management issues
CO2 Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
CO3 Discuss the various resource management techniques for distributed systems
CO4 Identify the different features of real time and mobile operating systems

UNIT-I (11 Hrs.)

Fundamentals of Operating Systems: Strategies of operating system, Structures of operating system, overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling –Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

Distributed Operating Systems: Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT-II (12 Hrs.)

Distributed Resource Management: Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non blocking Commit Protocol – Security and Protection.

UNIT-III (11 Hrs.)

Real Time And Mobile Operating Systems: Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads – Memory Management – File system, Networked file system

UNIT-IV (11 Hrs.)

Case Studies: Linux System: Design Principles - Kernel Modules - Process Management Scheduling –Memory Management - Input-Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer – File System.

RECOMMENDED BOOKS

1. Andrew S. Tanenbaum and Maarten van Steen, 'Distributed Systems: Principles and Paradigms', 2nd Edn., Prentice Hall, **2007**.
2. Mukesh Singhal and Niranjan G. Shivaratri, 'Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems', Tata McGraw Hill, **2001**.

3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 'Operating System Concepts', 7th Edn., John Wiley & Sons, **2004**.
4. Daniel P. Bovet and Marco Cesati, 'Understanding the Linux kernel', 3rd Edn., O'Reilly, **2005**.
5. Rajib Mall, 'Real-Time Systems: Theory and Practice', Pearson Education India, **2006**.
6. Neil Smyth, 'iPhone iOS 4 Development Essentials – Xcode', 4th Edn., Payload media, **2011**.

ENTERPRISE RFESOURCE PLANNING

Course Code: MCSE0-F96 **L T P C** **Contact Hrs. 45**
3 0 0 3

COURSE OBJECTIVES

This course will explore the concepts, principles, and state-of-the-art methods in successfully integrating Enterprise Resource Planning (ERP) systems into extant enterprise architectures. The course will help both functional area and IT managers understand the respective role of users, enterprise architects, developers and managers in the selection, preparation, implementation and management of large and complex enterprise applications

COURSE OUTCOMES

CO1 Understand and gain insight into process views of organizations and tools and techniques used to model both as-is and to-be models.
CO2 Know and be able to apply key technical terminology in enterprise information systems as they apply in different ERP products and development methods
CO3 to understand various actions and business modules in ERP
CO4 to understand market and various applications of ERP systems

UNIT-I (10 Hrs.)

ERP AND TECHNOLOGY: Introduction, Related Technologies, Business Intelligence. E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining, OLAP, Product life Cycle management, SCM, CRM

UNIT-II (12 Hrs.)

ERP IMPLEMENTATION: Implementation Challenges, Strategies, Life Cycle, Pre-implementation Tasks, Requirements Definition, Methodologies, Package selection, Project Teams, Process Definitions, Vendors and Consultants, Data Migration, Project management, Post Implementation Activities.

UNIT-III (12 Hrs.)

ERP IN ACTION & BUSINESS MODULES: Operation and Maintenance, Performance, Maximizing the ERP System, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

UNIT-IV(11Hrs.)

ERP MARKET: Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards, QAD Inc, SSA Global, Lawson Software, Epicor, Intuitive.
ERP Application: Enterprise Application Integration, ERP and E-Business, ERP II, Total quality management, Future Directions, Trends in ERP.

RECOMMENDED BOOKS

1. Alexis Leon, 'ERP DEMYSTIFIED', Tata McGraw Hill, 2nd Ed, **2008**.
2. Mary Sumner, 'Enterprise Resource Planning', Pearson Education, **2007**.
3. Jim Mazzullo, 'SAP R/3 for Everyone', Pearson,**2007**.

4. Jose Antonio Fernandz, 'The SAP R /3 Handbook', Tata McGraw Hill, **1998**.
5. Biao Fu, 'SAP BW: A Step-by-Step Guide', 1st Ed, Pearson Education, **2003**.

ADVANCED COMPUTER NETWORKS

Subject Code-MCSE0-F97 **L T P C** **Duration – 45 Hrs.**
3 0 0 3

COURSE OBJECTIVES:
This course provides knowledge about computer network related hardware and software using a layered architecture. It is also offer good understanding of the concepts of network security, wireless, Adhoc and various emerging network technologies.

COURSE OUTCOMES:
CO1: Able to explain the Fundamentals of Computer Networks and their layered architecture. Also acquire knowledge about ATM Layered model and LAN Emulation.
CO2: Able to explain about various Transport and Application Layer Protocols. Also acquire knowledge about various congestion control mechanisms and network management.
CO3: Able to explain Features, advantages and applications of Adhoc Networks, Adhoc versus Cellular networks, Network architecture and Technologies. Evolution with the examples of wireless communication systems other techniques of Cellular Networks like 2G, 2.5G and 3G Technologies. Also able to explain wireless local loop (WLL), Wireless and local Area Networks (WLANs).
CO4: Able to define the Fundamentals of network security, various authentication protocols and E-mail Security.

UNIT-I (11 Hrs.)

Computer networks and layered architecture, Asynchronous Transfer Mode- ATM layered model, switching and switching fabrics, network layer in ATM, QOS, LAN emulation.

UNIT-II (11 Hrs.)

Transport Layer-Elements of transport protocols; Internet transport protocols: TCP and UDP, TCP connection management, congestion control. Application Layer-Network application architectures: Client-server, P2P and hybrid; Application layer protocols: DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and electronic mail; Network management and SNMP.

UNIT-III (13 Hrs.)

Adhoc and Cellular networks- Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies. Wireless Communication Systems- Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA. Wireless and Mobile Networks-Wireless links and network characteristics, wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.

UNIT-IV (10 Hrs.)

Introduction to Network Security- Cryptography, symmetric and public-key algorithms, digital signatures, communication security, and authentication protocols, E-mail security, PGP and PEM.

RECOMMENDED BOOKS

1. B.A. Forouzan, 'Data Communication and Networking', 5th Edn., Tata McGraw Hill, **2013**.
2. A.S. Tanenbaum, 'Computer Networks', 4th Edn., Pearson Education, **2002.**

3. William Stallings, 'Network Security and Cryptography', 6th Edn., Prentice Hall of India, **2013**.
4. Theodore S. Rappaport, 'Wireless Communication: Principles and Practices', 2nd Edn., Pearson Education, **2001**.
5. D.E. Comer and R.E. Droms, 'Computer Networks and Internets', Prentice Hall, 4th Edn., **1998**.
6. Sunil Kumar S. Manvi, Mahabaleshwar S. Kakkasageri, 'Wireless and Mobile Networks: Concepts and Protocols', 2nd Edn., Wiley India, **2016**.

DIGITAL IMAGE PROCESSING

Course Code: MCSE0-F98 **L T P C** **Contact Hrs. 45**
3 0 0 3

COURSE OBJECTIVES:

Visual information plays an important role in many aspects of our life. Much of this information is represented by digital images. Digital image processing is ubiquitous, with applications including television, tomography, photography, printing, robot perception, and remote sensing. This is an introductory course to the fundamentals of digital image processing. It emphasizes general principles of image processing, rather than specific applications.

COURSE OUTCOMES:

CO1: To introduce the digital images, processing with digital images, application areas of the field, fundamentals step to process images, image acquisition and digitization and understand image processing system.

CO2: To learn basic image transforms, image enhancement in spatial as well as frequency domain, to make them aware about various filters used for enhancement. Aim is to introduce histograms in image processing.

CO3: To study the image restoration of degraded images and processing of colour images and Introduction to wavelets.

CO4: To understand the image compression in order to save bandwidth and storage, image segmentation techniques, representation of image and basics of morphological processing operations.

UNIT-I (11 Hrs.)

Introduction: Digital Images and their Representation, Digital image processing, Application areas of digital image processing. Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, A Simple Image Model, Image acquisition, Sampling and Quantization, Some Basic Relationships between Pixels, Mathematical Preliminaries, 2D Linear Space Invariant Systems,2D Convolution and Correlation.

UNIT-II (12 Hrs.)

Image Enhancement: Some Simple Intensity Transformations, Image Subtraction, Image Averaging, Spatial Domain Methods, Smoothing Filters, Sharpening Filters, Frequency Domain Methods, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency Domain Specifications, Histogram Processing: Streaching, Equalization and Specification.

Image Transforms: 2D Orthogonal and Unitary Transforms, Properties and Examples. Introduction to the Fourier Transform, The Discrete Fourier Transform, 2D DFT, FFT, DCT, Hadamard Transform, Haar Transform, KL Transform.

UNIT-III (11 Hrs.)

Image Restoration: Degradations Model, Degradation Model for continuous and discrete functions, Diagonalization of Circulant and Block - Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration: Unconstrained Restoration, Constrained Restoration, Inverse Filtering, weiner filters, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, Geometric Transformation.

Color Image Processing and Wavelets: Color Image Processing Fundamentals, Color Models: RGB, CMY, CMYK, HSI, Relationship Between Different Models, Introduction to waveletts and resolution analysis.

UNIT-IV (11 Hrs.)

Image Compression: Fundamentals: Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models, Loss Less Variable Length, Huffman, Arithmetic Coding, Bit Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, Sub Band Coding.

Image Segmentation: Edge Detection, Line Detection, Curve Detection, Edge Linking and Boundary Extraction, Image Representation: Boundary Representation, Region Representation and Segmentation, Morphological Processing: Dilation, Erosion, Opening and Closing, Hit And Miss Algorithms.

RECOMMENDED BOOKS

1. Rafael. C. Gonzalez & Richard E. Woods. 'Digital Image Processing', 2/e Pearson Education, **2006**
2. W.K. Pratt. 'Digital Image Processing',3rd Edn., John Wiley & sons, Inc. **2006**
3. M. Sonka et.al, 'Image Processing, Analysis and Machine Vision', 2nd Edn., Thomson, Course, India Edition, **2007**.
4. Kenneth R. Castleman, 'Digital Image Processing', Pearson Education, **1995**.
5. S. Jayaraman, S. Esakkirajan, T. Veerakumar, 'Digital Image Processing', McGraw Hill Education, **2009**.
6. Anil Jain. K, 'Fundamentals of Digital Image Processing', Prentice Hall of India, **1989**.

DATABASE MANAGEMENT SYSTEMS

Subject Code-MCSE0-F99 **L T P C** **Duration – 36 Hrs.**
3 0 0 3

COURSE OBJECTIVES

To familiarize the students with Data Base Management system

COURSE OUTCOME

CO1 To provide introduction to database systems and various models.
CO2 To provide introduction to relational model and SQL
CO3 To understand about Query Processing and Transaction Processing.
CO4 To learn the concept of failure recovery and concurrency control

UNIT-I (11 Hrs.)

Introduction to Database Systems: File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

Data Models: Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class

Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

UNIT-II (12 Hrs.)

The Relational Model: Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data

Relational Query Languages: SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Integrity Constraints in SQL, Cursors and Triggers

Basic Query Optimization Strategies

UNIT-III (11 Hrs.)

Database Design: Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Domain Key Normal Forms.

Transaction and Concurrency Management: ACID Properties, Serializability, Two-phase Commit Protocol, 2PL protocol, Lost Update Problem, Inconsistent Read Problem. Concurrency Control, Lock Management, Read-Write Locks, Deadlocks Handling.

UNIT-IV (11 Hrs.)

Physical Data Organization: File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

Database Protection: Threats, Access Control Mechanisms: Discretionary Access Control, Mandatory Access Control, Grant and Revoke, Role Based Security, Encryption and Digital Signatures.

RECOMMENDED BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', 6th Edn., Tata McGraw-Hill, **2011**.
2. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 5th Edn., Pearson Education, **2010**.
3. C.J. Date, 'An Introduction to Database Systems', Pearson Education, 8th Edn., **2006**.
4. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press, 1st Edn., **2008.**
5. S.K. Singh, 'Database Systems Concepts, Design and Applications', 2nd Edn., Pearson Education, **2011**.
6. Raghu Rama Krishnan, Johannes Gehrke, 'Database Management Systems', 3rd Edn., Tata McGraw-Hill, **2014**

ACCOUNTING AND FINANCIAL MANAGEMENT

Subject Code – MBAD0- F96 **L T P C** **Duration – 40 Hrs.**

3 0 0 3

Course Objectives: To provide an understanding of the function, the roles, the goals and the processes of corporate financial management, covering the sourcing of finances and their issues in investment and operations. Problem-solving methodology will be used to illustrate the theories and tools in financial decision making.

Unit I (10 Hrs.)

Overview: Accounting Concepts, Conventions and Principles, Accounting Equation, International Accounting Principles and Standards; Branches of Accounting: Financial, Cost and Management

Accounting and Their Inter-Relationships, Mechanics of Accounting: Double Entry System of Accounting, Journalizing of Transactions

Unit II (10 Hrs.)

Preparation of Final Accounts: Profit & Loss Account, Profit & Loss Appropriation Account and Balance Sheet, Common Size Statement; Comparative Balance Sheet and Trend Analysis
Cost Accounting – Objectives, Elements of Cost, Marginal Costing, Absorption Costing, Target Costing, Standard Costing, Different Methods of Costing, Break Even Analysis, Its Uses and Limitations, Break Even Chart

Unit III (10 Hrs.)

Financial Management Nature, Scope and Objectives of Financial Management, Ratio Analysis Fund Flow Statement and Cash Flow Statement, Working Capital Decision: Meaning, Nature and Scope of Working Capital – Component of Working Capital – Factors affecting Working Capital, Working Capital Strategies

Unit IV (10 Hrs.)

Cost of Capital, WACC, Investment Decision: Nature and Significance of Investment Decision, Capital Budgeting Techniques: Discounted and Non-Discounted Methods (Pay Back, ARR, NPV, IRR, Benefit Cost Ratio), Long Term and Short Term Sources of Funds

Course Outcomes: After completing this course the students should be able to make optimum decisions pertaining to raising funds, making investments & managing the assets of a corporation, big or small, with an ultimate goal of creating value.

Recommended Books

1. Brigham, 'Financial Management: Text & Cases', Cengage Course.
2. Brealy & Myres, Principles of Corporate Finance', Tata McGraw Hill.
3. Ambrish Gupta. 'Financial Accounting for Management', 2nd Edn., Pearson Education,
4. I.M. Pandey, 'Financial Management', Vikas Publishers
5. S.P. Jain and K.L. Narang, 'Principles of Accounting', Kalyani Publishers, New Delhi, **2004**

BUSINESS ETHICS

Subject Code: MBAD0- F97 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

UNIT-I (10 Hrs.)

Introduction to Ethics and Values and their Importance in Business: Ethical issues in Capitalism and Market System, Ethical and Social System. The Social Responsibility of Business, Ethical Conflict, Whistle Blowing.

UNIT-II (10 Hrs.)

Ethics and Organization, Ethics in Human Resource Management and Organizational Culture, Ethics in Marketing, Ethics in Finance, Ethical Codes and Incentives in Corporate Sector.

UNIT-III (10 Hrs.)

Broader Ethical issues in Society – Corruption, Ecological Concern, Discrimination on the Basis of Gender, Caste or Race, Ethics and Information Technology.

UNIT-IV (10 Hrs.)

Impact of Group Policies and Laws of Ethics, Resolving Ethical dilemma.

Recommended Books

1. R.C. Shekhar, 'Ethical Choices in Business', Response Book, New Delhi.

2. S.C. Chakraborty, 'Managerial Transformations by Value', Sage Publications, New Delhi, **1993.**
3. Ananta K. Giri, 'Values, Ethics and Business: Challenges for Education and Management', Rawat Publication, Jaipur

ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT

Subject Code: MBAD0- F98 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Course Objectives: To run an organization Finance and Human resources are the key factors. Their proper utilization decides its success. This course will give the basic understanding of both these resources.

UNIT-I (8 Hrs.)

Prerequisite: Basic Management Principles, C S.
Introduction: Scope of economics for engineers; Concept of: Goods, Utility, Value, Price, Capital, Money, Income; Law of Demand & Supply; Time value of money.

UNIT-II (11 Hrs.)

Cost Analysis: Cost classification: Prime cost, Overhead cost, Selling and Distribution Cost, Fixed cost, Variable cost, Implicit cost, Explicit cost, Replacement cost, Opportunity cost, Marginal cost and Sunk cost; Break even analysis; Economic order quantity.
Depreciation: Causes and Methods: Straight line method, Reducing balance method, Repair provision method, Annuity method, Sinking fund method, Revaluation method, Sum of the digit method.

UNIT-III (10 Hrs.)

Replacement analysis: Reasons and factors for replacement; Determination of economic life of an asset; Payback period method, Annual cost method, Present worth method.
Human Resource Management: Definition; Functions of HRM; Process of Human Resource Planning**;** Methods of Recruitment; Meaning of Placement and Induction.

UNIT-IV (11 Hrs.)

