



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

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Ref. No.: DAA/MRSPTU/2017/850

Date: 21-04-2017

SUBJECT: 1st MEETING OF FACULTY OF SCIENCES ON 28.04.2017.

To

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Sir/Madam,

It is to inform you that 1st Meeting of Faculty of Sciences has been scheduled on 28/04/2017 at 11.00 AM in Committee Room of Giani Zail Singh Campus College of Engg., & Tech., Bathinda. You are requested to make it convenient to attend this meeting. You are further requested to confirm your availability to attend this meeting and travel plan by email. TA/Honorarium will be paid as per MRSPTU, BTI norms.

**DEAN ACADEMIC AFFAIRS,
MRSPTU, BATHINDA**

Copy to:

- 1) PA to Hon'ble Vice Chancellor MRSPTU, Bathinda for Information Please
- 2) Registrar, MRSPTU, Bathinda
- 3) Assistant Registrar Accounts, MRSPTU, Bathinda.

**AGENDA - 1ST MEETING OF MRSPTU FACULTY OF SCIENCES
SCHEDULED ON 28.4.2017 AT 11.00 A.M. -**

**ITEM NO. 01.01 INFORMATION REGARDING 1ST MEETING OF STANDING
COMMITTEE OF MRSPTU ACADEMIC COUNCIL HELD ON
20.12.2016**

It is for information of the members that 1st Meeting of Standing Committee of MRSPTU Academic Council was held on 20.12.2016 and 1st year Syllabi of various Programmes for 2016 Batch were approved. Minutes of this Meeting are enclosed in **ANNEXURE-I**. 1st year Syllabi of these Programmes for 2016 Batch are also included in the agenda for today's Meeting.

The Members of Faculty please note it.

**ITEM NO. 01.02 APPROVAL OF SYLLABI OF UNDER GRADUATE
PROGRAMMES**

Syllabi of Under Graduate Programmes have been prepared for 2016 Batch onwards (**Annexure-III**).

The matter is placed before the Faculty for deliberation and approval.

ITEM NO. 01.03 APPROVAL OF SYLLABI OF POST GRADUATE PROGRAMMES

Syllabi of Post Graduate Programmes have been prepared for 2016 Batch onwards (**Annexure-IV**).

The matter is placed before the Faculty for deliberation and approval.

**ITEM NO. 01.04 APPROVAL OF PRE-Ph.D. COURSE WORK & SYLLABUS IN
PHYSICS**

Pre-Ph.D. Course Work & Syllabus in Physics (**Annexure-V**) has been prepared.

The matter is placed before the Faculty for deliberation and approval.

NOTE: Any other Agenda item can be discussed with permission of the Chair.

**MINUTES OF 1ST MEETING OF MRSPTU STANDING COMMITTEE OF
ACADEMIC COUNCIL HELD ON 20.12.2016.**

1st Meeting of Maharaja Ranjit Singh Punjab Technical University Bathinda Standing Committee of Academic Council was held on 20.12.2016 at 11:30 am in the committee room of MRSPU Campus under the chairmanship of Vice Chancellor. The following members were present

- | | |
|---|-----------------|
| 1. Dr. (Prof.) Mohan Paul Singh Ishar
Vice-Chancellor, MRSPTU, Bathinda | Chairman |
| 2. Dr. (Prof.) Ashish Baldi
Dean Faculty (Pharmacy),
Professor, HOD, Deptt. of Pharmacy, Main Campus, MRSPTU, Bathinda | Member |
| 3. Campus Director
Giani Zail Singh Campus College of Engineering & Technology, Bathinda
(Constituent College). | Member |
| 4. Director
Punjab Institute of Technology, Nandgarh, District Bathinda (Constituent College). | Member |
| 5. Director
Punjab Institute of Technology, GTB Garh, District Moga (Constituent College) | Member |
| 6. Dean Academic Affairs
MRSPTU, Bathinda | Member |
| 7. Dean College Development Council
MRSPTU, Bathinda | Member |
| 8. Dean R&D
MRSPTU, Bathinda | Member |
| 9. Dean Students Welfare
MRSPTU, Bathinda | Member |
| 10. Dean Planning & Development
MRSPTU, Bathinda | Member |
| 11. Controller of Examinations
MRSPTU, Bathinda | Member |
| 12. Registrar
MRSPTU, Bathinda | Member |

The following decisions were taken in the meeting:

ITEM NO. 01.01 APPROVAL OF SYLLABI OF UNDER GRADUATE PROGRAMMES

DECISION: Syllabi of 1st and 2nd semesters approved.

ITEM NO. 01.02 APPROVAL OF SYLLABI OF POST GRADUATE PROGRAMMES.

DECISION: Syllabi of 1st and 2nd semesters approved.

J. S. Singh
30/1/17
Dean Academic Affairs,
MRSSTU, Bathinda

**MINUTES OF 1ST MEETING OF MRSPTU STANDING COMMITTEE OF
ACADEMIC COUNCIL HELD ON 20.12.2016.**

**ITEM NO. 01.03 APPROVAL OF SYLLABI OF ONE-YEAR SKILL
CERTIFICATE PROGRAMMES.**

DECISION: The University has proposed to start following Skill Certification Programmes:

1. MRSPTU Curriculum for One-Year Certificate Programme in Computer Maintenance Programming Assistant for 2016-17 batch onwards.
2. MRSPTU Curriculum for One-Year Certificate Programme in Electrician 2016-17 batch onwards.
3. MRSPTU Curriculum for One-Year Certificate Programme in Farm Equipment Technician 2016-17 batch onwards.
4. MRSPTU Curriculum for One-Year Certificate Programme in Food Processing 2016-17 batch onwards.
5. MRSPTU Curriculum for One-Year Certificate Programme in Servicing and Maintenance of Electronic Instruments 2016-17 batch onwards.
6. MRSPTU Curriculum for One-Year Certificate Programme in Tool and Die Maker 2016-17 batch onwards.
7. MRSPTU Curriculum for One-Year Certificate Programme in Plumbing 2016-17 batch onwards.
8. MRSPTU Curriculum for One-Year Certificate Programme in Refrigeration and Air Conditioning Mechanic (RAC Mechanic) for 2016-17 batch onwards.
9. MRSPTU Curriculum for One-Year Certificate Programme in Welding for 2016-17 batch onwards.

It was decided that:

- (i) In case of these Programmes, suggestions received through email from the members of concerned BOS will be sent to the Chairpersons of the respective BOS for deliberations with the other members of the BOS.
- (ii) All of the suggestions received for these Programmes will be further discussed with experts from the concerned field and NITTTR.
- (iii) Vice Chancellor is authorized to approve the revised curriculum of above programmes.

**ITEM NO. 01.04 APPROVAL OF CHOICE BASED CREDIT SYSTEM
EFFECTIVE FROM 2016 BATCH ONWARDS**

DECISION: After deliberations on the Choice Based Credit System, the following decisions have been made (Choice Based Credit System is appended in the **Annexure-I** after including the following modified rules).

Sunil Kumar
30/1/17
Dean Academic Affairs,
MRSSTU, Bathinda

MINUTES OF 1ST MEETING OF MRSPTU STANDING COMMITTEE OF
ACADEMIC COUNCIL HELD ON 20.12.2016.

1. Point 11(a) of previous CBCS

Existing Rule: A student is required to maintain at least 4.0 CGPA at the end of each academic year, failing which he/she will be declared failed in that academic year. He/she will have to seek readmission to the odd semester of that academic year.

Modified Rule: A student is required to earn at least 25% of the credits registered by him/her in an academic year, failing which he/she will be declared failed in that academic year. He/she will have to seek readmission to the odd semester of the academic year.