Training and Development: Difference between Training and Development; methods of training and development; Promotion: merit v/s seniority; Performance Appraisal: Traditional and Modern methods; Meaning of Career Planning and Development; Career anchors; Career paths for various types of jobs; Problems in career Planning and Development.

Recommended Books

1. T.R. Jain, 'Micro Economics' V.K. Publications.
2. P. Khanna, 'Industrial Engineering and Management', Dhanpat Rai Publication (P) Ltd.
3. M.S. Mahajan, 'Industrial Engineering and Production Management', Dhanpat Rai & Co. Pvt. Ltd.
4. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
5. P.L. Mehta, 'Managerial Economics', Sultan Chand & Sons.

BASIC ACCOUNTING

Subject Code: MBAD0-F99 **L T P C** **Duration: 40 Hrs.**
3 0 0 3

Objective/s & Expected Outcome: This course provides an orientation in the field of accounting and basic accounting fundamentals. After completion of this course, candidate would be able to record and post transactions in the basic accounting equation and maintain subsidiary ledgers.

UNIT-I (10 Hrs.)

Basic Accounting Concepts: Background of Accounting, Introduction, importance and scope, Accounts– Types and classification; basic terms– Capital, Income, Expenditure, Expenses, Assets, Liabilities and application to Problems. Accounting Equation, Double Entry System. Generally accepted accounting principles (GAAP)

UNIT-II (10 Hrs.)

Journal and Ledger: Journal and recording of entries in journal with narration; Ledger –Posting from Journal to respective ledger accounts. Basic concepts of purchase book, sales book and cashbook.

UNIT-III (10 Hrs.)

Trial Balance: Need and objectives; Application of Trial Balance; different types of errors escaped, trial Balance preparation.

UNIT-IV (10 Hrs.)

Final Accounts: Final Accounts without adjustments. Bank Reconciliation Statement: Bank transactions, Preparation of simple bank reconciliation statement. Application of Computer in Accounting

Recommended Books

1. Jawahar Lal, 'Managerial Accounting', 1st Edn.
2. R.K. Mittal & M.R. Bansal, 'Financial Accounting'.
3. Rajni Sofat & Preeti Hiro, 'Basic Accounting', 2nd Edn.
4. Bhattacharya & Deaden, 'Accounting for Management', Paperback Edn., Vikas Publications, **1986.**
5. R.L Gupta & V.K. Gupta, 'Financial Accounting', (Part I and Part II).
6. S.N. Maheshwari, 'Fundamental Accountancy'.
7. Antony & Reece, 'Accounting Principal', 6th Edn.

DYES, SOAP AND DETERGENTS

Subject Code: MCHM0-F92 **L T P C** **Contact Hrs.**

UNIT–I (12 Hrs.)

Dyes:

Introduction, Classification of Dyes, Theory of colour and chemical constitution (Valence Bond Theory, M. O. Theory, Witt's Theory) textile fibers and application of dyes. Analysis and estimation of dyes. Fastness and properties, Synthesis and application of the following dyes: Methyl violet and Eosin, Fluorescein, Congo red, Auramine and Malachite green, Methylene blue, Alizarine, Direct black 1, Direct green, indanthrene blue and Dibenzanthrone, Eriochrome Black T, Rhodamine B and Acriflavine.

UNIT-II (8 Hrs.)

Soaps: Introduction, Raw Materials, Manufacturing process, Classification, mechanism of cleaning action, Recovery of glycerin from spent lye. Estimation of free alkali and phenol in soap.

UNIT-III (8 Hrs.)

Detergents: Introduction, Classification of surface active agents, Anionic, Cationic, Amphoteric and non-ionic detergents, Principal groups of synthetic detergents, Biodegradability of surfactants, Difference between soaps and detergents, Enzyme containing and Eco friendly detergents (Zeolites).

UNIT-IV (12 Hrs.)

Analysis of soaps and detergents: General scheme of analysis, sampling, alcohol soluble materials, moisture and volatile matter, analysis of soap (saponifiable, unsaponifiable) and for unsaponified matter in soaps, active ingredient and equivalent combined SO3 3- , Tests for soaps: total fatty acids, fatty anhydride combined alkali, and anhydrous soap, free glycerol, Tests for synthetic detergents: Unsulfonated or unsulfated matter, ester SO3, Alkalinity, chlorides, silicate, phosphate, borates, UV spectroscopic analysis of detergents: Biodegradability of detergents, Determination of sodium alkyl benzene sulfonate, determination of sodium toluene sulfonate, determination of sodium xylene sulfonate, determination of germicides in soaps and detergents

Books Recommended

1. F.W. Billmeyer, 'Textbook of Polymer Science', 3rd Edn., **1994**.
2. F. Rodrigue, 'Principles of Polymer Systems', Tata McGraw Hill, New Delhi.
3. P.J. Flory, 'Principles of Polymer Systems', Cornell University Press, New York.
4. Dryden, 'Chemical Process Industries, Shrieves Chemical Technology'.
5. Shah and Pandey, 'Chemical Technology'.
6. G.R. Chatwal, 'Synthetic Dyes'.
7. M. Swaminathan, G.F. Longonan, 'The Analysis of Detergents and Detergent Products', J W.
8. Davidsohn & B.M. Mlwidaky, 'Synthetic Detergents', Book Center, Mumbai.
9. P.P. Singh and D.W. Rangokav, 'An Introduction to Synthetic Dyes'.
10. K. Venkat Ramman, 'The Chemistry of Synthetic Dyes', Vol I and II.
11. O.P. Agarwal, 'Synthetic Organic Chemistry: Dyes and Drugs'.

ADVANCED POWER PLANT ENGINEERING

Course Code: MMEE0-F93 **L T P C** **Contact Hrs. 42**

3 0 0 3

Unit-I (10 Hrs.)

Introduction: Energy sources for generation of electric power, types of power plant-their special features and applications, present status and future trends of energy resources, overview of utility systems, project implementation stages, load curves, tariff methods.

Unit-II (12 Hrs.)

Conventional Power Generation: site selection, plant layout, steam generators, turbines, fossil and nuclear fuels, pulverizers and coal feeding, mill reject, combustion in furnace, coal handling, ash handling, electrostatic precipitators and bag filters, water systems, condensers, cooling towers, safety aspects, waste disposals, cogeneration, hydroelectric power generation, turbine specific speeds.

Unit-III (10 Hrs.)

Non-Conventional Power Generation: Fluidized bed combustion, energy generation through wind, geothermal, tidal and solar energy, nuclear energy.

Unit-IV (10 Hrs.)

Process Utility Systems: Bulk solids storage and transport systems – silo/hoppers, conveyors, selection and process and instrumentation diagram for pumps, fans and compressors, piping system design, pipe supports, different valves, fittings, instrumentation and data logging systems, industrial fire protection systems, dust hazards.

Recommended Books

1. P.K. Nag, 'Power Plant Engineering', McGraw Hill, **2007**.
2. A.K. Raja, A.P. Srivastava & M. Dwivedi, 'Power Plant Engineering', New Age Int., **2006**.
3. C. Elanchezhian, L. Saravankumar, B.V. Ramnath, 'Power Plant Engineering', I-K Int., **2007**.
4. T.C. Elliot, K. Chen, R. Swanekamp, 'Stanadard Handbook of Power Plant Engineering', McGraw Hill Education, **1998**.

SCIENCE OF RENEWABLE ENERGY SOURCES

Subject Code: MPHY0-F92 **L T P C** **Duration:**

3 0 0 3

Unit-1

Introduction

Production and reserves of energy sources in the world and in India, need for alternatives, renewable energy sources.

Unit-2

Energy

Thermal applications, solar radiation outside the earth's atmosphere and at the earth's surface, fundamentals of photovoltaic energy conversion. Direct and indirect transition semi-conductors, interrelationship between absorption coefficients and band gap recombination of carriers.

Types of solar cells, p-n junction solar cell, Transport equation, current density, open circuit voltage and short circuit current, description and principle of working of single crystal, polycrystalline and amorphous silicon solar cells, conversion efficiency. Elementary ideas of Tandem solar cells, solid-liquid junction solar cells and semiconductor-electrolyte junction solar cells. Principles of photo electrochemical solar cells. Applications.

Unit-3

Hydrogen Energy

Environmental considerations, solar hydrogen through photo electrolysis and photocatalytic process, physics of material characteristics for production of solar hydrogen. Storage processes, solid state hydrogen storage materials, structural and electronic properties of storage materials, new storage modes, safety factors, use of hydrogen as fuel; use in vehicles and electric generation, fuel cells, hydride batteries.

Unit-4

Other Sources

Nature of wind, classification and descriptions of wind machines, power coefficient, energy in the wind, wave energy, ocean thermal energy conversion (OTEC), system designs for OTEC.

Recommended Books:

1. S.P. Sukhatme, 'Solar Energy', Tata McGraw Hill, New Delhi, **2008**.

2. Fonash, 'Solar Cell Devices', Academic Press, New York, **2010**.
3. Fahrenbruch and Bube, 'Fundamentals of Solar Cells, Photovoltaic Solar Energy', Springer, Berlin, **1983**.
4. Chandra, 'Photoelectrochemical Solar Cells', 1st Edn., New Age, New Delhi.

FUNDAMENTALS OF ELECTRONIC COMMUNICATIONS

Subject Code: MECE0-F96 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives:
1. To understand the essentials of communication system.
2. To provide the students about the concepts of analog and digital modulation techniques
3. To impart basic knowledge of wireless communication.

Course Outcomes:
1. An ability to learn analog communication system and modulation techniques
2. An ability to understand design of useful circuits required in analog communication system.
3. An ability to explore working of transmitter and receiver circuits used in communication.
4. To explore about wireless communication.

UNIT-I (10 Hrs.)

Introduction to Communication Systems: The essentials of a Communication system, modes and media's of Communication, Classification of signals and systems, Fourier Analysis of signals. Analog Communication & Digital Communication, Basic concepts of Modulation, Demodulators, Channels, Multiplexing & Demultiplexing.

UNIT-II (12 Hrs.)

Amplitude Modulation: Amplitude modulation, Generation of AM waves, Spectrum of AM, Demodulation of AM waves, DSBSC, Generation of DSBSC waves, Coherent detection of DSBSC waves, single side band modulation, generation of SSB waves, vestigial sideband modulation (VSB).

Angle Modulation: Basic definitions: Phase modulation (PM) & frequency modulation(FM), narrow band frequency modulation, wideband frequency modulation, spectrum of FM.

UNIT-III (12 Hrs.)

Pulse Analog Modulation: Introduction to Sampling theory, Time division (TDM) and Frequency Division Multiplexing (FDM), Pulse Amplitude Modulation (PAM), Pulse Time Modulation.

Digital Modulation Techniques: Introduction to ASK, FSK, BPSK, QPSK, M-ary PSK. PC-PC data Communication.

UNIT-IV (11 Hrs.)

Wireless Communication: Introduction to wireless communication systems, Applications of wireless communication systems, Types of wireless communication systems, trends in mobile communication systems.

Recommended Books:

1. Simon Haykins, 'Communication Systems', 4th Edn., John Wiley & Sons.
2. Singh & Sapre, 'Communication Systems', TMH.
3. G. Kennedy, 'Electronic Communication Systems', TMH.
4. Frenzel, 'Communication Electronics', TMH.
5. Theodore S. Rappaport, 'Wireless Communications: Principles and Practice', PHI Publication.

ELECTRONIC INSTRUMENTATION

Subject Code: MECE0-F97 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives

1. To provide knowledge about different types of measuring, waveform generation, and analysis electronics instruments.
2. Exposure to various methods of data transmission and transduction.
3. Elaborate discussion about recorder & display devices.

Course Outcomes

1. Able to understand operation of different instruments and able to describe different terminology related to measurements.
2. A recognition and understanding of various analog measuring instruments.
3. Design Various types of Bridge circuits.
4. Measurement of Resistance and understanding of CRO

UNIT – I (11 Hrs.)

Units, Dimensions and Standards: SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

General Theory of Analog Instruments: Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/ weight ratio, pointers and scales.

UNIT–II (12 Hrs.)

Analog Measuring Instruments: Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/ applications.

UNIT – III(11Hrs.)

Measurement of Resistances: Low, Medium & High Resistance their measurement.

Bridges: Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

UNIT-IV (11 Hrs.)

Cathodes Ray Oscilloscopes: Principles and working of CRO, CRO– probes, Measurement of voltage, frequency and phase angle with CRO.

Recommended Books:

1. A.K. Sawhney, Electrical & electronic Measurement and Instrumentation, Dhanpat Rai & Publishers.
2. J B Gupta, A course in Electrical and Electronics Measurement & Instrumentation, S.K. Kataria & Sons.

3. W.D. Cooper, Electronic Instrumentation and Measurement techniques, PHI.

RELIABILITY ENGINEERING

Subject Code: MECE0-F98 **L T P C** **Duration: 45 Hrs.**
3 0 0 3

Course Objectives

1. To provide students with a comprehensive understanding on various aspects of reliability engineering
2. To enable students to understand reliability considerations in designing machine components, elements and systems
3. To ensure sound maintenance of machines and systems and bring about reliability improvement
4. To perform reliability engineering analysis and its management throughout the product life cycle.

Course Outcomes

After successful completion of this course the students will be able to:

1. Demonstrate understanding of basic reliability measures such as failure rate, availability, MTTR, etc.
2. Compute and evaluate reliability for redundant, series, and parallel systems
3. Develop fault trees and apply various reliability models to identify and analysis possible faults in machine systems and assess their impact on overall system reliability & maintainability.
4. Use reliability improvement techniques and undertake product testing.

UNIT-I (12 Hrs.)

Introduction: Definition for Reliability, Static and Dynamic Reliability Need for reliability Engineering, success and failure models, Causes of failures, catastrophic failures and degradation failures Characteristic types of failures, useful life of components, Exponential case of chance failure, Reliability Measures; MTBF, MTTR, hazard rate, probability distribution function, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Raleigh, Weibull, Gamma distribution, marks, Chains, failures data analysis.

UNIT-II (11 Hrs.)

Series Parallel Systems: Reliability Block Diagrams, series systems, parallel systems, K-out of-M systems, open and short circuits failures, standby systems.

Reliability Analysis of Non-Series Parallel System: Boolean algebra Method, Outset approach, delta star method, logical signal relation method, Bay's Theorem Method.

Reliability Prediction: objective of reliability prediction, classification, and information sources for failure rate data, prediction methodologies, general requirements, Role and limitations of Reliability prediction.

UNIT-III (11Hrs.)

Reliability Allocation: subsystems reliability improvement, allocation for new units, criticality.

Maintainability and Availability: forms of maintenance, measures of Maintainability and availability, maintainability function, availability function, two-unit parallel system with repair, Markov Model for two unit systems, preventive maintenance, provision of spares.

UNIT-IV (11Hrs.)

Reliability Testing: kinds of testing, component reliability measurements, parametric methods, confidence limits, accelerated testing, equipment acceptance testing, standard life testing plans, accelerated life testing, system safety analysis-FMECA, risk priority number and its allocation.

Economics of Reliability Engineering: Reliability cost, Life Cycle Costing, effect of reliability on cost, reliability achievement cost models, reliability Utility cost models, Replacement policies.

Recommended Books:

1. K.K. Agarwal, 'Reliability Engineering', Kluwer Academic Press, USA.
2. E. Balagurusamy, 'Reliability Engineering', Tata McGraw Hill.
3. L.S. Srinath, 'Reliability Engineering', East West Press Pvt. Ltd.
4. Brijendra Singh, 'Quality Control and Reliability Analysis', Khanna Publishers.
5. E.E. Lewis, 'Introduction to Reliability Engineering', John Wiley and Sons.

LINEAR CONTROL SYSTEMS

Subject Code: MECE0-F99 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives:

1. To introduce the elements of control system and their modelling using various Techniques.
2. To introduce methods for analysing the time response, the frequency response and the stability of systems
3. To introduce the state variable analysis method

Course Outcomes:

Upon completion of the course, students will be able to:

1. Analytical comparison between open & close loop system.
2. Modelling of linear control system.
3. Time domain and frequency domain analysis of control systems required for stability analysis.
4. Analysis of state models for linear control system.

UNIT-I (8 Hrs.)

Basic Concepts: Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems.

UNIT-II (11Hrs.)

Mathematical Models of Control System: Linear and non-linear systems, Transfer function, Mathematical modelling of electrical, mechanical and thermal systems, Analogies, Block diagrams and signal flow graphs.

Control Components: DC servomotor, AC servomotor, Potentiometers, Synchronous, Stepper-motor.

UNIT-III (14 Hrs.)

Time and Frequency Domain Analysis: Transient and frequency response of first and second order systems, Correlation ship between time and frequency domain specifications, Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

Stability Analysis: Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

UNIT-IV (12Hrs.)

State Variable Analysis: Introduction, Concept of State, State variables & State models, State Space representation of linear continuous time systems. State models for linear continuous –time systems, State variables and linear discrete time systems, Solution of state equations, Concept of Controllability & Observability.

Recommended Books:

1. K. Ogata, 'Discrete time Control Systems', Prentice Hall International.

2. Nagrath and Gopal, 'Control System Engineering', New Age International.
3. Warwick, Kevin, 'An Introduction to Control Systems', World Scientific Publishing Co. Pvt. Ltd.
4. Distefano, Joseph J. Stubberud, R. Allen, Williams, J. Ivan, 'Feedback and Control Systems', Schaums Series, TMH.

ORDINARY DIFFERENTIAL EQUATIONS

Subject Code: MMAT0-F92 **LT P C** **Contact Hrs.-32**
3 0 0 3

UNIT–I (10 Hrs.)

Linear Differential Equations: Basic theory of linear differential equations with constant coefficients, Homogeneous linear differential equations of second and higher order with constant coefficients, Method of variation of parameters to solve second degree equations.

UNIT–II (10 Hrs.)

Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients**.**

UNIT–III (7 Hrs.)

Leibnitz's linear and Bernoulli's equation, exact differential equations, Equations reducible to exact form by integrating factors**.**

UNIT–IV (5 Hrs.)

System of differential equations, Eigenvalue problems: Sturm-Liouville problem.

Recommended Books

1. D.A. Murray, 'Introductory Course in Differential Equations,' Orient Longman (India), **1967.**
2. Simmons, 'Differential Equations', TMH Edn., New Delhi, **1974**.
3. M.S.P. Eastham, 'Theory of Ordinary Differential Equations,'Van Nostrand, London, **1970**.
4. S.L. Ross, 'Differential Equations', John Wiley & Sons, NewYork, **1984**.
5. Erwin Kreyszig, 'Advanced Engineering Mathematics', John Wiley and Sons, New York.
6. Richard Bronson, 'Differential Equations,' 2nd Edn., Schaum's Outline Series,

NUMERICAL METHODS

Subject Code: MMAT0-F93 **LT P C** **Contact Hrs.-36**
3 0 0 3

UNIT–I (12 Hrs.)

Errors in numerical calculations: Error and their analysis, General error formula, Errors in a series approximation. Solution of Algebraic and Transcendental Equations: Bisection Method, Regula-Falsi Method, Iteration method, Newton-Raphson Method.

UNIT–II (12 Hrs.)

Solution of linear system of equations: Gauss-Elimination Method, Gauss Jordan method, Eigen value problems (by Power method only), Jacobi Method, Gauss- Seidal Method.

UNIT–III (7 Hrs.)

Interpolation: Finite differences, Difference of a polynomial, Newton's formula for interpolation, Central difference interpolation formula, Interpolation with unevenly spaced points, Newton's divided differences formula

UNIT–IV (5 Hrs.)

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson 3/8th rule, Newton-cots integration formula, Gaussian integration (one dimensional).

Recommended Books

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, 'Numerical Methods Scientific and Engineering Computation', 4th Edn,, New Age International Publishers, New Delhi, **2003.**
2. S.S. Sastry, 'Introductory Methods of Numerical Analysis', 5th Edn, PHI, **2012**

ADVANCED TRANSDUCER TECHNOLOGY

Subject Code: MELE0-F95 **L T P C** **Contact Hrs.-36**

4 0 0 4

Unit-I

Introduction to Transducers and Its Classification, Characteristics of Transducers, Selection Criteria of Transducers, Errors in measurement. Types of errors – Statistical analysis of measurement data – Mean, Standard Deviation, Probability errors.

Unit-II

Variable Resistance transducers and its types. Concept of Three Wire and Four Wire RTDs. Potentiometers, strain gauges, resistance thermometers, thermistors, hotwire anemometers, Variable Inductance and variable capacitance transducers. Piezoelectric, Magnetostrictive, Electromagnetic transducers, thermo-electric sensor, semiconductor temperature sensors. Force balance transducers.

UNIT-III

Analog Signal Conditioning Techniques: Bridge Amplifier, Carrier Amplifiers, Charge Amplifiers and Impedance Converters, Modulation and demodulation Techniques, dynamic compensation, linearization, multiplexing and de-multiplexing.

UNIT-IV

Digital Interfacing Techniques: Interfaces, processors, code converters, liberalizers, Single transmission Cable transmission of analog and digital signal, fiber optic signal transmission, radio, telemetry, pneumatic transmission. Signal Display/Recording systems, Graphic display systems, storage oscilloscope, recorders-ink, thermal, UV, Smart Sensors.

RECOMMENDED BOOKS:

1. E.O. Doeblin, 'Measurement Systems: Application and Design', McGraw Hill International.
2. D. Patranabis, 'Sensors and Transducers', Wheeler Pub., New Delhi.
3. Murthy, D.V.S., 'Transducers and Instrumentation', PHI, New Delhi.
4. Swobada, G., 'Telecontrol: Methods and Applications of Telemetry and Remote Control', Van Nostrand.
5. H.K. Newbert, 'Instrument Transducers', Oxford University Press.

ELECTRIC TRACTION SYSTEM

Subject Code: MELE0-F96 **L T P C** **Contact Hrs.-36**
3 0 0 3

UNIT-I

1. Traction Systems and Latest Trends: Present scenario of Indian Railways – High speed traction, Metro, Latest trends in traction-Metro, monorail, Magnetic levitation Vehicle, Steam, diesel, diesel-electric, Battery and electric traction systems, General arrangement of D.C., A.C. single phase and 3-phase, Composite systems, Choice of traction system - Electric and Diesel-Electric.

UNIT-II

2. Mechanism of Train Movement: Analysis of speed time curves for main line, suburban and urban services, Simplified speed time curves. Relationship between principal quantities in speed time curves, Requirement of tractive effort, Specific energy consumption and Factors affecting it.

UNIT-III

3. Traction Motors and their Control: Features of traction motors, Significance of D.C. series motor as traction motor, A. C. Traction motors-single phase, Three phase, Linear Induction Motor, Comparison between different traction motors, Series-parallel control, Open circuit, Shunt and bridge transition, Pulse Width Modulation control of induction motors, Types of electric braking system.

UNIT-IV

4. Electric Locomotives: Important features of electric locomotives, Different types of locomotives, Current collecting equipment, Coach wiring and lighting devices, Power conversion and transmission systems, Control and auxiliary equipment, Distribution systems pertaining to traction (distributions and feeders), Traction sub-station requirements and selection, Method of feeding the traction sub- station.

RECOMMENDED BOOKS:

1. R.B. Brooks, 'Electric Traction Hand Book', Sir Isaac Pitman and Sons Ltd. London.
2. A.T. Dover, Mac Millan, 'Electric Traction', Dhanpat Rai and Sons, New Delhi.
3. J. Upadhyay, S.N. Mahendra, 'Electric Traction', Allied Publishers Ltd., Dhanpat Rai and Sons, Delhi.
4. H. Partab, 'Modern Electric Traction', Dhanpat Rai and Sons, New Delhi.
5. J.B. Gupta, 'Electric Power Utilization', Kataria and Sons, New Delhi.

POWER ELECTRONIC DEVICES AND CONTROLLERS

Subject Code: MELE0-F97 **L T P C** **Contact Hrs.-36**
3 0 0 3

Course Objectives:

1. Learn the physics of device operation, static and dynamic characteristics, ratings, protection, operating limitations and safe operating area
2. Know about the design issues of drive circuits and their usage
3. Understanding the different types of inverters and cyclo-converters

Course Outcomes:

1. Knowledge of power semiconductor devices and their Gate and base drive circuits

2. Develop skills to utilize the different PWM schemes
3. Know about the different types of power converters and their applications

UNIT-I

1.Review of semiconductor devices: Conduction Process in semiconductors, pn Junction, Charge control description, Avalanche breakdown, Power diodes, Thyristors, Gate Turn Off thyristor (GTO), VI characteristics, Dynamic characteristics, ratings, protection.

UNIT-II

2.Power MOSFET and IGBT: Basic structure, I-V Characteristic, Physics of device operation, switching characteristics, operating limitation and safe operating area.

3. Emerging Devices and Circuits: Power junction Field effect transistor (FET), Integrated Gate-Commutated Thyristor (IGCT), Field Control Thyristor, Metal oxide semiconductor (MOS) Control Thyristor etc. Power ICs, New semiconductor materials.

UNIT-III

4. Snubber Circuits: Types of Snubber circuits, needs of Snubber circuit with diode, thyristor and transistors, Turn-off Snubber, over voltage snubber, turn on snubber, Snubber for bridge circuit configurations, GTO Snubber circuit.

UNIT-IV

5. Gate and Basic Drive Circuits: Design Consideration, De-coupled drive circuits, electrically isolated drive circuits, cascade connected drive circuits, Power device protection in drive circuits, circuit layout considerations.

RECOMMENDED BOOKS:

1. 'Power Electronics: Converters, Applications and Design' by Mohan, Undeland and Robbins John Wiley Sons.
2. 'Power Electronics Handbook' by Rashid M.H., Elsevier Press (Academic Press Series).
3. 'The Power Thyristor and its Applications' by Finney D., McGraw Hill, New York.
4. 'Power Electronics' by Lander C. W., McGraw Hill Book Co., U.K.
5. 'Power Electronics - Circuit

INTELLECTUAL PROPERTY RIGHTS

Subject Code: MBAD0-FX1 **L T P C** **Contact Hrs.-36**

3 0 0 3

Course Objectives

To impart knowledge of designing concepts of fabric and apparels, etc.

Unit-I

Intellectual property rights and its importance. Overview of world intellectual property organization (WIPO) and their role. IPR in perspective of India. Introduction to copyright, patent, industrial designs and trade. Concept of IPR in textile and fashion industries.

Unit-II

Copy Right: definition, types of works that are covered by copyright, rights protected by copy rights-economic rights, moral rights. Right of reproduction: right of public performance, broadcasting and communication to the public. Right of translation and adaptation. Step to get copy right, limitation and general duration of copy right. International agreements concerning copyright.

Related Rights: right of performers, broadcasting organization.

Unit-III

Trademarks: introduction, signs that may serve as trademarks, Madrid agreement, procedure for getting trademark register, geographic indications. Appellation of origin.
Industrial design: introduction, different between industrial design, trademark and patent. Procedure for protection of Industrial design, general duration of Industrial design.

Unit-IV

Patents: purpose, need of patent, required condition for patentability. Procedure for filing the patent application. Limitation and advantages of patenting. Issue of enforcement and licensing, patent cooperation treaty.
Unfair Competition: introduction, acts of unfair competition and protection.
Applications of IPR in textile and fashion industries.

OPERATION RESEARCH AND STATISTICS OF ENGG.

Subject Code: MMAT0-F95 **L T P C** **Contact Hrs.-36**
3 0 0 3

Course Objectives
To impart knowledge of statistical tools, designing of experiments, etc.

Unit-I

Linear Optimization Models: Formulation of linear – programming problems.
Graphical solution. Simplex algorithms: Prig M method, two phase Method, Dual Simplex algorithm (Numericals based on these methods). Transportation problems (including time minimizing transportation problems). Assignment problems including traveling salesman and airline crew problems. Degeneracy in Transportation problems.

Unit-II

Introduction to Sequencing Models: Problems based on n jobs 2 machines, 4 jobs in machines. Gantt chart.
Introduction to Networking Planning: CPM: Concept, difference from PERT. Critical path. Floats PERT. Concept, critical path finding, problems involving probability of project completion/

Unit-III

Concept of probability. Additive and multiplicative laws of probability. Random variables. Mathematical expectation. Discrete and continuous probability distributions (Definitions, and problems only). Binomial, Poisson and normal distributing (properties and applications). Concept of sampling. Techniques of sampling. Sampling distribution. Test of hypothesis. Type I and Type II errors. Level of significance and P-value approach.

Unit-IV

Test of significance for large and small samples. χ^2 test for goodness of fit. t-test. F-test. Analysis of variance (one way and two way classifications).
Introduction to MATLAB and its applications.

Recommended Books

1. C.K. Mustafi, ‘Operations Research Methods and Practices’.
2. Kantiswarup, P.K. Gupta, Manmohan, ‘Operations Research’.
3. Gupta and S.D. Sharma, ‘Operations Research’.
4. Gupta and Gupta, ‘Business Statistics’.
5. Gupta and Kapur, ‘Mathematical Statistics’.

6. M.P. Spiegel, 'Theory and Problems of Probability and Statistics'.

Semester 1st		Contact Hrs...			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFOT1-101	Principles of Food Preservation	3	1	0	40	60	100	**4**
MFOT1-102	Basic Food Microbiology	3	1	0	40	60	100	**4**
MFOT1-103	Food Chemistry	3	1	0	40	60	100	**4**
MFOT1-104	Food Analysis and Instrumentation Lab.-I	0	0	4	60	40	100	**2**
MFOT1-105	Food Microbiology Lab.-II	0	0	4	60	40	100	**2**
Departmental Elective –I (Select any one)		3	1	0	40	60	100	**4**
MFOT1-156	Nutraceutical and Functional Foods							
MFOT1-157	Nutrition and Health							
Open Elective –I (Select any one)		3	0	0	40	60	100	**3**
Total		**15**	**4**	**8**	**320**	**380**	**700**	**23**

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.

**Open Elective: Student must choose open elective subject offered by other departments.

Semester 2nd		Contact Hrs...			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFOT1-206	Basic Food Engineering	3	1	0	40	60	100	**4**
MFOT1-207	Technology of Cereals and Millets	3	1	0	40	60	100	**4**
MFOT1-208	Computer Fundamentals and Statistics	3	1	0	40	60	100	**4**
MFOT1-209	Technology of Cereals and Millets Lab.-III	0	0	4	60	40	100	**2**
Departmental Elective –II (Select any one)		3	1	0	40	60	100	**4**
MFOT1-258	Technology of Beverages							
MFOT1-259	Technology of Malting and Brewing							
Departmental Elective –III (Select any one)		3	1	0	40	60	100	**4**
MFOT1-260	Food Biotechnology							
MFOT1-261	Food Additives							
Total		**15**	**5**	**4**	**260**	**340**	**600**	**22**

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.

After 2nd semester the students will undertake an In-plant summer training of six weeks in industry/organization. The evaluation of training will be done in the fourth semester.

Semester 3rd		Contact Hrs...			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFOT1-310	Technology of Fruits and Vegetables	3	1	0	40	60	100	**4**
MFOT1-311	Unit operation in Food Engineering	3	1	0	40	60	100	**4**
MFOT1-312	Food Packaging	2	1	0	40	60	100	**3**
MFOT1-313	Technology of Fruits and Vegetables Lab.-IV	0	0	4	60	40	100	**2**
MFOT1-314	Food Packaging Lab.-V	0	0	4	60	40	100	**2**
Departmental Elective –IV (Select any one)		3	1	0	40	60	100	**4**
MFOT1-362	Food Standards and Quality Assurance							
MFOT1-363	Technology Pulses and Oil seed							
Open Elective –II (Select any one)		3	0	0	40	60	100	**3**
Total		**15**	**4**	**8**	**320**	**380**	**700**	**22**

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.

**Open Elective: Student must choose open elective subject offered by other departments.

Semester 4th		Contact Hrs...			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MFOT1-415	Technology of Egg, Meat, Fish and Poultry	3	1	0	40	60	100	**4**
MFOT1-416	Technology of Milk and Milk Products	3	1	0	40	60	100	**4**
MFOT1-417	Food Analysis and Instrumentation	2	1	0	40	60	100	**3**
MFOT1-418	Technology of Animal Products Lab.-VI	0	0	4	60	40	100	**2**
MFOT1-419	In Plant summer Training Viva	0	0	0	60	40	100	**2**
MFOT1-420	Project Report	0	0	0	Satisfactory/Unsatisfactory			**8**
Total		**8**	**3**	**4**	**280**	**220**	**500**	**23**

Overall

Semester	Marks	Credits
1st	700	23
2nd	600	22
3rd	700	22
4th	500	23
Total	**2500**	**90**

PRINCIPLES OF FOOD PRESERVATION

Subject Code: MFOT1-101 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (11 Hrs.)

Introduction and historical developments of food preservation.
Principles of Food Preservation. Food Spoilage: Microbial, physical, chemical and miscellaneous.
Heat Preservation and Processing: Thermal death curve, canning of foods, canning process, equipment, effect on food, aseptic processing.

Unit-II (12 Hrs.)

Dehydration: Drying curves, water activity, drying process, types of dryers, dehydration effect in food.
Concentration: Technology of concentration, equipment, process, and changes in food during concentration.
Intermediate Moisture (IM) Foods: Principles, characteristics, advantages, and problems in developing new IM foods.

Unit-III (12 Hrs.)