2. Point 11(d) of previous CBCS

Existing Rule: In a Programme of more than 2 years, a student can register for Courses of 5th semester only after clearing his/her all Courses of 1st semester, even if he/she maintains at least CGPA of 4.0 at end of 2nd academic year. A student can register for Courses of 6th semester only after clearing his/her all Courses of 2nd semester.

Modified Rule: In a Programme of more than 2 years, a student can register for Courses of 5th semester only after clearing his/her all Courses of 1st semester. A student can register for Courses of 6th semester only after clearing his/her all Courses of 2nd semester.

3. Point 15 (End Semester University Examination) of previous CBCS

Existing Rule: Written Quiz of 10 questions set by MRSPTU for 20 marks.

Modified Rule: Viva/Questionnaire by the External Examiner for 20 marks.

Existing Rule: Practical performed by the student and recorded on the answer sheet.

Modified Rule: Evaluation of Answer sheet of the Practical Examination by the External Examiner for 20 marks.

4. It was also decided that a tutorial is to be designed to disseminate the details of Relative Grading System.

5. Point 9(A) & 9(B) of existing CBCS have been deleted.

ITEM NO. 01.05

APPROVAL OF THE COURSE WORK RECOMMENDED BY DDRC FOR Ph.D. ADMISSION IN THE DEPARTMENT OF ELECTRICAL ENGINEERING, GZSCCET, BATHINDA

DECISION:

Approved.

ITEM NO. 01.06

APPROVAL OF THE REVISED Ph.D. REGULATIONS AS NOTIFIED BY UGC (MIN. STANDARDS AND PROCEDURE FOR AWARD OF M.PHIL./Ph.D. DEGREES) REGULATIONS-2016

DECISION:

Approved.

Sushant
30/1/17
Dean Academic Affairs,
MRSSTU, Bathinda

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MINUTES OF 1ST MEETING OF MRSPTU STANDING COMMITTEE OF
ACADEMIC COUNCIL HELD ON 20.12.2016.

ITEM NO. 01.07 APPROVAL OF THE SCORE CARD VALIDITY
RELAXATION TO GPAT AND GATE QUALIFIED
CANDIDATES FOR Ph.D. ENTRANCE TEST EXEMPTION

DECISION: It was decided that the Entrance Test for admission to Ph.D.
Programme will be exempted for GATE & GPAT qualified candidates
irrespective of their validity period. In case GATE/GPAT qualified
candidates are more than the number of seats available they shall have
to appear and qualify Ph.D. Entrance Test (PET) of MRSPTU,
Bathinda.

ITEM NO. 01.08 APPROVAL OF PRE-Ph.D. COURSE WORK FOR FACULTY
SERVING MRSPTU, BATHINDA MAIN CAMPUS GZSCET,
BATHINDA

DECISION: It was decided that a candidate as a part time teacher (Lecture basis) is
allowed to register for Pre-Ph.D Courses.

ITEM NO. 01.09 RATIFICATION/APPROVAL OF EQUIVALENCE OF
SYLLABI ALREADY GRANTED.

DECISION: Ratified.

ITEM NO. 01.10 RATIFICATION/APPROVAL OF MIGRATION ORDERS.

DECISION: Ratified.

ITEM NO. 01.11 APPROVAL OF ACADEMIC CALENDER 2017 & THE LIST
OF HOLIDAYS FOR THE CALENDAR YEAR 2017.

DECISION: Approved & appended in Annexure-II. III IV

ITEM NO. 01.12 APPROVAL OF MoU WITH DIFFERENT BODIES/
ORGANISATIONS.

DECISION: Approved.

ITEM NO. 01.13 APPROVAL OF INCLUSION OF NEW MEMBERS IN
DIFFERENT BoS.

DECISION: Approved and it was further decided that if required, more members
can be involved as special invitees.

ITEM NO. 01.14 INTIMATION OF APPROVAL OF MRSPTU, BATHINDA BY
AIU.

DECISION: Noted by the members.

Singhania
20/1/17
Dean Academic Affairs,
MRSPTU, Bathinda

4/23

MINUTES OF 1ST MEETING OF MRSPTU STANDING COMMITTEE OF
ACADEMIC COUNCIL HELD ON 20.12.2016.

ITEM NO. 01.15 CHANGE IN CRITERIA TO RE-ESTABLISH EXAMINATION CENTRES.

DECISION: Approved, if any examination centre is cancelled due to any reason, it may be considered for re-establishment after 1 year instead of 2 years.

General Decisions:

1. It was further decided that before putting the syllabus to Academic Council for approval, the syllabus is to be got approved in the meeting of concerned Faculty.
2. All regular faculty members possessing Ph.D. qualification are permitted to guide Ph.D. students. However, other conditions for approval of registered supervisors, as notified in Ph.D Regulations apply.
3. UGC nomenclature should be checked and implemented accordingly.
4. Uniformity in Internal and External marks distribution must be ensured.

The Meeting concluded with a vote of thanks to the Chair.

Susharan
DEAN 30/1/2017
ACADEMIC AFFAIRS,
MRSPTU, BTI
Dean Academic Affairs,
MRSSTU, Bathinda

Approved for approval
in the
The minutes are placed for approval please.

[Signature]
VICE CHANCELLOR
MRSPTU, BATHINDA

MRSPTU CHOICE BASED CREDIT SYSTEM-2016

Annexure - I
CBCS

1. PREAMBLE:

Maharaja Ranjit Singh Punjab Technical University, Bathinda (MRSPTU) has been established as an affiliating University vide Punjab Act No. 5 of 2015 notified through Punjab Government Gazette-Extraordinary (Regd. No. CHD/0092/2015-2017) notification No. 5-Leg./2015 dated 12th February, 2015.

Current evaluation system based on percentage of marks secured in the examinations in MRSPTU, Bathinda will be replaced with grading system called '**CHOICE BASED CREDIT SYSTEM**' (CBCS) w.e.f. academic session 2016-17. This credit system of continuous evaluation is as per guidelines of UGC and pertains to relative evaluation of the student's performance instead of absolute evaluation. The student will have the flexibility to pick up open elective Courses out of a pool of Courses available across different departments, suitable to his/her taste, requirement and capability. He/she will have the option to drop a Course after registering for it at a later stage, if permitted under the rules. The performance of a student in a Course is measured in terms of Credit Points earned by him/her in that course. It is proposed to implement this CBCS for various Programmes – B.Tech., B.Arch., M.Tech., M.Sc., MBA, etc., being offered by MRSPTU in its Constituent/Affiliated Colleges. This Credit System, after necessary amendments, if any, and there after the approval of the competent authority, will be known as **MRSPTU CHOICE BASED CREDIT SYSTEM-2016**. The CBCS facilitates transfer of credits earned by a student across different Departments/Centres of other recognized/accredited universities or institutions of higher education in India and abroad. In Relative Grading System, the following two acute circumstances normally bothering the students are nullified.

- a) When majority of students score very high marks because, either the question paper is easy or the evaluator is very lenient.
- b) When majority of students score very low marks because, either the question paper is tough or the evaluator is very strict.

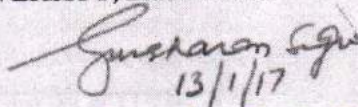
This Credit System will be implemented for students of 2016 batch and onwards. If the total number of students are equal to or less than 30 in a Course in MRSPTU, then Absolute Grading System will be followed. On the other hand, if total number of students are more than 30 in a Course in MRSPTU, then Relative Grading System will be followed. In Relative Grading System, grades will be awarded according to performance of students relative to their top peers in the same Course.