Refrigeration Storage: Requirements of refrigeration storage, changes in foods during refrigeration storage.
Freezing and Frozen Storage: Freezing curves, factors determining freezing rate, types of freezers, changes in food during freezing.
Ionizing Radiation: Source; equipment; mechanism of preservation, dose determination, effect on food.
Microwaves: Mechanism of heating, equipment and its effect on food.
Household Preservation Methods: Salt curing, oiling and smoking.
Chemical Preservation: types, uses and effects of class I and class II preservatives in foods.

Unit-IV (10 Hrs.)

Recent Methods in Food Preservation: Pulse electric, Ultrasound, Infrared, High pressure, Ohmic heating, Hurdle technology, Nanotechnology in food processing.

Recommended Books

1. N.P. Norman and H.H. Joseph, 'Food Science', CBS Publishers & Distributors Pvt. Ltd., New Delhi, India.
2. W.C. Frazier and D.C. Westhoff, 'Food Microbiology', Tata McGraw Hill Publishing Company Ltd., New Delhi, India.
3. M. Kalia and S. Sangita, 'Food Preservation and Processing', Kalyani Publishers, New Delhi, India.
4. B. Sivasankar, 'Food Processing and Preservation', Prentice Hall of India Pvt. Ltd., New Delhi, India.
5. J.N. Desrosier and N.W. Desrosier, 'Technology of Food Preservation', CBS Publishers & Distributors Pvt. Ltd., New Delhi, India.
6. P. Fellows, 'Food Process Technology: Principles and Technology', CRC Press, Cambridge, England.
7. N. Khetarpaul, 'Food Processing and Preservation', Daya Publishing House, New Delhi, India.

BASIC FOOD MICROBIOLOGY

Subject Code: MFOT1-102 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Microbiology: Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; classification of microorganisms- a brief account; sources of microorganisms in foods; microbial growth, growth curve; factors affecting growth-intrinsic and extrinsic factors controlling growth of microorganisms, microbiological criteria of foods and their significance.

Unit-II (11 Hrs.)

Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservatives and high-pressure processing on the microbiology of foods; control of water activity and microbial growth, applications of hurdle technology for controlling microbial growth.

Unit-III (12 Hrs.)

Foods Microbiology and Public Health: food poisoning, types of food poisonings, important features etc; bacterial agents of food borne illness, food poisoning by clostridium, salmonella, E. coli, bacillus, staphylococcus etc.; non-bacterial agents of food borne illness: poisonous algae, and fungi - a brief account, the HACCP system and food safety used in controlling microbiological hazards.

Unit-IV (12 Hrs.)

Food spoilage and microbes of milk, meats, fish and various plant products, spoilage of canned foods; Indicators microorganisms, methods of isolation and detection of microorganisms or their products in food; conventional methods; rapid methods (newer techniques) – immunological methods; fluorescent, antibody, radio immunoassay, principles of ELISA, PCR (Polymerized chain reactions).

Recommended Books

1. J.M. Jay, 'Modern Food Microbiology', CBS Publishers, New Delhi, India.
2. G.J. Banwart, 'Basic Food Microbiology', CBS Publishers, New Delhi, India.
3. M.R. Adam and M.O. Moss, 'Food Microbiology', CRC Press, U.S.A.
4. B. Ray, 'Fundamental Food Microbiology', CRC Press, New York, U.S.A.
5. R.Y. Stanier, 'General Microbiology', Palgrave Macmillan, Dunfermline, United Kingdom.

FOOD CHEMISTRY

Subject Code: MFOT1-103 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Unit-I (10 Hrs.)

Food Chemistry: Definition, scope and importance.
Carbohydrates: classification, physical and chemical properties of sugars, functional properties, and uses of pectic substances, gums and dietary fiber in food; browning reaction in food: enzymatic and non-enzymatic browning, their occurrence and applications in food; starches: functionality of starch in foods, gelatinization and retro-gradation of starches, modified starches, resistant starches.
Vitamins: Water and fat–soluble vitamins, use of vitamins in foods and their properties. Effect of processing on vitamins.
Minerals of Foods: Calcium, phosphorus, iron, copper, lead, zinc and arsenic.

Unit-II (9 Hrs.)

Proteins: structures of protein and amino acids; physical, chemical and functional properties of proteins, functional properties of food proteins, modification of food protein in processing and storage and its implications, texturized, denaturation of protein, gel formation. Enzymes-sources, properties, role of enzymes in dairy, starch and sugar, juice/beverage, and meat industry.

Unit-III (8 Hrs.)

Lipids classification, properties- lipolysis, auto-oxidation, rancidity and flavor reversion, thermal decomposition and effect of ionizing radiations; modification of fats and oils (hydrogenation and inter-esterification); role of food lipids in flavor; nutritional aspects of natural and modified fats; fat mimetics.

Unit-IV (9 Hrs.)

Plant Pigments: Chlorophyll, anthocyanins and carotenoids, occurrence, structure, chemistry, functions and changes during processing.

Essential Oils: Occurrence, structure, biosynthesis, monoterpene sesquiterpenes, oxygenated terpenes, extraction of essential oils, terpenes oils, uses in foods.

Flavoring compounds in foods.

Allergens, toxic constituents and anti-nutritional factors of foods (enzyme inhibitors, trypsin and chymotrypsin inhibitor, amylase inhibitor, flatulence causing sugars, phytolectins).

Recommended Books

1. L.H. Meyer, 'Food Chemistry', Van Nostrand, Reinhold Company Publication, New York, U.S.A.
2. C. Alias and G. Linden, 'Food Biochemistry', Ellis Horwood, New York, U.S.A.
3. Y. Pomeranz and R. Meloon, 'Food Analysis: Theory and Practice', Westport, An AVI Publication, New York, Sydney, Toronto.
4. R.O. Fennema, 'Food Chemistry', Marcel Dekker, New York, U.S.A.
5. L.H. Meyer, 'Food Chemistry', Van Nostrand, Reinhold Company Publication, New York, U.S.A.

FOOD ANALYSIS AND INSTRUMENTATION LAB.- I

Subject Code: MFOT1-104 **L T P C**
0 0 4 2

1. Analysis of given food sample for its moisture, fat, protein and ash contents.
2. Determination of vitamin C content in a given sample of citrus juice.
3. Estimation of Calcium and Phosphorus content in a given sample of food.
4. Calculation of Iodine value and Saponification value of given sample of fat or oil.
5. Estimation of Tannins in a given sample of Tea.
6. To study the process of Thin Layer Chromatography (TLC) to separate out various components in a given sample.
7. To estimate the amount of reducing sugars in a given food sample.
8. Calculation of smoke point, flash point and fire point of a given sample of vegetable oil.
9. Estimation of Caffeine content in a given sample of coffee.
10. Determination of Crude Fiber content in given sample of vegetable/fruit.
11. Determination of non-reducing sugars, total sugars and starch in fruit sample.
12. Determination of total ash, acid insoluble and soluble ash in a given flour sample.
13. Estimation of rancidity in rancid oil/fat.
14. Detection of adulterants in oil/fat samples.

15. Estimation of Free Fatty Acids (FFA) in crude and refined oil sample.
16. Sensory analysis of various processed food products like jam, bread, and biscuit.
17. Determination of % age moisture, fat and curd content of Table Butter.

FOOD MICROBIOLOGY LAB.-II

Subject Code: MFOT1-105 **L T P C**
0 0 4 2

1. Study of the different parts and use of laboratory microscope.
2. Preparation and sterilization of culture media, glassware.
3. Estimation of bacterial population in a given sample of food by Direct Microscopic Count (DMC) method.
4. Estimation of bacterial load of food sample by SPC (Standard Plate Count) method.
5. Insolation of pure culture of bacteria by Pour Plate and Streak Plate methods.
6. To study simple staining of bacteria.
7. To conduct Gram's staining of bacteria and differentiate between Gram +ve and Gram -ve bacteria.
8. Determination of bacteriological quality of potable water and soft drinks by SPC method.
9. Microbial analysis of Cereals and Cereal products such as wheat flour and biscuits.
10. Microbial analysis of spices (red chilies and coriander).
11. Detection of presence of E. coli and other Coliform bacteria by rapid high coliform test.
12. Detection of presence of coliforms in water by MPN method.
13. Studies on the bacterial growth curve.
14. Estimation of Total Microbial Count of:
    i) Surrounding air
    ii) Workers
    iii) Fruit and vegetable products
15. Isolation of bacteria by serial dilution technique.
16. To study various sub-culturing techniques

NUTRACEUTICALS AND FUNCTIONAL FOODS

Subject Code: MFOT1-156 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Defining nutraceuticals and functional foods. Nature, type and scope of nutraceutical and functional foods.

Nutraceutical and functional food applications and their health benefits. Nutraceutical compounds and their classification based on chemical and biochemical nature with suitable and relevant descriptions.

Unit-II (12 Hrs.)

Nutraceuticals for specific situations such as cancer, heart disease, stress, osteoarthritis, hypertension.

Antioxidants and other phytochemicals, (isoflavones, lycopenes), their role as nutraceuticals and functional foods.

Dietary fibers and complex carbohydrates as functional food ingredients.

Unit-III (12 Hrs.)

Protein as a functional food ingredient.
Probiotic foods and their functional role.
Cereal products as functional foods – oats, wheat bran, rice bran etc.

Unit-IV (11 Hrs.)

Functional vegetable products, oil seeds and sea foods.
Coffee, tea and other beverages as functional foods/drinks and their protective effects.
Effects of processing, storage and interactions of various factors on the potentials of such foods.

Recommended Books

1. G. Mazza, 'Functional foods: Biochemical and Processing Aspects', Techonomic Publication Lancaster, USA.
2. R.S. Kirk and R. Sawyer, 'Pearson's Composition and Analysis of Foods', Wesley Longman Inc. California, USA.
3. R.E.C. Wildman, 'Handbook of Nutraceuticals and Functional Foods', CRC Press, New York, U.S.A.
4. AOAC, 'Official Methods of Analysis', Association of Official Analytical Chemists, USA.

NUTRITION AND HEALTH

Subject Code: MFOT1-157 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Foods and Nutrients: Basic definitions, functions of food and nutrients, levels of nutritional status, changing concepts of nutrition.
Energy: Energy content of foods, physiological fuel value - review, measurement of energy expenditure. estimating energy requirements of individuals and groups. regulation of energy metabolism, control of food intake and weight.
Energy Balance: Food energy measure, energy control in human metabolism, basal metabolic rate (B.M.R.), factors affecting B.M.R., measuring B.M.R., energy requirements and its estimation.

Unit-II (12 Hrs.)

Nutrition and Weight Management: Obesity and its causes, body composition, B.M.I., weight for height measures, health implications of obesity, problems of weight management.
Glycaemia Index of Foods: Control its importance.
Recommended dietary allowances (R.D.A.), ICMR standards, food guide, exchange lists, health promotion guidelines
Carbohydrates: Classification, dietary importance, Special functions of carbohydrates in body tissues, Relationship between dietary fiber and various health problems

Unit-III (12 Hrs.)

Fats: Functions of EFA, role of ω-3, ω -6 fatty acids in health and disease. Trans fatty acids and prostaglandins, essential fatty acids, cholesterol, LDL and HDL and their health importance
Proteins: Nature and essentiality of amino acids and proteins, Functions of protein, the concept of protein balance, Comparative quality of food proteins, Biological value, Net protein utilization, Protein efficiency ratio, Therapeutic applications of specific amino acids
Vitamins: Clinical applications, sources, requirements and functions of vitamin A, D, E, K, C and 'B' complex, vitamins toxicity problems.

Unit-IV (11 Hrs.)

Minerals: Minerals in human health, macro and micro minerals, trace minerals- functions, clinical applications, food sources and requirements

Functional Foods: concept and categories of functional foods and their importance

Food security: problem and prospects

Recommended Books

1. P. Insel, R.E. Turner and D. Ross, 'Discovering Nutrition', ADA, Jones and Bartlett Publishers Inc., USA.
2. S.R. Williams, 'Essentials of Nutrition and Diet Therapy', Mosby Publishing, New York, U.S.A.
3. P.V. Hegarty, V. Hegarty, 'Nutrition Food and the Environment', Eagen Press, United States.
4. A.F. Brian and G. Allen, 'Food Science, Nutrition & Health', Edward Arnold, A member of Hodder Headline Group London, Sydney, Auckland.
5. S.R. Mudambi and M.V. Rajagopal, 'Fundamentals of Food & Nutrition'. New Age International (P) Limited, Publishers, New Delhi, India.
6. ICMR, 'Nutrient Requirement & RDA' ICMR, New Delhi.
7. M.J. Gibney, M. Elia, O. Ljungqvist and J. Dowsett, 'Clinical Nutrition', The Nutrition Society Textbook Series, Blackwell Publishing Company.

BASIC FOOD ENGINEERING

Subject Code: MFOT1-206 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (11 Hrs.)

Fundamental Concepts and Definitions: Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales.

Material Balances: Basic principles, process flow diagrams, total mass balance, component mass balance, material balance problems involved in dilution, concentration and dehydration.

Unit-II (12 Hrs.)

Energy Balances: Basic principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heat balances.

Fluid Flow Principles: Fluid statics and dynamics, mass balance and energy balance, Bernoulli's equation, concept of viscosity, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Reynold's number.

Unit-III (12 Hrs.)

Heat Transfer: Modes of heat transfer, conductive, convective and radiative heat transfer, thermal properties of foods, conductive heat transfer in a rectangular slab, tubular pipe and multilayered systems, estimation of convective heat transfer coefficient, forced convection and free convection, estimation of overall heat transfer coefficient

Heat exchangers: plate, tubular, scraped surface and steam infusion.

Unit-IV (10 Hrs.)

Thermal Process Calculations: Commercially sterile concept, concept of D, F and Z values, reference F value, effect of temperature on thermal inactivation of micro-organisms, lethality function, thermal process calculation for canned foods. Calculation of processing time in continuous flow systems. Thermal process calculation for canned foods.

Psychrometrics: Properties of dry air: composition of air, specific heat of dry air, enthalpy of dry air and dry bulb temperature.
Properties of Water Vapor: specific volume of water vapor, specific heat of water vapour, Gibbs-Dalton law, Dew point temperature, relative humidity, humidity ratio, wet bulb temperature.
Study of Psychrometric chart.

Recommended Books

1. R.P. Singh and D.R. Heldman, 'Introduction to Food Engineering', Academic Press, INC, London.
2. R.L. Earle, 'Unit Operations in Food processing', Pergamon Press Oxford, U.K.
3. R.T. Toledo, 'Fundamentals of Food Process Engineering', CBS Publishers, New Delhi, India.
4. J.C. Batty and S.L. Folkman, 'Food Engineering Fundamentals', John Wiley and Sons, New York, U.S.A.

TECHNOLOGY OF CEREALS & MILLETS

Subject Code: MFOT1-207 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (12 Hrs.)

Wheat Chemistry and Technology: Structure and chemical composition of wheat grain. Criteria of wheat quality – physical and chemical factors. Wheat milling – general principles and operation; cleaning, conditioning and roller milling systems. Flour extraction rates and various flour grades. criteria of flour quality. enzymes of wheat and their technological significance. Dough rheology and its measurement. Functionality of wheat proteins, carbohydrates, lipids and enzymes in bread making. Durum wheat- chemistry, quality and technology of pasta products.

Unit-II (10 Hrs.)

Bread making processes, importance of critical unit operations, functions of ingredients/additives such as fat, emulsifiers, oxidants, reducing agents and conditioners. Bread faults and remedies. Technology of biscuit, cake, cookie and cracker manufacturing. Baking powders as leavening agents in bakery industry.

Unit-III (12 Hrs.)

Rice Chemistry and Technology: Structure and chemical composition of rice grain, milling of rice–types of rice mill; huller mill, Sheller-cum-cone polisher mill. modern rice milling unit operation-dehusking, paddy separation, polishing and grading. Factors affecting rice yield during milling. By-products of rice milling. rice parboiling technology. CFTRI process of parboiling. Properties of parboiled rice, changes during parboiling. Advantages and disadvantages of parboiling. cooking characteristics of rice. rice convenience foods: precooked rice, canned rice, expanded rice, rice-based infant food formulae, rice cakes, rice noodles.

UNIT-IV (11 Hrs.)

Corn Technology: Wet and dry milling of corn, products of wet and dry milling of corn, corn sweeteners and their uses.
Malt Technology: Malting of barley: steeping, germination and drying. different types of malts and their food applications.
Technology of coarse cereal grains: chemical, technological and milling aspects of sorghum, oats and millets.