2. DEFINITIONS OF KEY TERMS:

- a) **MRSPTU**: Maharaja Ranjit Singh Punjab Technical University, Bathinda-151001.
- b) **VICE CHANCELLOR**: Vice Chancellor of MRSPTU.
- c) **DEAN ACADEMIC AFFAIRS**: Dean Academic Affairs of MRSPTU.
- d) **PROGRAMME**: Two/Three/Four/Five Year UG/PG Degree as applicable. It also includes Ph.D. Degree.

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA

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Dean Academic Affairs,
MRSSTU, Bathinda

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MRSPTU CHOICE BASED CREDIT SYSTEM-2016

- e) **BRANCH OF A PROGRAMME:** For example: Mechanical Engineering, Civil Engineering are the branches of B. Tech. Programme.
- f) **PROGRAMME CURRICULUM:** Each Programme Curriculum contains, prescribed Course Structure known as Study Scheme. The Study Scheme consists of Courses grouped into various types, viz. Foundation Courses, Core Courses, Departmental Electives, Open Electives and Professional Skills.
- g) **COURSE:** Any subject (Theory/Practical) or a Project/Training/Field Work/Thesis/Seminars of the Curriculum of a Programme. Different Courses may have different credits allotted to them.
- h) **COURSE SYLLABUS:** A Course Syllabus contains,
- Contents of study
 - Course Code
 - Course Nomenclature
 - L-T-P-C (Number of Hours/Week for: Lectures, Tutorials, Practicals, Credits)
 - Course Prerequisites (if any)
 - Course Objectives
 - Expected Outcomes
 - Four Units in a Theory Course and the number of Lectures allotted to each unit
 - Suggested Text and Reference Books
 - Date of approval of Study Scheme by the Academic Council.
- i) **BOARD OF STUDIES (BOS) OF A PROGRAMME:** The BOS shall prepare and recommend the Curriculum of the Programme and submit it to Academic Council for approval. The term of BOS shall be for 2 years.
- j) **PROGRAMME COORDINATOR:** Chairperson BOS will be Programme Coordinator. He/she is deemed to own the Curriculum of the Programme Branch.
- i) **COURSE COORDINATOR:** The Dean Academic Affairs, MRSPTU shall nominate a faculty member as Course Coordinator for each Course of the Programmes being taught in the University/affiliated/constituent colleges. Course Coordinator should be teaching/have taught that Course. Course Coordinator will be heading a team of five faculty members across all Affiliated/Constituent colleges. The Committee is deemed to own that Course of the Programme. Its Chairperson will be Course Coordinator.
- This team will decide, the contents of syllabus for 1st and 2nd midterm semester tests. It will ensure that the same quantum of Course Content is covered in each College before each midterm test. He/she will also prepare Assignment/Tutorial Sheets and provide a copy of it to every faculty member teaching that Course. This Committee will have its term for 2 years.
- j) **END SEMESTER UNIVERSITY EXAMINATIONS:** External examinations conducted by MRSPTU at the end of a semester.

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Susharan
13/1/17
Dean Academic Affairs,
MRSSTU, Bathinda

MRSPTU CHOICE BASED CREDIT SYSTEM-2016

- k) **COURSE PLAN:** Each faculty member will prepare a plan sheet in which he/she will record the topics to be covered/experiments to be performed in each lecture /tutorial/ lab, mode of delivery of lectures/tutorials and reference material to be used.
- l) **LETTER GRADES:** Performance of a student in a Course is measured in terms of Letter Grades. Every Letter Grade has been given a numerical weight called Grade Point on a scale of 10 points.
- m) **COURSE CREDITS:** A class room Lecture/Tutorial of 60-minute duration per week is equivalent to one credit. A laboratory session/Practical or Field work/ Project or a combination of these of two hours per week is equivalent to one credit. Number of credits allotted to a Training/Project/Field Work/Thesis/Seminar Course will be decided by the concerned BOS.
- n) **CREDIT POINTS:** Performance of a student in a Course is measured in terms of Credit Points earned by the student in that Course.
Credit Point earned in a Course = Grade Point earned in that Course x Credits allotted to that Course.
- o) **SEMESTER GRADE POINT AVERAGE (SGPA):** Performance of a student in a Semester is measured in terms of Semester Grade Point Average (SGPA), rounded up to two decimal places.

$$SGPA = \frac{\text{Total Credit Points earned by a student in a Semester}}{\text{Total Credits for the Courses registered by the student in that Semester}}$$

- p) **CUMULATIVE GRADE POINT AVERAGE (CGPA):** Overall cumulative performance of a student over all Semesters is measured in terms of 'Cumulative Grade Point Average' (CGPA), rounded up to two decimal places.

$$CGPA = \frac{\text{Total Credit Points earned by a student in all Semesters in a Programme}}{\text{Total Credits for the Courses registered by the student in that Programme}}$$

- q) **GRADE CARD:** After the end of every Semester, a student is issued a Grade Card depicting details of the Courses registered by him/her, which includes Course Titles, Course Codes, number of Credits allotted to that Course, Grades, SGPA and CGPA earned by the student up to end of that Semester.
- r) **INTERNAL ASSESSMENT:** It is continuous evaluation of the performance a student in a Course during a Semester in 2 midterm sessional tests, quizzes, assignments, projects, attendance, seminars and discussions, etc.
- s) **L-T-P-C OF A COURSE:** 2-1-2-4 means that Course consists of two Lecture Hours, one Tutorial Hour, two Laboratory Hours per week and the Course has been allotted 4 Credits. Number of Laboratory Hours per week to be allotted to any Laboratory Course will be decided by the concerned BOS.
- t) **COURSE FLOWCHART:** Pictorial representation to show how various Courses (Fundamental, Core, Departmental Elective, Open Elective) are connected through pre-requisites.

Gursharan
13/1/17
Dean Academic Affairs,
MRSSTU, Bathinda

8/23

MRSPTU CHOICE BASED CREDIT SYSTEM-2016

- u) **INTERPRETATION COMMITTEE:** If any doubt/conflict arises in the interpretation of any of the Academic Regulations, the matter will be referred by the Vice Chancellor to the Interpretation Committee for its interpretation. Final decision lies with the Vice Chancellor.
- v) **AWARD OF DEGREE:** A student will be awarded Degree after the end of the Programme when he/she fulfils the requirements to earn that Degree.
3. **DURATION OF A PROGRAMME:**
A Programme of N academic year duration is divided into 2N semesters. Each semester consists of 15-18 weeks of academic work equivalent to 90 actual teaching days. Odd semester is scheduled from July to December and Even semester from January to June. Maximum duration allowed for a student to complete his/her Degree is N+2 academic years, where N stands for the minimum academic years required to earn the Degree.
4. **END SEMESTER UNIVERSITY EXAMINATIONS:**
- a) **GENERAL:**
- (i) End Semester University examinations shall be held by MRSPTU as per Date Sheet announced on its website and the Study Scheme of the Programme.
 - (ii) The College/Institute office shall display on its Notice Board, the schedule of examination/date sheet etc. as soon as it is received from the University. The University will notify the date sheet of the End Semester examinations, preferably fifteen days before the start of the examinations.
 - (iii) The medium of instruction and examination shall be English.
- b) **ELIGIBILITY CRITERIA TO APPEAR IN END SEMESTER UNIVERSITY EXAMINATION OF A COURSE:** The student must have registered for that Course and has attended at least 75% of contact hours in that Course for becoming eligible to appear in the End Semester University Examination. He/she should not have any dues pending towards him/her.
5. **EVALUATION SYSTEM - CHOICE BASED CREDIT SYSTEM:**
- a) **UG DEGREE PROGRAMME STRUCTURE:** Each UG Degree Programme consists of Fundamental (F), Core (C), Departmental Electives (E), Open Elective (O), Professional Skills (S) and Training/Project Work Courses.
 - b) **PG DEGREE PROGRAMME STRUCTURE:** Each PG Degree Programme consists of Core (C), Departmental Electives (E), Open Elective (O), Project Work/Thesis and Professional Skills (S) Courses.
 - c) **CORE COURSES (C):** Core Courses comprise of Theory/Practical subjects, projects/thesis, seminars, visits, discussions, studio and Field work, etc. These Courses include Courses of basic sciences and humanities. Around 65% Credits of the Programme are assigned to Department Specific Courses and about 15% Credits of the Programme are allotted to Courses from the arena of basic sciences and humanities, wherever applicable. These are compulsory Courses.
 - d) **DEPARTMENTAL ELECTIVES (E):** These Courses are offered to a student by his/her own department. He/she has to choose any of these Courses out of the basket

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Deputy Academic Affairs,
MRSSTU, Bathinda

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of Courses offered by his/her department. Around 20% of the total Credits of the Programme are earmarked for these Courses.

- e) **OPEN ELECTIVES (O):** These Courses are offered by a department to students of other departments. This provides resilience to the technical education system and generates interest for learning among the students. He/she has to choose any of these Courses out of the pool of Courses offered by the other departments. Around 8% of the total Credits of the Programme are earmarked for these Courses.
- f) **PROFESSIONAL SKILLS COURSES (S):**
One Credit Course of Professional Skills at UG level may be offered in various semesters to build up the aptitude of the students progressively, which includes,
(i) Human Values,
(ii) Written and Oral Communication Skills,
(iii) Personality Development.
Contents for the above will be different for different semesters.
One Credit Course for technical writing, presentation and personality development in various semesters and evaluation based on midterm papers and presentation of 10 minutes may be added at PG level.
- g) Each Semester consists of Theory Courses and Lab/Seminar/Project/Training/Thesis Courses as given in illustration in Table-I.
- h) 1st academic year of Four Year Degree Programme will have 50 Credits.
- i) Total Credits in a Programme will be $N \times 45$, where N stands for the minimum of academic years required to earn the Degree.
- j) F, C, E Courses are of 3L+1T type and are of 4 Credits each. O Courses are of 3L type and are of 3 Credits each. S Courses are of 1P type and are of 1 Credit each.
- k) Credits for Lab/Seminar/Project/Training/Thesis Courses etc. are to be decided by concerned BOS. BOS may deviate from the distribution shown in Table-I for fine tuning/special reasons.
- l) A Lab/Workshop/Drawing/Studio Course may be of more than two hrs. duration.
- m) In PG Degree Programmes where thesis work is not feasible, BOS of that Programme may add more Core Courses in the Curriculum.

6. **GENERAL GUIDELINES FOR CURRICULUM OF A FOUR YEAR BACHELOR DEGREE PROGRAMME:** An illustration is given below in Table-I for distribution of various Courses of a Four Year Bachelor Degree Programme. BOS may redistribute these subjects.

- a) Training-I: In house 4-week training during summer vacation after 2nd sem.
b) Training-II: In house/Ind. 6-week training during summer vacation after 4th sem.
c) Training-III: In house/Ind. 8-week training during summer vacation after 6th sem.

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TABLE-I										
Sem.	Fundamental (F)		Core (C)		Deptt. Elective (E)	Open Elective (O)	Profess. Skills (S)	Training/Project/Thesis	Total Contact Hrs.	Total Credits
	Th.	Lab.	Th.	Lab.						
I	5 (20)	4 (5)	---	---	---	---	---	---	30	25
II	5 (20)	3 (5)	---	---	---	---	---	---	30	25
III	---	---	4 (16)	2 (2)	1 (2)	---	1 (1)	Training-I (2)	25	23
IV	---	---	4 (16)	2 (2)	1 (3)	---	1 (1)	---	24	22
V	---	---	3 (12)	2 (2)	1 (2)	1 (3)	1 (1)	Training-II (3)	25	23
VI	---	---	2 (8)	2 (2)	2 (8)	1 (3)	1 (1)	---	24	22
VII	---	---	2 (8)	2 (2)	1 (4)	1 (3)	---	Training-III (4) + Project-I (4)	19	25
VIII	---	---	1 (4)	1 (1)	1 (4)	---	---	Project-II (6)	10	15
Total Credits										180

7. **GENERAL GUIDELINES FOR CURRICULUM OF A THREE/FIVE YEAR BACHELOR DEGREE PROGRAMME:** For Three Year Bachelor Degree Programmes: BBA, B.Com., BCA, etc. and for Five Year Bachelor Degree Programme: B.Arch., the concerned BOS may decide Courses of its own by following the concept of Fundamental (F), Core (C), Departmental Electives (E), Open Elective (O), Professional skills (S) and Training/Project Work/Seminar Courses, as illustrated in the Table-I.
8. **GENERAL GUIDELINES FOR CURRICULUM OF M.TECH. & OTHER TWO YEAR PG DEGREE PROGRAMMES WITH THESIS:** An illustration is given below in Table-II for distribution of various Courses of M.Tech. & other Two Year Degree Programmes with Thesis. BOS may redistribute these subjects.

TABLE-II										
Sem.	Fundamental (F)		Core (C)		Deptt. Elective (E)	Open Elective (O)	Professional Skills (S)	Training/Project/Thesis	Total Contact Hrs.	Total Credits
	Th.	Lab.	Th.	Lab.						
I	---	---	3 (12)	1 (2)	2 (8)	---	---	---	26	22
II	---	---	2 (8)	1 (2)	2 (8)	1 (4)	---	---	26	22
III	---	---	---	---	1 (4)	1 (4)	1 (4)	Project + seminar (10+4)	12	26
IV	---	---	---	---	---	---	---	Thesis (20)	---	20
Total Credits										90

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TABLE-III										
Sem.	Fundamental (F)		Core (C)		Deptt. Elective (E)	Open Elective (O)	Soft Skills (S)	Training/ Project/ Thesis	Total Contact Hrs.	Total Credits
	Th.	Lab.	Th.	Lab.						
I	---	---	3 (12)	2 (4)	1 (4)	1 (3)	---	---	27	23
II	---	---	3 (12)	1 (2)	2 (8)	---	1 (1)	---	25	23
III	---	---	3 (12)	2 (4)	1 (4)	1 (3)	1 (1)	---	28	24
IV	---	---	2 (8)	1 (2)	---	---	---	Project + Seminar (10)	22	20
Total Credits										90

9. REGISTRATION FOR COURSES:

- a) Before the start of registration for Courses by students for a semester, every department of each college will announce its Departmental and Open Electives being offered, on its website.
- b) Registration dates will be announced by University on its website.
- c) Before a student can register for a particular Course, he/she should have fulfilled conditions of pre-requisite (if applicable) attached to that Course.
- d) If more than 80 students register for a Course, then class will be split into two sections.
- e) Online registration procedure will be adopted.
- f) Departmental/Open Elective Course will be run in a college, only if minimum 15 students have registered for this Course.
- g) Every student has to register for minimum 15 Credits and maximum 35 Credits in a semester, in a UG Programme. However, maximum limit of 35 Credits is allowed only in any two semesters. Condition of minimum credits is not applicable in final semester.
- h) Every student has to register for minimum 12 Credits and maximum 35 Credits in a semester, in a PG Programme. However, maximum limit of 35 Credits is allowed only in any two semesters. Condition of minimum credits is not applicable in final semester.
- i) If a student wants to drop any Course registered by him/her for a semester, he/she may do so before the start of first sessional test in that semester provided he/she fulfills the condition specified in subsection 9 (c).
- j) Lab Courses, seminars, projects etc. may be added in a semester by BOS as per need of the Courses being taught in that semester.
- k) Each midterm internal assessment test will be of 1.5 hrs duration.
- l) Each End Term University Examination will be of three hrs or as specified.