Recommended Books

1. A.M. Samuel, 'The Chemistry and Technology of Cereals as Food and Feed', CBS Publisher & Distribution, New Delhi, India.
2. Y. Pomeranz, 'Wheat: Chemistry and Technology', American Association of Cereal Chemists, St. Paul, MN, U.S.A.
3. A.C. Eliasson and K. Larsson, 'Cereals in Bread Making', Marcel Dekker. Inc. NewYork, U.S.A.
4. R.C. Honeney, 'Principles of Cereal Science and Technology', American Association of Cereal Chemists, St. Paul, U.S.A.
5. Y. Pomeranz, 'Advances in Cereal Science and Technology', American Association of Cereal Chemists, St. Paul, U.S.A.
6. B.O. Juliano, 'Rice Chemistry and Technology', American Association of Cereal Chemists, St. Paul, U.S.A.
7. J.M.V. Blanshard, P.J. Frazier and T. Galliard, 'Chemistry and Physics of Baking', Royal Society of Chemistry, London.
8. A. Chakraverty, 'Postharvest Technology of Cereals, Pulses and Oilseeds', Oxford and IBH, New Delhi, India.
9. S.C. Durbey, 'Basic Baking: Science and Craft', Gujarat Agricultural University, Anand (Gujrat).
10. N.L. Kent, 'Technology of Cereals', Pergamon Press, Oxford, UK.
11. R.H. Matthews, 'Legumes: Chemistry, Technology and Human Nutrition', CRC Press, New York, U.S.A.
12. D.K. Salunkhe, S.S. Kadam, 'Handbook of World Food Legumes: Chemistry, Processing and Utilization', CRC Press, Florida, U.S.A.

COMPUTER FUNDAMENTALS AND STATISTICS

Subject Code: MFOT1-208 **L T P C** **Duration: 36 Hrs.**

3 0 0 3

Unit-I (8 Hrs.)

Introduction of Computer: Characteristics, classification of computer; block diagram of computer and overview of working.

Number System: Non-positional vs. positional number, binary, octal, decimal, hexa-decimal conversion of number system.

Unit-II (8 Hrs.)

Hardware: Input, output, and secondary storage devices, central processing unit.

Software: Types of software; meaning, functions and types of operating system.

Unit-III (10 Hrs.)

Understanding Computer Networks: Types; topologies for LANS, transmission media; analog and digital signals; network security.

Working with Software Packages: An introduction to PC-software packages; word processor-working with text, tables, checking spelling and grammar, printing a document; spreadsheet software-working with worksheet, formulas and functions, inserting charts; PowerPoint presentation-working with different views and designing presentation; window XP-working with files and folders, windows explorer.

Lab.: Windows explorer, MS-Word, MS-Excel, MS-PowerPoint and Internet Surfing.

Unit-IV (10 Hrs.)

Methods of data collection, sampling and sampling methods, measurement of central tendency, mean, median, mode, standard deviation, standard error, variance. Correlation & regression analysis, analysis of variance (ANOVA), tests of significance, t-test, z- test and f- test.

Recommended Books

1. 'Introduction to Information Technology', Pearson Education, New Delhi, India.
2. P. Norton, 'Introduction to Computers', Tata McGraw Hill Education Pvt. Ltd., New Delhi, India.
3. D.E. Comer, 'Computer Networks and Internet', Pearson Education, New Delhi. India.
4. V. Rajaraman, 'Fundamentals of Computers', Prentice Hall of India, New Delhi, India.
5. 'Office 2000: No Experience Required', BPB Publications, New Delhi, India.
6. A.K. Ray and T. Acharya, 'Information Technology: Principles and Applications', Prentice Hall of India, New Delhi, India.
7. A.S. Tanenbaum, 'Computer Networks', Eastern Economy Edn., PHI, New Delhi, India.

TECHNOLOGY OF CEREALS LAB.-III

Subject Code: MFOT1-209 **L T P C** **Duration: 48 Hrs.**

0 0 4 2

1. Experimental milling of rice and assessment of presence of head, broken and immature kernels and degree of polish.
2. Experimental parboiling of rice by different methods and evaluation of parboiled rice.
3. Determination of proximate analysis of wheat flour for moisture, ash, protein and fat contents.
4. Determination of wet gluten and dry gluten content of given sample of wheat Flour.
5. Determination of alpha-amylase activity in wheat flour by falling number apparatus.
6. Determination of amylose content of cereal and legume starches by iodine binding method.
7. Isolation of rice starch and its quantification.
8. Determination of different cooking parameters of various rice cultivars.
9. Determination of the alcoholic acidity of a given sample of wheat flour.
10. Study of pasting properties of corn starch by Rapid Visco Analyzer.
11. Study of thermal properties of different Cereal starches by Differential Scanning Calorimeter.
12. To compare different types of wheat flours by Polenshke test.
13. Determination of turbidity and percentage light transmittance of cereal starches
14. Determination of textural properties of cooked rice using Texture Analyzer.
15. Experimental baking of different baked products like biscuits, breads and cakes and their evaluation for different parameters.
16. Visit to milling and bakery industry.

TECHNOLOGY OF BEVERAGES

Subject Code: MFOT1-258 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

Unit-I (10 Hrs.)

Beverages: Definition, types, importance of beverages in our diets.

Treatment of water for food industry.

Technology of Alcoholic Beverages: Wine, cider, brandy, perry, toddy, bear and whisky.

Unit-II (12 Hrs.)

Manufacturing of carbonated beverages and technology of carbonation.
Technology of soft drinks, ingredients and additives used in production of soft drinks.
Citrus beverages, whey beverages and utilization of whey in development of fortified drinks, use of low calorie sweeteners in beverages.

Unit-III (11 Hrs.)

Production, processing and chemistry of tea manufacturing and types of tea.
Production, processing, roasting and brewing of coffee, soluble coffee, decaffeinated coffee, monsoon coffee, coffee brew concentrate and chicory.

Unit-IV (12 Hrs.)

Cocoa processing, cocoa beverages and chocolate.
Packaged drinking water- manufacturing processes, quality evaluation of raw and processed water, methods of water treatment, BIS quality standards of bottled water.

Recommended Books

1 D.K. Tressler and M.A. Joslyn, 'Fruit and Vegetable Juice Processing Technology', The AVI Publication Com., Inc. U.S.A.
2 N. Manay Shakuntala and M. Shadaksharaswamy, 'Foods: Facts and Principles', New Age Inter. Publishers, New Delhi, India.
3 N.F. Haard and D.K. Salunkhe, 'Postharvest Biology and Handling of Fruits and Vegetables', AVI Publishing Co. Westport, U.S.A.
4 A.A. Kader, 'Postharvest Technology of Horticultural Crops', University of California, Division of Agriculture and National Resources, California, U.S.A.

TECHNOLOGY OF MALTING AND BREWING

Subject Code: MFOT1-259 **L T P C** **3 1 0 4** **Duration: 45 Hrs.**

Unit-I (12 Hrs.)

Barley production and trade, composition and structure of barley. preparation and storage of barley for malting, suitability of different cereals for malting, characteristics of barley for malting and brewing, problem of dormancy and water sensibility. Steeping techniques, Germination of barley, morphological, enzymatic and chemical changes during malting, Role of gibberellic acid in malting, Techniques of malting composition of malt, malting of wheat and other cereals. Kilning, changes during kilning, Kilning techniques.

Unit-II (12 Hrs.)

Quality evaluation of malt, special malts, milling techniques. significance of water quality in brewing process mashing: changes during mashing, methods of mashing, treatment of cereals used as adjucts, properties and complications of using adjuncts of different sources. Filtration of wort and sparging. spent grain: composition and uses.

Unit-III (11 Hrs.)

Techniques of wort boiling, changes during boiling, hops, selection of hops, acidification of mash, wort cooling, methods of fermentation, management of primary fermentation.
Lagering: objectives and techniques Beer: composition, filtration, racking, pasteurization and defects.

Unit-IV (10 Hrs.)

Application of malt in food: baking, infant food etc. Quality control–malt specifications and test procedures. Brewing operations, constituents of hops. brewing adjuncts

Bear quality–flavor, taste, alcohol content, chemical constituent etc. Head retention–factors affecting head retention. Haze formation.

Recommended Books

1. M.J. Lewis and T.W. Young 'Malting and Brewing Science Vol. I', Springer Science & Business Media, Germany.
2. M.J. Lewis and T.W. Young 'Malting and Brewing Science Vol. II', Springer Science & Business Media, Germany.

FOOD BIOTECHNOLOGY

Subject Code: MFOT1-260 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Introduction to Food Biotechnology: basic principles of genetic engineering, improvement of the processing of various crops by genetic engineering, food safety.

Unit-II (11 Hrs.)

Natural Antimicrobials for Food Preservation: Phytoalexins, essential oils and their components, bacteriocins of Lactic acid bacteria, nisin, pediocins etc, applications of bacetriocins in food systems. Aflatoxins - production, control and reduction using molecular strategy.

Unit-III (12 Hrs.)

Protein Engineering in Food Technology: Methods, applications of protein engineering (e.g. glucose isomerase, Lactobacillus beta-galactosidase and peptide antibiotic nisin). Biotechnology and Food ingredients: biogums, fat substitutes, biocolors, organic acids and sweeteners.

Unit-IV (12 Hrs.)

Food Biotechnology and Intellectual property rights (IPR), benefits of securing IPRs; bioethics in food biotechnology.

Transgenic Plants and Animals: Their contribution to food production enhancement.

Recommended Books

1. B.H. Lee, 'Fundamentals of Food Biotechnology', VCH Publishers, New York, U.S.A.
2. M.P. Tombs, 'Biotechnology in Food Industry', Wiley-Blackwell, U. K.
3. D. Knorr, 'Food Biotechnology', Marcel Dekker, INC, New York, U.S.A.
4. A. Schwartzberg and A Rao 'Biotechnology & Food Process Engineering' Marcel Dekker, INC, New York.
5. I. Goldberg and R. Williams, 'Biotechnology and Food Ingredients', Springer Science & Business Media, Germany.
6. R.D. King and P.S.J. Cheetham, 'Food Biotechnology', Elsevier Applied Science, London.

FOOD ADDITIVES

Subject Code: MFOT1-261 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (11 Hrs.)

Introduction to Food Additives: General classification, types, uses, functions, legal aspects, risks and benefits.

Preservatives: Antimicrobial agents (types, mode of action and their application), antioxidants (types and mechanism of oxidation inhibition), anti-browning agents (types, functions and mode of action).
Chelating Agents and Sequestrants: Types, uses and mode of action.

Unit-II (12 Hrs.)

Acidulants and pH Control Agents: Types, uses and mode of action.
Coloring Agents: Synthetic food colorants, color chemistry, applications and levels of use, natural colorants, sources of natural color (plant, microbial, animal and insects), misbranded colors, color extraction techniques, color stabilization
Flavoring Agents: flavors (natural and synthetic flavors), off flavor in foods, flavor enhancers, flavor stabilization, flavor encapsulation.

Unit-III (11 Hrs.)

Sweeteners: Natural and artificial sweeteners, nutritive and non-nutritive sweeteners, properties and uses of saccharin, acesulfame-K, aspartame, corn sweeteners, invert sugar sucrose and sugar alcohols (polyols) as sweeteners in food products
Emulsifiers: Types, selection of emulsifiers, emulsion stability, functions and mechanism of action.
Stabilizers: Types, uses and functions.

Unit-IV (11 Hrs.)

Food Spices and Condiments: Types and uses spices and condiments, chemical composition, extraction, general processing, uses and special attributes of important Indian spices like pepper, cinnamon, clove, ginger, turmeric, cardamom, fenugreek and fennel etc., seasonings and condiments blends.
Advances in Food Additives: Classification, functions, safety aspects, recent advances with relevance to color, flavor enhancement, sweeteners and preservatives.

Recommended Books

1. A.L. Branen, 'Food Additives', Marcel Dekker Inc., New York, U.S.A.
2. J.W. Purseglove 'Spices' Longman Publishers, London, England.
3. D.R. Tainter and A.T. Grenis, 'Spices and Seasonings- A Food Technology Handbook', VCH Publishers, Inc., Hoboken, U.S.A.
4. J. Merory, 'Food Flavorings, Composition, Manufacture and Use', AVI Publishing Inc., Westport, U.S.A.
5. K.T. Farrell 'Spices, Condiments and Seasonings', Springer, U.S.A.

TECHNOLOGY OF FRUITS AND VEGETABLES

Subject Code: MFOT1-310 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (11 Hrs.)

Classification and nutritional value of fruits and vegetables. Pre-harvest factors influencing post-harvest physiology, post-harvest handling, physical and chemical techniques to increase the post-harvest life of fresh fruits and vegetables.
Physical and chemical indices of fruit maturity, ripening, bio-chemical changes during ripening, processing and storage.

Unit-II (11 Hrs.)

Different storage methods for fruits and vegetables like modified atmospheric storage, cold storage, controlled atmospheric storage etc.

Preprocessing operations; Washing, blanching, peeling, sorting/grading, peeling, blanching, coring, destoning. Minimal processing of fruits and vegetables, quality factors for processing, fruit product order (FPO).

Unit-III (12 Hrs.)

Technology of jam, jellies, marmalades, specifications, role of pectin and theories of gel formation.

Technology for juice pressing, juice extraction and clarification, methods of bottling, enzymatic clarification and debittering of juices, fruit juice powders- preparation and packaging.

Fruit juice beverages, squash, cordial, crush, RTS, nectar, syrups, their types and production, blending of juices.

Technology of tomato products: Sauce, puree, ketchup and tomato paste

Fruit preserves and candied fruits, dehydrated fruits & vegetables, spoilage of processed products.

Unit-IV (11 Hrs.)

Canning of fruits and vegetables, preparation of syrups and brines, method and spoilage of canned fruits and vegetables.

By products from fruit and vegetable wastes.

Mushroom Technology: Types of edible mushrooms, processing of mushrooms.

Recommended Books

1. R.P. Srivastava and S. Kumar, 'Fruit and Vegetable Preservation – Principles and Practices', Bio-Green Books, New Delhi, India.
2. A.K. Thompson, 'Fruit and Vegetables – Harvesting, Handling and Storage' Blackwell Publishing, UK.
3. B. Pantastico, 'Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables', AVI Publishing Company, Inc., Westport, U.S.A.
4. W.V. Cruess, 'Commercial Fruit and Vegetable Products', Allied Scientific Publishers, Bikaner, India.
5. Girdharilal, 'Preservation of Fruits and Vegetables', ICAR, New Delhi.
6. M.E. Dauthy, 'Fruit and Vegetable Processing', International Book Distributing Co. Lucknow, India.
7. L.P. Hamson, 'Commercial Processing of Vegetables', Noyes Data Corporation, New Jersey.

UNIT OPERATIONS IN FOOD ENGINEERING

Subject Code: MFOT1-311 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Preliminary Unit Operations: Material handling: Conveyors and elevators, types of conveyors and elevators.

Cleaning: Dry-cleaning; screening, aspiration and magnetic cleaning, wet cleaning; soaking, spray washing, ultrasonic washing, sorting and grading: methods, advantages of sorting and grading.

Unit-II (12 Hrs.)

Conversion Unit Operations: Size reduction: Benefits, criteria for size reduction, size reduction of solid, fibrous and liquid foods.

Mixing: Mixing terminology, mixers for dry solids (tumbler and vertical screw mixers). mixers for high viscosity pastes (dough mixer), mixers for low viscosity pastes, effect of mixing on foods.
Filtration: Filtration terminology (feed slurry, filtrate, filter medium, filter cake), filtration equipments.

Unit-III (11 Hrs.)

Processing/Preservation Unit Operations: High temperature operations: Pasteurization, pasteurizer and its functioning.
Evaporation: Single effect evaporator, multiple effect evaporators and plate evaporators, batch type pan evaporators, natural circulation, forced circulation, rising film, falling film and agitated thin film evaporators.
Dehydration: Terminology, dehydration systems; tray drier, tunnel drier, spray drier, fluidized bed drying, vacuum drying and drum driers.

Unit-IV (11 Hrs.)

Low Temperature Operations: Refrigeration, components of refrigeration system, compressors, condensers and expansion valve, selection of refrigerant, cooling load, coefficient of performance, refrigerant flow rate.
Freezing Systems: Direct contact and indirect systems, freezing load calculations.
Freeze Drying: Conventional drying versus freeze drying, Basic principle, freeze dryer and its components

Recommended Books

1. R.P. Singh and D.R. Heldman, 'Introduction to Food Engineering', Academic Press, INC, London.
2. R.L. Earle, 'Unit Operations in Food processing', Pergamon Press, Oxford, U.K.
3. J.G. Brennan, J. R. Butters, N. D. Cowell and A. E. V. Lilley, 'Food Engineering Operations', Elsevier, New York, U. S. A.
4. J.C. Harper, 'Elements of Food Engineering', AVI, Westport, U.S.A.

FOOD PACKAGING

Subject Code: MFOT1-312 **L T P C** **Duration: 36 Hrs.**
2 1 0 3

Unit-I (9 Hrs.)