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- m) A student is eligible to register for reappear examination of a Course only in that semester in which that Course is being offered.
- n) The student should obtain at least 25% marks in external University examination in a course to qualify it.
- o) The average internal assessment marks submitted by a teacher of his/her class in a particular Course (subject) must not be greater than 75%. If The average internal assessment marks submitted by a teacher of his/her class in a particular Course (subject) is greater than 75%, then the teacher will have to submit the complete academic record (attendance register, MST answer sheets and assignments etc.) of that class to the University.

10. ELIGIBILITY CRITERIA FOR PROMOTION TO NEXT ACADEMIC YEAR AND EARN THE DEGREE:

- a) A student is required to earn at least 25% of the credits registered by him/her in an academic year, failing which he/she will be declared failed in that academic year. He/she will have to seek readmission to the odd semester of the academic year.
- b) A student has to earn $\geq 30\%$ marks in a Course to qualify it, failing which he/she will be declared failed in that Course. A failed student has to repeat the Course by appearing in continuous evaluation tests, quizzes etc. during the semester and End Semester University Examination.
- c) If a student fails in Departmental Elective/Open Elective Course, he/she has the option to repeat the same Course by appearing in continuous evaluation tests, quizzes etc. during the semester and End Semester University Examination or choose another Departmental Elective/Open Elective Course.
- d) In a Programme of more than 2 years, a student can register for Courses of 5th semester only after clearing his/her all Courses of 1st semester. A student can register for Courses of 6th semester only after clearing his/her all Courses of 2nd semester.
- e) Total Credits mentioned for Study Scheme of any Programme are the minimum Credits to be earned to qualify the Programme. However, one can register for maximum 200 Credits in a UG Programme and maximum 100 Credits in a PG Programme.
- f) In the beginning of syllabus of each Open Elective Course, it should be clearly mentioned, whether there is any Pre-requisite or not for this Course.
- g) Minimum 5.0 CGPA will be required to qualify the Programme.

11. RELATIVE GRADING SYSTEM:

At the end of the semester, for every Course registered by a student, he/she is assigned a Letter Grade (Table-IV) based on his/her overall performance based on his/her continuous evaluation during the semester and End Semester University Examinations over the semester in all the assessments carried out in that Course.

- a) Relative grading system for a Course will be followed, when the total number of students in all colleges registering for a that Course are more than 30. Otherwise, Absolute Grading System shall be followed.
- b) In relative grading system $CGPA \times 10.0 = \% \text{ age marks}$.

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- c) For every Course, a student is required to have at least 75% attendance to appear in the End Semester University Examination.
- d) If the value of $\bar{X} - 1.5SD$ comes out to be less than 30, then the student will have to secure minimum 30 marks to qualify the course (pass grade E).
- e) If the value of $\bar{X} - 1.5SD$ comes out to be more than 40, then the student will have to secure minimum 40 marks to qualify the course (pass grade E).
- f) If the value of $\bar{X} - 1.5SD$ comes out to be greater than 30 but less than 40, then the student will have to secure minimum $\bar{X} - 1.5SD$ marks (MIN) to qualify the course (pass grade E).
- g) Any student who has obtained F grade in any of the Courses, he/she will have to repeat that Course by appearing in both internal and external examinations during the maximum tenure of the Programme (N+2 years, where N is the no. of years of Programme. For example, N = 4 for 4-year B. Tech. Programme). His/her grade in that Course shall be calculated based on the performance of the regular students along which he/she is appearing for improvement. However, he/she will not have to attend classes again. The new grade of the student shall be calculated on the basis of the group of students appearing that particular Course, in that particular Semester in that academic session.
- h) Average \bar{X} will be calculated up to second decimal.
- i) A student who wants to reappear in a particular Course, will be given the grade by considering him/her in the group of students who are appearing in that examination at that time. Such a student wanting to reappear will have to appear both in internal tests, submit assignments etc. for continuous evaluation and in end semester examination.

TABLE-IV				
Letter Grade/ Performance Grade given in a Course	Grade Point earned	Academic Performance in a Course	Relative Grading Formula X_i =Marks obtained by a candidate in a Course in the University, \bar{X} =Average marks in a Course in the University N=Total students in a Course in the University, MIN= $\bar{X} - 1.5SD$ =Minimum marks required to pass a Course	Added Constraint for award of the Grade
A ⁺	10	Outstanding	$X_i > \bar{X} + 1.5SD$	Marks $X_i > 85\%$
A	9	Excellent	$\bar{X} + 1.5SD \geq X_i > \bar{X} + 1.0SD$	In order to obtain grade E or higher grade in a Course, the student must obtain at least 25% marks in End Semester external
B ⁺	8	Very Good	$\bar{X} + 1.0SD \geq X_i > \bar{X} + 0.5SD$	
B	7	Good	$\bar{X} + 0.5SD \geq X_i > \bar{X}$	

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C	6	Average	$\bar{X} \geq X_i > \bar{X} - 0.5SD$	University examination in it, otherwise he/she would get grade F.
D	5	Below Average	$\bar{X} - 0.5SD \geq X_i > \bar{X} - 1.0SD$	
E	4	Pass	$\bar{X} - 1.0SD \geq X_i > MIN$	
F	0	Fail	$MIN > X_i$, (If $MIN \geq 40$ then $MIN=40$, If $MIN < 30$ then $MIN=30$)	11 (d), (e), (f), (g).
R	0	Detained on attendance basis	---	Detained on attendance basis & is required to repeat Course by attending classes when the Course is offered.

- j) After completing the requisite number of credits to obtain a Degree/Diploma, if a student wishes to improve his/her CGPA, he/she will be allowed to do so in maximum five theory subjects already studied by him earlier. This permission to improve is subject to the condition that he/she has cleared all his/her subjects and during the maximum tenure of the Programme (N+2 years, where N is the no. of years of Programme. For example, N = 4 for 4-year B. Tech. Programme). His/her grade in that Course shall be calculated based on the performance of the regular students along which he/she is appearing for improvement.

$$\text{Standard Deviation SD} = \sqrt{\frac{\sum_{i=1}^{i=N} (X_i - \bar{X})^2}{N}}$$

12. MARKS DISTRIBUTION FOR THEORY COURSE:

- a) Internal Assessment: Maximum Marks: 40
 Distribution of Internal Assessment will be as follow:
 Mid Term Sessional Tests 60%
 Assignments & Tutorial Sheets (Minimum 5) 25%
 Written Quizzes 15%
- b) End Semester External University Examination: Maximum Marks: 60

MARKS DISTRIBUTION FOR LAB COURSE:

- Internal Assessment: Maximum Marks: 60
 End Semester Lab. Course External Examination: Maximum Marks: 40

13. All study schemes should allot 100 marks for each Course.
14. **EVALUATION FOR LAB COURSES:** Evaluation of performance of a student in a semester is as given below in Table-V,

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 Dear Sir,
 Academic Affairs,
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TABLE-V			
Internal Assessment (internal)		End Semester Univ. Examination	
Component	Marks	Component	Marks
Record Marks based on continuous assessment of Lab/practical work, considering regularity and timely submission of lab record (i.e. practical note book)	30	Viva/Questionnaire of 20 marks by the External Examiner	20
Viva Voce/Quiz/Assignments/Mini Project	30	Evaluation of Answer sheet of 20 marks of the Practical Examination by the External Examiner.	20

15. ABSOLUTE GRADING SYSTEM:

In absolute grading system $CGPA \times 10.0 = \% \text{ Marks}$

TABLE-VI				
Letter Grade/ Performance Grade given in a Course	Grade Point earned	Academic Performance in a Course	$M = \% \text{ Marks obtained}$	Added constraint for award of the Grade
A ⁺	10	Outstanding	$X_i > 90$	In order to obtain grade E or higher grade in a Course, the student must obtain at least 25% marks in End semester external examination, otherwise he/she would get grade F
A	9	Excellent	$80 < X_i \leq 90$	
B ⁺	8	Very Good	$70 < X_i \leq 80$	
B	7	Good	$60 < X_i \leq 70$	
C	6	Average	$50 < X_i \leq 60$	
D	5	Below Average	$45 < X_i \leq 50$	
E	4	Pass	$40 \leq X_i \leq 45$	
F	0	Fail	$40 > X_i$	Student will get F in a Course when he/she earns <40 Marks
R	0	Detained on attendance basis	---	Detained on attendance basis & is required to repeat Course by attending classes when the Course is offered

Annexure - II
Academic Calendar
2017



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)]

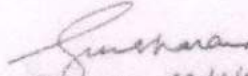
Ref. No. DAA/MRSPTU/702

Date: 24/01/2017

Academic Calendar 2017

S. No.	Event	Date
Even Semester		
1.	Start of Semester	3 rd Jan-2017
2.	1 st Mid Semester Test	21 st -25 th Feb-2017
3.	2 nd Mid Semester Test	18 th -22 nd April-2017
4.	Classes up to	6 th May-2017
5.	End Semester Examinations	9 th May-2017 onwards
6.	Practical Examinations	Immediately after the regular Examinations of classes
7.	Summer Vacation	12 th June - 11 th July-2017
Odd Semester		
1.	Start of Semester	17 th July-2017
2.	1 st Mid Semester Test	18 th -22 nd Sept.-2017
3.	2 nd Mid Semester Test	13 th -17 th Nov-2017
4.	Classes up to	30 th Nov-2017
5.	End Semester Examinations	5 th Dec-2017
6.	Practical Examinations	Immediate after the regular Examinations of classes
7.	Winter Vacation	22 nd Dec-2017 - 2 nd Jan-2018

Note: All the Institutes must ensure 90 teaching days. To ensure 90 teaching days, classes should be held on Saturdays also, if needed.


Dean Academic Affairs,
MRSSTU, Bathinda

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Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

Ref. No. Reg./Notification/Admin./061/413

Dated: 20-01-2017

NOTIFICATION

It is hereby notified that the holidays as listed below shall be observed as Public Holidays by **Administrative (Non-vacational) Staff** of the University and its Constituent Colleges/PIT(s)/Affiliated Colleges during the Calendar Year 2017.

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1	All Saturdays		
2	All Sundays		

Public/Gazetted Holidays

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1	Parkash Gurburab Sri Guru Gobind Singh Ji	5 th January	Thursday
2	Republic Day	26 th January	Thursday
3	Basant Panchmi / Birthday of Satguru Ram Singh Ji	1 st February	Wednesday
4	Birthday of Sri Guru Ravidas Ji	10 th February	Friday
5	Maha Shivaratri	24 th February	Friday
6	Holi	13 th March	Monday
7	Shahidi Divas S. Bhagat Singh Ji	23 rd March	Thursday
8	Ram Navami	4 th April	Tuesday
9	Mahavir Jayanti	9 th April	Sunday
10	Vaisakhi	13 th April	Thursday
11	Good Friday	14 th April	Friday
12	Birthday of Dr. B.R. Ambedkar	14 th April	Friday
13	Lord Parshuram Jayanti	29 th April	Saturday
14	May Day	1 st May	Monday
15	Martyrdom Day of Sri Guru Arjan Dev Ji	29 th May	Monday
16	Kabir Jayanti	9 th June	Friday
17	Idul Fitr	26 th June	Monday
18	Martyrdom Day of Shahid Udham Singh	31 st July	Monday
19	Independence Day	15 th August	Tuesday
20	Janmashtami	15 th August	Tuesday



Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
21	Parkash Utsav Sri Guru Granth Sahib Ji	22 nd August	Tuesday
22	Birthday of Baba Sri Chand Ji	30 th August	Wednesday
23	Id-ul-Zuha (Bakrid)	2 nd September	Saturday
24	Maharaj Agarsain Jayanti	21 th September	Thursday
25	Birthday of S. Bhagat Singh Ji	28 th September	Thursday
26	Dussehra	30 th September	Saturday
27	Birthday of Mahatma Gandhi Ji	2 nd October	Monday
28	Birthday of Maharishi Valmiki Ji	5 th October	Thursday
29	Parkash Gurpurab of Sri Guru Ram Dass Ji	7 th October	Saturday
30	Diwali	19 th October	Thursday
31	Vishwakarma Day	20 th October	Friday
32	Parkash Gurpurab of Sri Guru Nanak Dev Ji	4 th November	Saturday
33	Shahidi Divas S. Kartar Singh Srabha Ji	16 th November	Thursday
34	Martyrdom Day of Sri Guru Teg Bahadur Ji	23 rd November	Thursday
35	Christmas day	25 th December	Monday

1. The University/Colleges shall open at 11:00 am on account of **Raksha Bandhan** and **Bhai Dooj** as and when these occasions fall.

Restricted Holidays

Besides above holidays, each employee will also be permitted to avail himself/herself any two (2) holidays to be chosen by him/her out of the Restricted Holidays below during the Calendar Year 2017.

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1	New Year Day	1 st January	Sunday
2	Lohri	13 th January	Friday
3	Nirwan Diwas of Bhagwan Adinath ji	26 th January	Thursday
4	International Women Day	8 th March	Wednesday
5	Holla Mohalla	13 th March	Monday
6	Buddh Purnima	10 th May	Wednesday
7	Nirjala Ekadashi	5 th June	Monday
8	Death Anniversary of Maharaja Ranjit Singh	29 th June	Thursday

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Dean Academic Affairs,
MRSSTU, Bathinda.

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Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

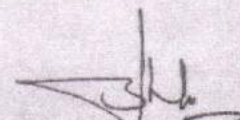
(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
9	Birthday of Baba Jiwan Singh Ji	5 th September	Tuesday
10	Anant Chaturdashi	5 th September	Tuesday
11	Muharram	1 st October	Sunday
12	Karva Chauth	8 th October	Sunday
13	Birthday of Baba Banda Singh Ji Bahadur	16 th October	Monday
14	Goverdhan Pooja	20 th October	Friday
15	Birthday of Sant Nam Dev Ji	31 st October	Tuesday
16	New Punjab Day	1 st November	Wednesday
17	Birthday of Prophet Mohammad Sahib (Milad-un-Nabi or Id-e-Milad)	2 nd December	Saturday
18	Jor Mela Sri Fatehgarh Sahib	25 th , 26 th & 27 th December	Monday, Tuesday & Wednesday

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Registrar

Copy to:

1. PA to Vice Chancellor, Maharaj Ranjit Singh Punjab Technical University, Bathinda.
2. Campus Director, GZSCCET, Bathinda.
3. Dean: Academic Affairs, R & D, Student Welfare and Planning & Development.
4. Directors: College Development Council, IQAC, Training & Placement, Sports & Youth Welfare, PIT (Nandgarh), PIT (GTB Garh) Moga, PIT (Rajpura), PIT (Mansa).
5. Controller of Examinations and Public Relations Officer.
6. HODs: Electrical Engg., Electronics & Communication Engg., Pharmacy, Mechanical Engg., Computer Sc. & Engg., Civil Engg., Text. Engg., Architecture, Applied Mathematics, Applied Chemistry, Applied Physics and Computer Applications.
7. Director, Centre for IT Enables Services to upload on University Website.
8. Chief Warden.
9. Dy. Registrar (Admin.), (Store & Purchase) & (A/cs) and Asstt. Registrar (A/cs.).
10. Incharge: Humanities & Management, Estate, Horticulture, Security, Library, Dispensary, Workshop, Transport & Guest House.