Introduction to food packaging, primary food packaging and secondary packaging, factors involved in the evolution and selection of a food package, functions of food packaging
Packaging requirements of selected foods-cereals and snack food, beverages, milk and dairy products, poultry & eggs, red meat, frozen food, horticultural products.
Safety considerations in food packaging: Food safety problems associated with package, package labeling and food safety, recycling of packaging materials.

Unit-II (9 Hrs.)

Paper and Paper Based Packaging Materials: Types of paper (Kraft, bleached, greaseproof) paper products (paper bags, cartoons, drums and molded paper containers), functional properties of paper, testing of paper packaging materials.
Plastic Packaging Materials: Classification of polymers, functional and mechanical.
Properties of thermoplastic polymers, processing and converting of thermoplastic polymers (extrusion, blow molding, injection molding, compression molding, lamination and heat sealing).

Unit-III (9 Hrs.)

Metal Packaging Materials: Functional properties of metal containers, tin plate containers - quality control tests, can manufacturing and protective coatings.

Glass packaging materials: Composition and manufacturing of glass containers, glass container nomenclature, mechanical and optical properties of glass containers, testing of glass containers.

Aseptic Packaging of Foods: Sterilization of packaging material, food contact surfaces & aseptic packaging systems, retort pouches.

Unit-IV (9 Hrs.)

Active Food Packaging: Definition, physical and chemical principles involved.

Edible Films and Coatings as Active Layer: Concept, different edible films used, use of edible active layers to control water vapor transfer and gas exchange

Oxygen Absorbents: Classification and main type of oxygen absorbents, factors influencing the choice of oxygen absorbents, application of oxygen absorbents for shelf -life extension of foods, disadvantages of oxygen absorbents.

Ethanol Vapor: Ethanol vapor generator, uses of ethanol for shelf - life extension of foods, disadvantages of ethanol/vapor generators.

Recommended Books

1. G.L. Robertson, 'Food Packaging: Principles and Practice', Taylor & Francis.
2. S. Sacharow and R.C. Griffin, 'Principles of Foods Packaging', Avi Publication Co. Westport, U.S.A.
3. A.S. Athalye, 'Plastics in Packaging', Tata McGraw Hill Publishing Co., New Delhi, India.
4. M.L. Rooney, 'Active Food Packaging', Blackie Academic & Professional, Glasgow, UK.
5. M. Bakker, 'The Wiley Encyclopedia of Packaging Technology', John Willey & Sons. Inc; New York, U.S.A.
6. 'Food Packaging Technology Handbook', NIIR Board, National Institute of Industrial Research, New Delhi, India.
7. R. Ahvenainen, 'Novel Food Packaging Techniques', CRC Press, U.S.A.
8. J. Han and J. Han, 'Innovations in Food Packaging', Elsevier Academic Press, U.S.A.
9. R. Coles, D. McDowell and M.J. Kirwan, 'Food Packaging Technology', CRC Press, U.S.A.

TECHNOLOGY OF FRUITS &VEGETABLES LAB.-IV

Subject Code: MFOT1-313 **L T P C**
0 0 4 2

1. Extraction of Juices of different fruit (citrus, pomegranate, apple) and
   i) Evaluation of Vitamin C content
   ii) Determination of pH
   iii) Evaluation of Browning Time
   iv) Determination of Acidity
   v) Cost evaluation of Juice
   vi) Sensory evaluation of the products
   vii) Shelf -life study
2. Preparation of Jams (using different fruits) and
   i) Determination of Pectin content
   ii) Evaluation of Total Soluble Solids
   iii) Evaluation of Sugars using lane eynon method
   iv) Determination of pH

v) Evaluation of Acidity
vi) Sensory evaluation of the products
vii) Cost evaluation product prepared sensory evaluation & organoleptic test

3. Preparation of Jelly and
   i) Estimation of Pectin content
   ii) Determination of total soluble solids (TSS)
   iii) Jelmeter test
   iv) Checking for pH
   v) Checking of Acidity
   vi) Cost evaluation of product
   vii) Microbiological analysis
   viii) Sensory evaluation of the products
4. Preparation of Marmalade (using different fruits)
   i) Jam Marmalade
   ii) Jelly Marmalade
5. Preparation of Preserves and Candies
   i) Evaluation of TSS
   ii) Determination of End point
   iii) Microbiological Analysis
   iv) Evaluation of product cost
   v) Sensory evaluation of the products
6. Preparation of Potato chips and
   i) Calculation of product dimension
   ii) Determination of time-temp combination for product
   iii) Study of the effect of anti-browning agents
7. Preparation of Tomato products (Sauce, Ketchup, Soup, puree) for
   i) Evaluation of TSS
   ii) Evaluation of pH
   iii) Evaluation of acidity
   iv) Cost evaluation
   v) Microbiological analysis
8. Pickling & Fermented products
9. Preparation and shelf-life study of ready-to-serve beverages
10. Experimental studies on drying and dehydration of fruits and vegetables

FOOD PACKAGING LAB.-V

Subject Code: MFOT1-314 **L T P C**
0 0 4 2

1. Designing of an ideal packaging material for different type of food products.
2. Identification of different packaging materials.
3. Testing of paper based packaging materials.
4. Equilibrium Relative Humidity (ERH) study of foods.
5. To study uniformity and amount of wax in wax paper for packaging of hygroscopic foods.
6. To study chemical resistance of plastic and paper packaging materials.
7. To study Water Vapor Transmission Rates (WVTR) of paper and plastic polymers.
8. Shelf life studies of packaged foods.

9. Study of grease resistance of paper, plastic laminates and aluminum foil for the packaging of fatty foods.
10. To perform various functional tests on corrugated fiberboard boxes.
11. Determination of Cobb value of different types of paper board.
12. Shrink Packaging of poultry products.
13. Aseptic packaging of different food products.
14. Vacuum Packaging of dry powders.
15. Testing of glass containers for thermal shock resistance.
16. Determination of tensile strength and heat seal strength of different plastics.
17. To conduct drop and vibration tests on different types of corrugated fiberboard boxes.
18. Determination of tin coating weight and porosity of tin plate container.
19. Determination of lacquer coating in tin containers.
20. Study of manufacture of 2-piece and 3-piece metal cans.
21. Visit to paper manufacturing industry.

FOOD STANDARDS AND QUALITY ASSURANCE

Subject Code: MFOT1-362 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to food safety Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents.

Unit-II (12 Hrs.)

Principles of food quality assurance, total quality management (TQM), good manufacturing /management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control Food safety management, applications of HACCP in food safety, concept of food traceability for food safety,

Unit-III (11 Hrs.)

Microbial Quality Control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry Food safety and Standards Act 2006: salient provision and prospects

Unit-IV (12 Hrs.)

Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI), Codex alimentarious commission, USFDA, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161, ISO 14000).

Recommended Books

1. R. Early, 'Guide to Quality Management Systems for the Food Industry', Blackie, Academic and Professional, London.
2. W.A. Gould and R.W. Gould, 'Total Quality Assurance for the Food Industries', CTI Publications Inc. Baltimore.
3. Y. Pomeraz and C.E. MeLoari, 'Food Analysis: Theory and Practice', CBS Publishers and Distributor, New Delhi, India.

4. F.L. Bryan, 'Hazard Analysis Critical Control Point Evaluations- A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage', World Health Organization, Geneva.
5. R. Kirk and R. Sawyer, 'Pearson's Composition and Analysis of Food', Longman Scientific and Technical, England.
6. 'Manuals of Food Quality Control, Additives Contaminants Techniques', Food and Agricultural Organization, Rome.
7. T.E. Furia, 'Regulatory Status of Direct Food Additives', CRC Press, Florida, U.S.A.

TECHNOLOGY OF PULSES AND OIL SEEDS

Subject Code: MFOT1-363 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (10 Hrs.)

Importance of fats and oils in human nutrition, Chemical, physical and functional properties of fats and oils.
Importance of oilseeds processing in India.

Unit-II (12 Hrs.)

Commercial oil resources, basic processing of fats and oils - oil extraction, expeller pressing and solvent extraction, degumming, refining, bleaching, hydrogenation, fractional crystallization, inter-esterification, glycerolizes, molecular distillation, plasticizing and tempering.
Preparation of protein concentrates and isolates and their use in high protein foods, fermented and traditional products.

Unit-III (12 Hrs.)

Fat substitutes and mimetics.
Common pulses produced in the country.
Soybean: processing and utilization.
Milling methods for pulses, home scale commercial and recent methods with equipments.

Unit-IV (11 Hrs.)

Anti-nutrients in pulses and modes of elimination.
Main processing methods: Cooking, germination, sprouting, fermentation, roasting, puffing, frying and extrusion cooking etc.
Products from legumes and uses: Starch, flour, protein concentrates and isolates.

Recommended Books

1. R.J. Hamilton and A. Bharti, 'Fats and Oils: Chemistry and Technology', Applied Science, London.
2. D.K. Salunkhe, J.K, Chavan, R.N. Adsule and S.S. Kadam, 'World Oilseeds: Chemistry, Technology and Utilization', VNR, New York, U.S.A.
3. I.A. Wolf, 'Handbook of Processing and Utilization in Agriculture', CRC Press, Florida, U.S.A.

TECHNOLOGY OF EGG, MEAT, FISH AND POULTRY

Subject Code: MFOT1-415 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (11 Hrs.)

Status and scope of meat industry in India.

Structure and physico-chemical properties of muscle.
Meat: Composition and nutritive value, conversion of muscle into meat, environmental and animal production factors that affect meat quality, post mortem changes in meat, rigor mortis, cold shortening, pre-rigor processing.

Unit-II (11 Hrs.)

Aging of meat, meat tenderization- natural and artificial methods.
Properties of fresh meat-water holding capacity, color, palatability.
Cooking methods for meat.
Storage and preservation of meat: Chilling, Freezing, Curing, Smoking, Dehydration, Canning.
Spoilage of meat.

Unit-III (12 Hrs.)

Restructured meat products, meat analogs.
Meat industry by products: Importance and applications.
Fish: Factors affecting quality of fresh fish, fish dressing, chilling, freezing, salting and canning of fish.
Manufacturing of fish oil, fish protein concentrate, fish meal.
By-products of fish industry, their technology of utilization.

Unit-IV (11 Hrs.)

Egg: Structure, composition, nutritive and functional properties.
Quality of Egg: Internal quality evaluation, egg candling, egg grading, microbial spoilage of eggs, preservation and storage methods for eggs.
Egg powder.
Packaging and transportation of eggs.
Poultry: Types, chemical and nutritive value of poultry meat, poultry dressing and slaughtering methods, preservation, grading and packaging of poultry meat.

Recommended Books

1. W.J. Stadelman and J. Owen, 'Egg Science & Technology', AVI Publishing Company, INC. Westport, U.S.A.
2. R.A. Lawrie and D. Ledward, 'Lawrie's Meat Science', Woodhead Publishers, UK.
3. G. Mead, 'Poultry Meat Processing and Quality', Woodhead Publishers, UK.
4. P.C. Panda, 'Text Book on Egg and Poultry Technology', Vikas Publishers, Chennai, India.

TECHNOLOGY OF MILK AND MILK PRODUCTS

Subject Code: MFOT1-416 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Unit-I (12 Hrs.)

Dairy Industry in India: Scope, strengths and opportunities for dairy industry.
Milk: Definition, composition and nutritive value, factors affecting composition of milk.
Physicochemical properties and nutritive value of milk.
Liquid Milk Processing: filtration/clarification, standardization, pasteurization (LTLT, HTST, UHT), homogenization.
Microbiology of milk

Unit-II (12 Hrs.)

Technology of Recombined and Reconstituted Milk: Composition, process of manufacture, defects

Technology of Condensed and Evaporated Milk: process of manufacture, defects (their causes and prevention).
Technology of Milk Powders (WMP, SMP): process of manufacture, defects (their causes and prevention), instantization of milk powder.
Technology of Indigenous Milk Products: Dahi, butter, ghee, channa, paneer etc.

Unit-III (10 Hrs.)

Technology of Cheese: classification, composition, Nutritive value, process of manufacture of cheddar, mozzarella, cottage and processed cheese, defects (their causes and prevention).
Technology of frozen milk products: process of manufacture, defects (their causes and prevention).

Unit-IV (11 Hrs.)

Milk and Milk Product Standards and Legislations in India: Grading of milk and criterion of grading, reconstituted milk, synthetic milk.
Membrane Processing of Milk: types of membranes, applications of reverse osmosis, ultrafiltration and microfiltration in dairy industry.
Milk adulteration, synthetic milk and quality control in dairy industry. By products of dairy industry and their utilization. Imitation dairy products.

Recommended Books:

1. Sukumar, De 'Outlines of Dairy Technology', Oxford University Press, UK.
2. G. Smith, 'Dairy processing improving quality', Woodhead Publishers, New Delhi, India.
3. A.T. Andrews and J. R. Varley, 'Biochemistry of Milk Products' Woodhead Publishers, New Delhi, India.
4. R. Early, 'Technology of Dairy Products', Springer Science & Business Media, Germany.
5. R.P. Aneja, B.N. Mathur, R.C. Chandan and A.K. Banerjee, 'Technology of Indian Milk Products', Dairy India Publishers, New Delhi, India.

FOOD ANALYSIS AND INSTRUMENTATION

Subject Code: MFOT1-417 **L T P C** **Duration: 36 Hrs.**
2 1 0 3

Unit-I (8 Hrs.)

Introduction to food analysis, types of samples and sampling techniques, storage and preservation of samples, expression of results.
Proximate Analysis of Foods: Principles of moisture, fat, protein, carbohydrates, crude fiber and vitamins in foods.

Unit-II (8 Hrs.)

Sensory Analysis of Foods: overview of the sensory principles and practices, selection and screening of the sensory panel, types of panel (trained, semi trained), methodology of sensory evaluation: discriminative tests: difference tests, paired comparison, duo trio, triangle; descriptive tests.

Unit-III (10 Hrs.)

Instrumentation in Food Analysis: Principles, types and applications of spectroscopy, photometry, electrophoresis; chromatography and atomic absorption spectrophotometry.

Unit-IV (10 Hrs.)

Instrumentation in Food Analysis: Color measurement in foods; X-ray analysis of foods and its applications; mass spectroscopy; nuclear magnetic resonance (NMR); differential scanning calorimetry (DSC).

Refractometry and ultrasonic in food analysis; texture analysis in foods, sensory versus instrumental analysis of texture, rapid methods of microbial analysis; immunoassays methods.

Recommended Books

1. R.S. Kirk and R. Sawyer, 'Pearson's Composition & Analysis of foods', Longman Scientific and Technical, UK.
2. G.G. Birk, J.G. Herman and K.J. Parker, 'Sensory Properties of Foods', Applied Science, London.

TECHNOLOGY OF ANIMAL PRODUCTS LAB.-VI

Subject Code: MFOT1-418 **L T P C**
0 0 4 2

1. Determination of specific gravity, total solids (T.S) % and SNF (Solid not fat) % in the given milk sample.
2. Determination of percentage fat in the given sample of milk by Gerber centrifuge method.
3. Determination of titrable acidity (T.A.) and pH of milk.
4. Determination of added Urea in the given sample of milk.
5. Determination of added starch in the given sample of milk.
6. To conduct clot on boiling (COB) and Alcohol – Alizarin test for testing milk quality.
7. Determination of added water in a given sample of milk.
8. Preparation qualitative testing of milk products like chhana, Khoa and Paneer, Ice cream.
9. Determination of added preservatives, neutralizers in the given sample of milk.
10. Estimation of bacterial numbers in a given sample of milk by direct microscopic count in a given sample of milk.
11. Determination of microbiological quality of milk of MBR test.
12. To study dismantling, cleaning and assembling of HTST pasteurizer for milk.
13. Separation of cream by cream separator.
14. Visit to a milk collection/chilling and milk processing plant.
15. Determination of external and internal quality of poultry egg.
16. To study the effect of time, temperature on coagulation properties of egg.
17. Determination of time temperature condition on formation of iron sulphide in egg.
18. Preservation and evaluation of different egg products.
19. Preparation and evaluation of different egg products
20. Preparation of different types of meat products using different methods of preservation.
21. Visit to meat, fish and poultry processing industries.
22. Determination of tenderness and water holding capacity of different meat type.

NUTRITION AND HEALTH (OPEN ELECTIVE)

Subject Code: MFOT0-F91 **L T P C** **Duration: 36 Hrs.**
3 0 0 3

Unit-I (9 Hrs.)

Food and Nutrients: Basic definitions, changing concepts of nutrition.
Energy requirements of individuals and groups. Control of food intake and weight.

Unit-II (9 Hrs.)

Obesity and its causes, Body composition, Body Mass Index (B.M.I).
Basal metabolic rate (B.M.R.), Factors affecting B.M.R.

Unit-III (9 Hrs.)