Registrar


Dean Academic Affairs,
MRSSTU, Bathinda

20/23



Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

Ref. No. Reg./Notification/Teaching/60/412

Dated: 20-01-2017

NOTIFICATION

It is hereby notified that the holidays as listed below shall be observed as Public Holidays by **Vacational** and **Non-vacational Staff** working in the teaching departments of the University and its Constituent Colleges/PIT(s)/Affiliated Colleges during the Calendar Year 2017.

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1	All Saturdays		
2	All Sundays		

Public/Gazetted Holidays

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1.	Parkash Gurburab Sri Guru Gobind Singh Ji	5 th January	Thursday
2.	Republic Day	26 th January	Thursday
3.	Birthday of Sri Guru Ravidas Ji	10 th February	Friday
4.	Maha Shivaratri	24 th February	Friday
5.	Holi	13 th March	Monday
6.	Shahidi Divas S. Bhagat Singh Ji	23 rd March	Thursday
7.	Mahavir Jayanti	9 th April	Sunday
8.	Vaisakhi	13 th April	Thursday
9.	Good Friday/Birthday of Dr. B.R. Ambedkar	14 th April	Friday
10.	Martyrdom Day of Sri Guru Arjan Dev Ji	29 th May	Monday
11.	Idul Fitr	26 th June	Monday
12.	Independence Day and Janmashtami	15 th August	Tuesday
13.	Id-ul-Zuha (Bakrid)	2 nd September	Saturday
14.	Dussehra	30 th September	Saturday
15.	Birthday of Mahatma Gandhi Ji	2 nd October	Monday
16.	Birthday of Maharishi Valmiki Ji	5 th October	Thursday
17.	Diwali	19 th October	Thursday
18.	Vishwakarma Day	20 th October	Friday
19.	Parkash Gurburab of Sri Guru Nanak Dev Ji	4 th November	Saturday
20.	Christmas day	25 th December	Monday

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Dean Academic Affairs,
MRSSTU, Bathinda



Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

1. The University/Colleges shall open at 11:00 am on account of **Raksha Bandhan** and **Bhai Dooj** as and when these occasions fall.
2. In order to compensate for lesser number of Gazetted Holidays, Non-vacational staff working in the teaching departments shall be entitled for eleven (11) Compensatory Leaves to be availed during vacations, not less than three (3) at a time.

Restricted Holidays

Besides above holidays, each employee will also be permitted to avail himself/herself any three (3) holidays to be chosen by him/her out of the Restricted Holidays below during the Calendar Year 2017.

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
1.	New Year Day	1 st January	Sunday
2.	Lohri	13 th January	Friday
3.	Nirwan Diwas of Bhagwan Adinath ji	26 th January	Thursday
4.	Basant Panchmi / Birthday of Satguru Ram Singh Ji	1 st February	Wednesday
5.	International Women Day	8 th March	Wednesday
6.	Holla Mohalla	13 th March	Monday
7.	Ram Navami	4 th April	Tuesday
8.	Lord Parshuram Jayanti	28 th April	Friday
9.	May Day	1 st May	Monday
10.	Buddh Purnima	10 th May	Wednesday
11.	Nirjala Ekadashi	5 th June	Monday
12.	Kabir Jayanti	9 th June	Friday
13.	Death Anniversary of Maharaja Ranjit Singh Ji	29 th June	Thursday
14.	Martyrdom Day of Shahid Udham Singh	31 st July	Monday
15.	Parkash Utsav Sri Guru Granth Sahib Ji	22 nd August	Tuesday
16.	Birthday of Baba Sri Chand Ji	30 th August	Wednesday
17.	Birthday of Baba Jiwan Singh Ji Anant Chaturdashi	5 th September	Tuesday
18.	Maharaj Agarsain Jayanti	21 st September	Thursday
19.	Birthday of S. Bhagat Singh Ji	28 th September	Thursday
20.	Muharram	1 st October	Sunday
21.	Parkash Gurpurab of Sri Guru Rasso Dass Ji	7 th October	Saturday



Maharaja Ranjit Singh Punjab Technical University
Bathinda -151001

(Established by Govt. of Punjab vide Punjab Act No. 5 of 2015)

S. No.	Name of the Holiday(s)	Date on which they fall	Day of the week
22.	Karva Chauth	8 th October	Sunday
23.	Birthday of Baba Banda Singh Ji Bahadur	16 th October	Monday
24.	GoverdhanPooja	20 th October	Friday
25.	Birthday of Sant Nam Dev Ji	31 st October	Tuesday
26.	New Punjab Day	1 st November	Wednesday
27.	Shahidi Divas S. Kartar Singh Srabha Ji	16 th November	Thursday
28.	Martyrdom Day of Sri Guru Teg Bahadur Ji	23 rd November	Thursday
29.	Birthday of Prophet Mohammad Sahib (Milad-un-Nabi or Id-e-Milad)	2 nd December	Saturday
30.	Jor Mela Sri Fatehgarh Sahib	25 th , 26 th & 27 th December	Monday, Tuesday & Wednesday

Registrar

Copy to:

1. PA to Vice Chancellor, Maharaj Ranjit Singh Punjab Technical University, Bathinda.
2. Campus Director, GZSCCET, Bathinda.
3. Dean: Academic Affairs, R & D , Student Welfare and Planning & Development.
4. Directors: College Development Council, IQAC, Training & Placement, Sports & Youth Welfare, PIT (Nandgarh), PIT (GTB Garh) Moga, PIT (Rajpura), PIT (Mansa).
5. Controller of Examinations and Public Relations Officer.
6. HODs: Electrical Engg., Electronics & Communication Engg., Pharmacy, Mechanical Engg., Computer Sc. & Engg., Civil Engg., Text. Engg., Architecture, Applied Mathematics, Applied Chemistry, Applied Physics and Computer Applications.
7. Director, Centre for IT Enables Services to upload on University Website.
8. Chief Warden.
9. Dy. Registrar (Admin.), (Store & Purchase) & (A/cs) and Asstt. Registrar (A/cs.).
10. Incharge: Humanities & Management, Estate, Horticulture, Security, Library, Dispensary, Workshop, Transport & Guest House.