Cardio vascular diseases, Diabetics, Hypertension, Inflammatory bowel disorder (IBD): causes, precaution and preventive measures.
Functional Foods, role in controlling various diseases.

Unit-IV (9 Hrs.)

Diet planning for specific age groups.
Diet planning for diabetic patients.
Preparation of food charts.

Recommended Books

1. P. Insel, R.E Turner and D. Ross 'Discovering Nutrition', ADA, Jones and Bartlett Publishers Inc., USA.
2. S.R. Williams. 'Essentials of Nutrition and Diet Therapy', Times Mirror/Mosby College Publication.
3. V. Hegarty, 'Nutrition Food and the Environment,' Eagen Press.
4. A.F. Brian, and G. Allen, 'Food Science, Nutrition & Health.,' Edward Arnold, A Member of Hodder Headline Group London, Sydney, Auckland.
5. S.R. Mudambi and M.V. Rajagopal, 'Fundamentals of Food & Nutrition,' New Age International (P) Ltd., Publishers, New Delhi.
6. ICMR, 'Nutrient Requirement and RDA', ICMR, New Delhi.
7. M.J. Gibney, M. Elia, O. Ljungqvist, and J. Dowsett, 'Clinical Nutrition', The Nutrition Society Textbook Series, Blackwell Publications.

FOOD ADULTERATION AND SAFETY (OPEN ELECTIVE)

Subject Code: MFOT0-F92 **L T P C** **Duration: 36 Hrs**
3 0 0 3

Unit-I (8 Hrs.)

Introduction and Concept: Food Adulteration – Definition, concept, classification of adulterants, food contaminants, difference between adulterants and contaminants, list of foods commonly adulterated, harmful effects of adulterants.

Unit-II (10 Hrs.)

Adulteration in Milk and Milk Products: Common adulterants in milk and milk products. Household and laboratory scale methods to detect the adulterants in milk and milk products
Adulteration in Spices and Additives: Common adulterants in spices and food additive. Household and laboratory scale methods to detect the adulterants in these commodities.

Unit-III (8 Hrs.)

Food Laws and standards for adulteration: National and international Laws and regulations to minimize adulteration in food commodities.

Unit-IV (10 Hrs.)

Public Health Hazards and Food Safety: Food borne illness, food poisoning, types of food poisonings, bacterial agents of food borne illness, food poisoning by clostridium, salmonella, E. coli, bacillus, staphylococcus etc.

Recommended Books

1. N.S. Manay and M. Shadaksharaswamy, 'Food Facts and Principles', New Age International Publisher, New Delhi.
2. F.W. Traphagen, 'Food Adulteration', Nabu Press.
3. E.M. Bruce, E.M. Bruce, 'Detection of the Common Food Adulterants', Forgotten Books.
4. S.N. Jha, 'Rapid Detection of Food Adulterants and Contaminants', Academic Publication Ltd.
5. J.M. Jay, 'Modern Food Microbiology', CBS Publishers, New Delhi.

GROUP-A

1ST SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHY0-101	Physics	3	1	0	40	60	100	4
BMAT0-101	Mathematics-I	3	1	0	40	60	100	4
BMEE0-101	Engineering Graphics & Design	1	0	0	40	60	100	1
BELE0-101	Basics Electrical Engineering	3	1	0	40	60	100	4
BPHY0-102	Physics Lab.	0	0	3	60	40	100	1.5
BMEE0-102	Engineering Graphics & Design Lab.	0	0	4	60	40	100	2
BELE0-102	Basics Electrical Engineering Lab.	0	0	2	60	40	100	1
BHUM0-104	Drug Abuse: Problem, Management and Prevention	3	0	0	40	60	100	0
Total		13	3	9	380	420	800	17.5

Note:

1. **There will be Induction Programme of 3 weeks before start of normal classes.**
2. **Drug Abuse: Problem, Management and Prevention is a non-credit Course; however, it is necessary to secure at least E grade in it.**

2ND SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHM0-101	Chemistry-I	3	1	0	40	60	100	4
BMAT0-101	Mathematics-I	3	1	0	40	60	100	4
BHUM0-101	English	2	0	0	40	60	100	2
BCSE0-101	Programming for Problem Solving	3	0	0	40	60	100	3
BCHM0-102	Chemistry-I Lab.	0	0	3	60	40	100	1.5
BHUM0-102	English Lab.	0	0	2	60	40	100	1
BCSE0-102	Programming for Problem Solving Lab.	0	0	4	60	40	100	2
BMFP0-101	Manufacturing Practices	1	0	4	60	40	100	3
BHUM0-103	Human Values & Professional Ethics	3	0	0	60	40	100	0
Total		15	2	13	400	400	800	20.5

Note:

1. **Human Values & Professional Ethics is a non-credit Course; however, it is necessary to secure at least E grade in it.**
2. **Marks of 4 Week Manufacturing Practices Training during Summer Vacation will be included in 3rd Semester**

GROUP-B

1ST SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHM0-101	Chemistry-I	3	1	0	40	60	100	4
BMAT0-201	Mathematics-II	3	1	0	40	60	100	4
BHUM0-101	English	2	0	0	40	60	100	2
BCSE0-101	Programming for Problem Solving	3	0	0	40	60	100	3
BCHM0-102	Chemistry-I Lab.	0	0	3	60	40	100	1.5
BHUM0-102	English Lab.	0	0	2	60	40	100	1
BCSE0-102	Programming for Problem Solving Lab.	0	0	4	60	40	100	2
BMFP0-101	Manufacturing Practices	1	0	4	60	40	100	3
BHUM0-103	Human Values & Professional Ethics	3	0	0	60	40	100	0
Total		15	2	13	400	400	800	20.5

Note:

1. **There will be Induction Programme of 3 weeks before start of normal classes.**
2. **Human Values & Professional Ethics is a non-credit Course; however, it is necessary to secure at least E grade in it.**

2ND SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHY0-101	Physics	3	1	0	40	60	100	4
BMAT0-201	Mathematics-II	3	1	0	40	60	100	4
BMEE0-101	Engineering Graphics & Design	1	0	0	40	60	100	1
BELE0-101	Basics Electrical Engineering	3	1	0	40	60	100	4
BPHY0-102	Physics Lab.	0	0	3	60	40	100	1.5
BMEE0-102	Engineering Graphics & Design Lab.	0	0	4	60	40	100	2
BELE0-102	Basics Electrical Engineering Lab.	0	0	2	60	40	100	1
BHUM0-104	Drug Abuse: Problem, Management and Prevention	3	0	0	40	60	100	0
Total		13	3	9	380	420	800	17.5

Note:

1. **Drug Abuse: Problem, Management and Prevention is a non-credit Course; however, it is necessary to secure at least E grade in it.**
2. **Marks of 4 Week Manufacturing Practices Training during Summer Vacation will be included in 3rd Semester**

PHYSICS (INTRODUCTION TO ELECTROMAGNETIC THEORY)

Subject Code: BPHY0-101 **L T P C** **Duration: 45 Hrs.**

3 1 0 4

PRE-REQUISITE: Mathematics course with vector calculus

UNIT-I

1. **Electrostatics in Vacuum (8 Hrs.)**
   Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Faraday's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

UNIT-II

2. **Electrostatics in a Linear Dielectric Medium (5 Hrs.)**
   Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.
3. **Magnetostatics (6 Hrs.)**
   Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

UNIT-III

4. **Magnetostatics in a Linear Magnetic Medium (6 Hrs.)**
   Magnetization and associated bound currents; auxiliary magnetic field; Boundary conditions on and. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.
5. **Faraday's Law (6 Hrs.)**
   Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.
6. **Displacement Current, Magnetic Field due to Time-Dependent Electric Field and Maxwell's Equations (5 Hrs.)**
   Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time dependent electric field; calculating magnetic field due to changing electric fields in quasistatic approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields.

UNIT-IV

7. **Electromagnetic Waves (8 Hrs.)**
   The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of

electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

Recommended Text Books

1. David Griffiths, 'Introduction to Electrodynamics'.

Recommended Reference Books

1. Halliday and Resnick, 'Physics'.
2. W. Saslow, 'Electricity, Magnetism and Light'.

Course Outcomes

To be uploaded

PHYSICS (INTRODUCTION TO MECHANICS)

Subject Code: BPHY0-101 **L T P C** **Duration: 43 Hrs.**
3 1 0 4

UNIT-I

1. Module-1 (9 Hrs.)

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates

UNIT-II

2. Module-2 (8 Hrs.)

Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite manoeuvres;

UNIT-III

3. Module-3 (6 Hrs.)

Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum;

4. Module-4 (6 Hrs.)

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

UNIT-IV

5. Module-5 (6 Hrs.)

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

6. Module-6 (8 Hrs.)

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two dimensional formulation fails.

Recommended Reference Books

1. M.K. Harbola, 'Engineering Mechanics', 2nd Edn.

2. M.K. Verma, 'Introduction to Mechanics'.
3. D. Kleppner & R. Kolenkow, 'An Introduction to Mechanics'.
4. J.L. Synge & B.A. Griffiths, 'Principles of Mechanics'.
5. J.P. Den Hartog, 'Mechanics'.
6. J.L. Meriam, 'Engineering Mechanics – Dynamics', 7th Edn.
7. J.P. Den Hartog, 'Mechanical Vibrations'.
8. W.T. Thomson, 'Theory of Vibrations with Applications'.

Course Outcomes

To be uploaded

PHYSICS (INTRODUCTION TO QUANTUM MECHANICS FOR ENGINEERS)

Subject Code: BPHY0-101 **L T P C** **Duration: 44 Hrs.**

3 1 0 4

PRE-REQUISITE: Mathematics course on differential equations and linear algebra

UNIT-I

1. Wave Nature of Particles and the Schrodinger Equation (8 Hrs.)

Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave-function, Born interpretation, probability current, Expectation values, Free-particle wave-function and wave-packets, Uncertainty principle.

2. Mathematical Preliminaries for Quantum Mechanics (6 Hrs.)

Complex numbers, Linear vector spaces, inner product, operators, eigenvalue problems, Hermitian operators, Hermite polynomials, Legendre's equation, spherical harmonics.

UNIT-II

3. Applying the Schrodinger Equation (17 Hrs.)

Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Numerical solution of stationary-state Schrodinger equation for one dimensional problems for different potentials Scattering from a potential barrier and tunneling; related examples like alpha-decay, field-ionization and scanning tunneling microscope
Three-dimensional problems: particle in three dimensional box and related examples, Angular momentum operator, Rigid Rotor, Hydrogen atom ground-state, orbitals, interaction with magnetic field, spin. Numerical solution stationary-state radial Schrodinger equation for spherically symmetric potentials.

UNIT-III

4. Introduction to Molecular Bonding (5 Hrs.)

Particle in double delta-function potential, Molecules (hydrogen molecule, valence bond and molecular orbitals picture), singlet/triplet states, chemical bonding, hybridization.

UNIT-IV

5. Introduction to Solids (8 Hrs.)

Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands. Numerical solution for energy in one-dimensional periodic lattice by mixing plane waves.

Recommended Text Books

1. Eisberg and Resnick, 'Introduction to Quantum Physics'.

Recommended Reference Books

1. D.J. Griffiths, 'Quantum Mechanics'.

2. Richard Robinett, 'Quantum Mechanics'.
3. Daniel McQuarrie, 'Quantum Chemistry'.

Course Outcomes

To be uploaded

PHYSICS (OSCILLATIONS, WAVES AND OPTICS)

Subject Code: BPHY0-101 **L T P C** **Duration: 44 Hrs.**

3 1 0 4

PRE-REQUISITES: (i) Mathematics course on Differential equations, (ii) Introduction to Electromagnetic theory

UNIT-I

1. Simple Harmonic Motion, Damped and Forced Simple Harmonic Oscillator (9 Hrs.)

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

UNIT-II

2. Non-dispersive Transverse and Longitudinal Waves in One Dimension and Introduction to Dispersion (8 Hrs.)

Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Waves with dispersion, water waves, superposition of waves and Fourier method, wave groups and group velocity.

UNIT-III

3. The Propagation of Light and Geometric Optics (10 Hrs.)

Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them, transfer formula and the matrix method.

UNIT-IV

4. Wave Optics (7 Hrs.)

Huygens' principle, superposition of waves and interference of light by wave-front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

5. Lasers (10 Hrs.)

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Recommended Reference Books

1. Ian G. Main, 'Oscillations and Waves in Physics'.
2. H.J. Pain, 'The Physics of Vibrations and Waves'.
3. E. Hecht, 'Optics'.

4. A. Ghatak, 'Optics'.
5. O. Svelto, 'Principles of Lasers'.

Course Outcomes

To be uploaded

MATHEMATICS-I

Subject Code: BMAT0-101 **L T P C** **Duration: 40 Hrs.**

3 1 0 4

UNIT-I

1. Calculus (6 Hrs.)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

2. Calculus (6 Hrs.)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT-II

3. Sequences and Series: (10 Hrs.)

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT-III

4. Multivariable Calculus (Differentiation) (8 Hrs.)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

UNIT-IV

5. Matrices (10 Hrs.)

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Recommended Text/Reference Books

1. G.B. Thomas and R.L. Finney, 'Calculus and Analytic Geometry', 9th Edn., Pearson, Reprint, **2002**.
2. Erwin Kreyszig, 'Advanced Engineering Mathematics', 9th Edn., John Wiley & Sons, **2006**.
3. T. Veerarajan, 'Engineering Mathematics for First Year', Tata McGraw Hill, New Delhi, **2008**.
4. B.V. Ramana, 'Higher Engineering Mathematics', 11th Reprint, Tata McGraw Hill, New Delhi, **2010**.
5. D. Poole, 'Linear Algebra: A Modern Introduction', 2nd Edn., Brooks/Cole, **2005**.
6. N.P. Bali and Manish Goyal, 'A Text Book of Engineering Mathematics', Laxmi Publications, Reprint, **2008**.
7. B.S. Grewal, 'Higher Engineering Mathematics', 36th Edn., Khanna Publishers, **2010**.

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful

in their disciplines.
The students will learn:
1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
4. To deal with functions of several variables that are essential in most branches of engineering.
5. The essential tool of matrices and linear algebra in a comprehensive manner.

ENGINEERING GRAPHICS & DESIGN

Subject Code: BMEE0-101 **L T P C** **Duration: 12 Hrs.**
1 0 0 1

1. Traditional Engineering Graphics
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing. Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.
2. Computer Graphics
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM) (Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

Recommended Text/Reference Books
1. N.D. Bhatt, V.M. Panchal & P.R. Ingle, 'Engineering Drawing', Charotar Publishing House, **2014**.
2. M.B. Shah & B.C. Rana, 'Engineering Drawing and Computer Graphics', Pearson Education, **2008.**
3. B. Agrawal & C.M. Agrawal, 'Engineering Graphics', TMH Publication, **2012**.
4. K.L. Narayana & P. Kannaiah, 'Text book on Engineering Drawing', Scitech Publishers, **2008.**
5. (Corresponding set of) CAD Software Theory and User Manuals.

Course Outcomes
All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:
1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. To prepare you to communicate effectively.
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for

engineering practice

The student will learn:

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

BASIC ELECTRICAL ENGINEERING

Subject Code: BELE0-101 **L T P C** **Duration: 42 Hrs.**

3 1 0 4

UNIT-I

1. DC Circuits (8 Hrs.)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, The venin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II

2. AC Circuits (8 Hrs.)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

3. Transformers (6 Hrs.)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

4. Electrical Machines (8 Hrs.)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-IV

5. Power Converters (6 Hrs.)

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

6. Electrical Installations (6 Hrs.)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Recommended Text/Reference Books

1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill, **2010**.
2. D.C. Kulshreshtha, 'Basic Electrical Engineering', McGraw Hill, **2009**.
3. L.S. Bobrow, 'Fundamentals of Electrical Engineering', Oxford University Press, **2011**.
4. E. Hughes, 'Electrical and Electronics Technology', Pearson, **2010**.

5. V.D. Toro, 'Electrical Engineering Fundamentals', Prentice Hall India, **1989**.

Course Outcomes

1. To understand and analyze basic electric and magnetic circuits
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low voltage electrical installations

PHYSICS (INTRODUCTION TO ELECTROMAGNETIC THEORY) LAB.

Subject Code: BPHY0-102 **L T P C**
0 0 3 1.5

EXPERIMENTS

Choice of experiments from the following

1. Experiments on electromagnetic induction and electromagnetic breaking;
2. LC circuit and LCR circuit;
3. Resonance phenomena in LCR circuits;
4. Magnetic field from Helmholtz coil;
5. Measurement of Lorentz force in a vacuum tube.

Laboratory Outcomes

To be uploaded

PHYSICS (INTRODUCTION TO MECHANICS) LAB.

Subject Code: BPHY0-102 **L T P C**
0 0 3 1.5

EXPERIMENTS

Choice of 3-4 experiments from the following

1. Coupled oscillators;
2. Experiments on an air-track;
3. Experiment on moment of inertia measurement,
4. Experiments with gyroscope;
5. Resonance phenomena in mechanical oscillators.

Laboratory Outcomes

To be uploaded

PHYSICS (INTRODUCTION TO QUANTUM MECHANICS FOR ENGINEERS) LAB.

Subject Code: BPHY0-102 **L T P C**
0 0 3 1.5

EXPERIMENTS

Choice of experiments

To be uploaded

Laboratory Outcomes:

To be uploaded

PHYSICS (INTRODUCTION TO OSCILLATIONS, WAVES AND OPTICS) LAB.

Subject Code: BPHY0-102 **L T P C**
0 0 3 1.5

EXPERIMENTS

Choice of experiments
To be uploaded
Laboratory Outcomes:
To be uploaded

ENGINEERING GRAPHICS & DESIGN LAB.

Subject Code: BMEE0-102 **L T P C** **Duration: 60 Hrs.**
0 0 4 2

1. Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;
2. Orthographic Projections
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;
3. Projections of Regular Solids
those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.
4. Sections and Sectional Views of Right Angular Solids
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)
5. Isometric Projections
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;
6. Overview of Computer Graphics
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];
7. Customization & CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;
8. Annotations, Layering & other Functions
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line

lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi-view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerance techniques; dimensioning and scale multi views of dwelling;

***9.* Demonstration of a Simple Team Design Project**

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerance; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

BASIC ELECTRICAL ENGINEERING LAB.

Subject Code: BELE0-102 **L T P C**
0 0 2 1

EXPERIMENTS/DEMONSTRATIONS

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).
6. Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
7. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
8. Torque Speed Characteristic of separately excited dc motor.
9. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
10. Synchronous Machine operating as a generator: stand-alone operation with a load.
11. Control of voltage through field excitation.
12. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the

use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Laboratory Outcomes

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of power electronic converters.

DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

Subject Code: BHUM0-104 **L T P C** **Duration: 30 Hrs.**
3 0 0 0

UNIT-I

Meaning of Drug Abuse:

Meaning: Drug abuse, Drug dependence and Drug addiction. Nature and extent of drug abuse in India and Punjab.

UNIT-II

Consequences of Drug Abuse:

Individual: Education, Employment, Income.
Family: Violence.
Society: Crime.
Nation: Law and Order problem.

UNIT-III

Prevention of Drug Abuse:

Role of Family: Parent-child relationship, Family support, supervision, shipping values, active scrutiny.
School: Counselling, Teacher as role-model, Parent-teacher-health professional coordination, Random testing on students.

UNIT-IV

Treatment and Control of Drug Abuse:

Medical Management: Medication for treatment and to reduce withdrawal effects.
Psychological Management: Counselling, Behavioural and Cognitive therapy.
Social Management: Family, Group therapy and Environmental intervention.
Treatment: Medical, Psychological and Social Management.
Control: Role of Media and Legislation.

Recommended Books:

1. Ram Ahuja, 'Social Problems in India', Rawat Publications, Jaipur, **2003**.
2. 'Extent, Pattern and Trend of Drug Use in India', Ministry of Social Justice and Empowerment, Govt. of India, **2004.**
3. J.A. Inciardi, 'The Drug Crime Connection', Sage Publications, Beverly Hills, **1981**.
4. T. Kapoor, 'Drug Epidemic among Indian Youth', Mittal Publications, New Delhi, **1985**.
5. Kessel, Neil and Henry Walton, 'Alcoholism, Harmond Worth', Penguin Books, **1982**.
6. Ishwar Modi and Shalini Modi, 'Addiction and Prevention', Rawat Publications, Jaipur, **1997.**
7. 'National Household Survey of Alcohol and Drug Abuse', Clinical Epidemiological Unit, All India Institute of Medical Sciences, New Delhi, **2003 & 2004**.
8. Ross Coomber and Others, 'Key Concept in Drugs and Society', Sage Publications, New Delhi, **2013**.

9. Bhim Sain, 'Drug Addiction Alcoholism, Smoking Obscenity', Mittal Publications, New Delhi, **1991**.
10. Ranvinder Singh Sandhu, 'Drug Addiction in Punjab: A Sociological Study', Guru Nanak Dev University, Amritsar, **2009**.
11. Chandra Paul Singh, 'Alcohol and Dependence among Industrial Workers', Shipra, Delhi, **2000**.
12. S. Sussman and S.L. Ames, 'Drug Abuse: Concepts, Prevention and Cessation', Cambridge University Press, **2008**.
13. P.S. Verma, 'Punjab's Drug Problem: Contours and Characteristics', Vol. LII, No. 3, P.P. 40-43, Economic and Political Weekly, **2017**.
14. 'World Drug Report', United Nations Office of Drug and Crime, **2016**.
15. 'World Drug Report', United Nations Office of Drug and Crime, **2017**.

CHEMISTRY-I

Subject Code: BCHM0-101 **L T P C** **Duration: 42 Hrs.**
3 1 0 4

UNIT-I

1. Atomic and Molecular Structure (12 Hrs.)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT-II

2. Spectroscopic Techniques and Applications (8 Hrs.)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

3. Intermolecular Forces and Potential Energy Surfaces (4 Hrs.)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

UNIT-III

4. Use of Free Energy in Chemical Equilibria (6 Hrs.)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

5. Periodic Properties (4 Hrs.)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

UNIT-IV

6. Stereochemistry (4 Hrs.)

Representations of 3-dimensional structures, structural isomers and stereoisomers,

configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

7. Organic Reactions and Synthesis of a Drug Molecule (4 Hrs.)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Recommended Text Books

1. B.H. Mahan, 'University Chemistry'.
2. M.J. Sienko and R.A. Plane 'Chemistry: Principles and Applications'.
3. C.N. Banwell, 'Fundamentals of Molecular Spectroscopy'.
4. B.L. Tembe, Kamaluddin and M.S. Krishnan, 'Engineering Chemistry (NPTEL Web-book).
5. P.W. Atkins, 'Physical Chemistry'.
6. K.P.C. Volhardt and N.E. Schore 'Organic Chemistry: Structure and Function', 5th Edn., http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalize bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. List major chemical reactions that are used in the synthesis of molecules.

MATHEMATICS-II

Subject Code: BMAT0-201 **L T P C** **Duration: 40 Hrs.**
3 1 0 4

UNIT-I

1. Multivariable Calculus (Integration) (10 Hrs.)

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT-II

2. First Order Ordinary Differential Equations (6 Hrs.)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

3. Ordinary Differential Equations of Higher Orders (8 Hrs.)

Second order linear differential equations with variable coefficients, method of variation of

parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT-III

4. Complex Variable – Differentiation (8 Hrs.)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT-IV

5. Complex Variable – Integration (8 Hrs.)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Recommended Text/Reference Books

1. G.B. Thomas and R.L. Finney, 'Calculus and Analytic Geometry', 9th Edn., Pearson, Reprint, **2002**.
2. Erwin Kreyszig, 'Advanced Engineering Mathematics', 9th Edn., John Wiley & Sons, **2006**.
3. W.E. Boyce and R.C. DiPrima, 'Elementary Differential Equations and Boundary Value Problems', 9th Edn., Wiley India, **2009**.
4. S.L. Ross, 'Differential Equations', 3rd Edn., Wiley India, **1984**.
5. E.A. Coddington, 'An Introduction to Ordinary Differential Equations', Prentice Hall India, **1995**.
6. E.L. Ince, 'Ordinary Differential Equations', Dover Publications, **1958**.
7. J.W. Brown and R.V. Churchill, 'Complex Variables and Applications', 7th Edn., McGraw Hill, **2004**.
8. N.P. Bali and Manish Goyal, 'A Text Book of Engineering Mathematics', Laxmi Publications, Reprint, **2008**.
9. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, 36th Edn., **2010**.

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

1. The mathematical tools needed in evaluating multiple integrals and their usage.
2. The effective mathematical tools for the solutions of differential equations that model physical processes.
3. The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.

ENGLISH

Subject Code: BHUM0-101 **L T P C** **Duration: 25 Hrs.**

2 0 0 2

UNIT-I

1. Vocabulary Building

1.1 The concept of Word Formation

1.2 Root words from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

UNIT-II

2. Basic Writing Skills
2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

UNIT-III

3. Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

UNIT-IV

4. Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. Writing Practices
5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

Recommended Books

1. Michael Swan, 'Practical English Usage', OUP, **1995**.
2. F.T. Wood, 'Remedial English Grammar', Macmillan, **2007.**
3. William Zinsser, 'On Writing Well', Harper Resource Book, **2001.**
4. Liz Hamp-Lyons and Ben Heasly, 'Study Writing', Cambridge University Press, **2006**.
5. Sanjay Kumar and Pushp Lata, 'Communication Skills', Oxford University Press, **2011**.
6. 'Exercises in Spoken English', Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Course Outcomes

1. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

PROGRAMMING FOR PROBLEM SOLVING

Subject Code: BCSE0-101 **L T P C** **Duration: 51 Hrs.**
3 0 4 5

UNIT-I

1. Introduction to Programming (8 Hrs.)
Introduction to components of a computer system (disks, memory, processor, where a

program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

2. Arithmetic Expressions and Precedence (15 Hrs.)

Conditional Branching and Loops. Writing and evaluation of conditionals and consequent branching. Iteration and loops.

3. Arrays (6 Hrs.)

Arrays (1-D, 2-D), Character arrays and Strings

4. Basic Algorithms (6 Hrs.)

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

5. Function (5 Hrs.)

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

6. Recursion (5 Hrs.)

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

7. Structure (4 Hrs.)

Structures, Defining structures and Array of Structures

8. Pointers (2 Hrs.)

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

9. File handling (only if time is available, otherwise should be done as part of the lab)

Recommended Text Books

1. Byron Gottfried, 'Schaum's Outline of Programming with C', McGraw Hill.
2. E. Balaguruswamy, 'Programming in ANSI C', Tata McGraw Hill.

Recommended Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, 'The C Programming Language', Prentice Hall of India.

Course Outcomes

The student will learn

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

CHEMISTRY-I LAB.

Subject Code: BCHM0-101 **L T P C**
0 0 3 1.5

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscometers to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

1. Estimate rate constants of reactions from concentration of reactants/products as a function of time
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
3. Synthesize a small drug molecule and analyze a salt sample

ENGLISH LAB.

Subject Code: BHUM0-102 **L T P C**
0 0 2 1

Oral Communication

(This unit involves interactive practice sessions in Language Lab.)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

PROGRAMMING FOR PROBLEM SOLVING LAB.

Subject Code: BCSE0-102 **L T P C**
0 0 4 2

NOTE: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.
Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self referential structures.
8. To be able to create, read and write to and from simple text files.

MANUFACTURING PRACTICES (THEORY & LAB.)

Subject Code: BMFP0-101 **L T P C** **Duration: 70 Hrs.**
1 0 4 3

Lectures & Videos (10 Hrs.)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing Methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.

4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

Recommended Text/Reference Books

1. S.K. Hajra Choudhury, A.K. Hajra Choudhury and S.K. Nirjhar Roy, 'Elements of Workshop Technology', Vol.-I, **2008** and Vol.-II **2010**, Media Promoters and Publishers Pvt. Ltd., Mumbai.
2. S. Kalpakjian, Steven S. Schmid, 'Manufacturing Engineering and Technology', 4th Edn., Pearson Education India Edn., **2002**.
3. Gowri P. Hariharan and A. Suresh Babu, 'Manufacturing Technology – I', Pearson, **2008**.
4. Roy A. Lindberg, 'Processes and Materials of Manufacture', 4th Edn., Prentice Hall India, **1998**.
5. P.N. Rao, 'Manufacturing Technology', Vol.-I and Vol.-II, Tata McGraw Hill House, **2017**.

Course Outcomes

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Workshop Practice (60 Hrs.)

1. Machine shop **(10 Hrs.)**
2. Fitting shop **(8 Hrs.)**
3. Carpentry **(6 Hrs.)**
4. Electrical & Electronics **(8 Hrs.)**
5. Welding shop **(8 Hrs. (Arc welding 4 Hrs. + Gas welding 4 Hrs.)**
6. Casting **(8 Hrs.)**
7. Smithy **(6 Hrs.)**
8. Plastic moulding & Glass Cutting **(6 Hrs.)**
9. Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

HUMAN VALUES AND PROFESSIONAL ETHICS

Subject Code: BHUM0-103 **L T P C** **Duration: 30 Hrs.**
3 0 0 0

UNIT-I (8 Hrs.)

Meaning of values, Values as social fact, Universal values – equality, justice, freedom/ liberty, inclusion. Distinction between social and culture values and values associated with crafts and occupations. Work and leisure as values – Marx and Veblen

UNIT-II (9 Hours)

Values, morality, ethics and their relation with Religion, values as mechanisms of control and coercion. Functional Theory of Values of Talcott Parsons, Theory of Basic Values of Shalom

Schwartz, Theory of Protestant Ethic and Capitalism of Max Weber, Bhagwat Gita and Theory of Karma-Dharma, Sikhism and theory of work, dignity of labour, meditation and sharing.

UNIT-III (7 Hours)

Meaning and types of Professional Ethics, Goals of professional work and their problems, Normative and evaluative elements in professional work, Duties and obligations, Professional rights, Virtues in professional life (honesty, trustworthiness, transparency, competence, integrity and exemplary conduct), Engineering ethics and service ideals.

UNIT-IV (6 Hours)

Technology for and against mankind and environment- fulfilment of human needs, and industrial disasters: case studies – Bhopal Gas Tragedy, Chernobyl and Fukushima Disasters; Equality at work place: gender discrimination and caste/class-based exclusions.

Recommended Books

1. Schwartz, H. Shalom, 'An Overview of the Schwartz Theory of Basic Values'. Online Readings in Psychology and Culture. **2** (1). doi:10.9707/2307-0919.1116, **2012**.
2. John Berry, Janek, Pandey; Poortinga, Ype 'Handbook of Cross-cultural Psychology', 2nd Edn.. Boston, MA: Allyn and Bacon. p. 77. ISBN 9780205160747, **1997**.
3. Timo Airaksinen, 'The Philosophy of Professional Ethics', University of Helsinki, Finland.

DEPARTMENT OF PHARMACEUTICAL SCIENCES & TECHNOLOGY
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY
ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਾਦਲ ਰੋਡ, ਬਠਿੰਡਾ
Badal Road, Bathinda -151001
(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

Ref. No:MRSPTU/PHARM/ 569 Date: 9/1/2018

To

Dean Academic Affairs,
MRSPTU, Bathinda.

Sub: Proposed courses to start at department.

In reference to your letter No. DAA/MRSPTU/2018/1260 dated 19-12-2017, the Department of Pharmaceutical Sciences &Technology, MRSPTU is planning to start following courses in forthcoming session(s) as per following details:

Sr. No.	Course	Session
1	B.Pharm.	2018-19
2	M.Sc. Clinical Research	2018-19
3	M.Sc. Biotechnology	2019-20

Kindly do the needful to include it in the agenda of forthcoming meeting of Academic Council.

Thanking you.

9.1.18

HOD,
Dept. of Pharm. Sci. &Tech.
MRSPTU, Bathinda.

Gmail

daa mrsstu <daa.mrsstu@gmail.com>

Courses to be started in the Department of Food Science and Technology from May, 2018 onwards

1 message

Kawaljit <kawsandhu@rediffmail.com> Sun, Feb 18, 2018 at 9:27 AM
To: daa.mrsstu@gmail.com

Respected Sir,

As per our telephonic conversation please find attached the programs to be started in the Department of Food Science and Technology, MRSPTU, from May, 2018 onwards, their nomenclature, durations and strength of students intake.

1. M.Sc (Food Technology)-2 years course with intake of 30 students.

2. B.Sc (Food Technology)-3 years course with intake of 30 students.

3. B.Sc (Home Science)- 3 years course with intake of 30 students.

Thank you.

With regards,
Kawaljit Singh

Kawaljit Singh Sandhu, Ph.D.
Associate Professor & Head
Department of Food Science & Technology
Maharaja Ranjit Singh Punjab Technical University
Bathinda-151001
Punjab (India)
Mobile: +91-9896268539
Office e-mail: foodtechnologymrsptu@gmail.com

Proposal for New courses

* B.Sc. (Hons School) / B.Sc. (Non-Medical) in Affiliated Colleges — only if Additional lab & staff is provided

(a) B.Sc (Hons in Mathematics)
(b) B.Sc (Hons in Physics)
* (c) B.Sc (Hons in Chemistry)

— in Campus

Deptt of Phy/Chem/Maths

Sam [illegible] 8/1/17

Kamini Singh 8/1/17

[illegible signature] 08/01/17