Jushan Singh

Dean Academic Affairs
MRSSTU, Bathinda

23/23

[Signature]
Registrar

AGENDA FOR 1ST MEETING OF MRSPTU SCIENCES ON 28.4.2017

TABLE-I		
SR. NO.	ITEM -2 (UG SYLLABI)	PAGE NO.
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2	B.Sc. (MEDICAL LAB. SCIENCE) (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	24-49
3	BCA (SEM 1-6) SYLLABUS 2016 BATCH ONWARDS	50-82
4	B.Sc. FASHION TECHNOLOGY (SEM 1-6) SYLLABUS 2016 BATCH ONWARDS	83-115
5	B.Sc. FASHION DESIGN (SEM1-2) SYLLABUS 2016 BATCH ONWARDS	116-132
6	B.Sc. AGRICULTURE (SEM 1-2) SYLLABUS 2016 BATCH ONWARDS	133-150
7	UG OPEN ELECTIVES-I 2016 BATCH ONWARDS	151-158
8	UG OPEN ELECTIVES-II 2016 BATCH ONWARDS	159-165
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10	B.Sc. INFORMATION TECHNOLOGY (SEM 1-6) SYLLABUS BATCH ONWARDS	170-209

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SR. NO.	ITEM-3 (PG SYLLABI)	PAGE NO.
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2	M.Sc. PHYSICS (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	40-57
3	M.Sc. MATHEMATICS (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	58-80
4	MCA (SEM 1-6) SYLLABUS 2016 BATCH ONWARDS	81-123
5	PGDCA (SEM 1-2) SYLLABUS 2016 BATCH ONWARDS	124-138
6	M.Sc. BIOTECHNOLOGY (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	139-155
7	PG OPEN ELECTIVES-I 2016 BATCH ONWARDS	156-182
8	PG OPEN ELECTIVES-II 2016 BATCH ONWARDS	183-203
9	M.Sc. INFORMATION TECHNOLOGY (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	204-225
10	M.Sc. MEDICAL LAB. TECHNOLOGY (CLINICAL BIOTECHNOLOGY) (SEM 1-4) SYLLABUS 2016 BATCH ONWARDS	226-240

MRSPTU B.Sc. BIOTECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 27

Total Marks = 800

Total Credits = 25

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BBOT1-101	Cell Biology	4	0	0	40	60	100	4
BBOT1-102	Genetics	4	0	0	40	60	100	4
BBOT1-103	Organic Chemistry	4	0	0	40	60	100	4
BBOT1-104	Basics of Biosciences	4	0	0	40	60	100	4
BCAP0-195	Computer Applications	4	0	0	40	60	100	4
BBOT1-105	Organic Chemistry Lab.	0	0	2	60	40	100	1
BCAP0-196	Computer Applications Lab.	0	0	2	60	40	100	1
BMAT0-102/BBIO0-103	*Mathematics/Life Sciences	3	0	0	40	60	100	3
Total		23	0	4	360	440	800	25

*Compulsory Deficiency Course for 10+2 students with Mathematics/Biology and to be awarded as satisfactory and non- satisfactory during their final results,

**No credits will be allotted being the deficiency courses

Total Contact Hours = 26

Total Marks = 800

Total Credits = 24

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BBOT1-206	Communication Skills	2	0	0	40	60	100	2
BBOT1-207	Fundamentals of Biotechnology	4	0	0	40	60	100	4
BBOT1-208	Microbiology	4	0	0	40	60	100	4
BBOT1-209	Inorganic & Physical Chemistry	4	0	0	40	60	100	4
BBOT1-210	Biochemistry- I	4	0	0	40	60	100	4
BBOT1-211	Techniques in Biotechnology	4	0	0	40	60	100	4
BBOT1-212	Microbiology Lab.	0	0	2	60	40	100	1
BBOT1-213	Inorganic & Physical Chemistry Lab.	0	0	2	60	40	100	1
Total		22	0	4	360	440	800	24

MRSPTU B.Sc. BIOTECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 22

Total Marks = 700

Total Credits = 19

SEMESTER 3 rd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BBOT1-314	Fundamentals of Industrial Biotechnology	4	0	0	40	60	100	4
BBOT1-315	Fundamentals of Immunology- I	4	0	0	40	60	100	4
BBOT1-316	Biochemistry- II	4	0	0	40	60	100	4
BBOT1-317	Molecular Biology	4	0	0	40	60	100	4
BCAP0-318	Immunology Lab.- I	0	0	2	60	40	100	1
BBOT1-319	Biochemistry- II Lab.	0	0	2	60	40	100	1
BBOT1-320	Molecular Biology Lab.	0	0	2	60	40	100	1
Total		16	0	6	340	360	700	19

Total Contact Hours = 24

Total Marks = 800

Total Credits = 20

SEMESTER 4 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BBOT1-421	Plant Tissue Culture	4	0	0	40	60	100	4
BBOT1-422	Animal Tissue Culture	4	0	0	40	60	100	4
BBOT1-423	Recombinant DNA Technology	4	0	0	40	60	100	4
BBOT1-424	Fundamentals of Immunology- II	4	0	0	40	60	100	4
BBOT1-425	Plant Tissue Culture Lab.	0	0	2	40	60	100	1
BBOT1-426	Animal Tissue Culture Lab.	0	0	2	40	60	100	1
BBOT1-427	Recombinant DNA Technology Lab.	0	0	2	60	40	100	1
BBOT1-428	Immunology Lab.- I	0	0	2	60	40	100	1
Total		16	0	8	360	440	800	20

CELL BIOLOGY

Subject Code: BBOT1-101

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To understand the basic concepts related to cell and its functions.

UNIT-1 (9 Hrs.)

Cell as a basic unit of life

Cell theory and detailed classification of cell types within an organism. Different levels of organization of cells and cell organelles.

UNIT-II (12 Hrs.)

Cell division and cell cycles

Cell cycle, Mitosis and Meiosis, binary fission, amitosis, molecular organization of mitotic spindle apparatus, cell cycle regulation and carcinogenesis.

UNIT-III (11 Hrs.)

Biochemical compositions of cells

Proteins, lipids, carbohydrates, nucleic acids and metabolic pool and biological membranes.

UNIT-IV (13 Hrs.)

Cellular interactions

Cell recognition and cell coat; differentiation of cell membrane; inter cellular communication and gap junctions.

Recommended Books

1. E.D.P. De Robertis, E.M.F. Jr. De Robertis, 'Cell and Molecular Biology', 8th Edn., Publisher Lea & Febiger.
2. H.F. Lodish., A. Berk., C.A. Kaiser, M. Krieger, M.P. Scott, 'Molecular Cell Biology', 6th Edn., W.H. Freeman & Co.

GENETICS

Subject Code: BBOT1-102

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Imparting knowledge about the genetic material, their structure, functions and existence in prokaryotes and eukaryotes.

UNIT-1 (11 Hrs.)

Organization of Chromosomes

The structure of prokaryotic and eukaryotic chromosome, centromere and telomere structure, euchromatin and heterochromatin, special chromosomes: polytene Chromosomes and lampbrush chromosomes, satellite DNA, the supercoiling of DNA, detail structure of chromosome consisting of histones, nucleosomes and scaffold proteins.

UNIT-II (13 Hrs.)

Mendel's Law of Inheritance

Principle of segregation and independent assortment, monohybrid, dihybrid and trihybrid crosses, Back cross and test cross. Interaction of Genes: Incomplete inheritance and CO-dominance, pleiotropism, modification of F₂ ratios: epistasis, complementary genes, supplementary genes, inhibitory genes, duplicates genes, lethality and collaborators genes. Multiple allelism.

UNIT-III (9 Hrs.)

Linkage & Crossing over

Coupling and repletion hypothesis, chromosomal theory of linkage, complete and incomplete linkage, linkage groups and significance of linkage. Introduction, mechanism of meiotic crossing over, type of crossing over, factors affecting it and its significance, Hardy Weinberg Law.

UNIT-IV (12 Hrs.)

Mutation & Microbial Genetics Spontaneous versus induced mutations, types of mutations, mutations rate and frequency, mutagens: physical and chemical, the molecular basis of mutations. Significance & Practical application of mutation. Conjugation, transduction, transformation

Recommended Books

1. S.R. Maloy, J.E. Crown and D. Freifelder, 'Microbial Genetics', 2nd Edn., Jones & Bartlett Publishers, 1994.
2. D.L. Hartl, 'Genetics', 3rd Edn., Jones & Bartlett Publishers, 1994.
3. R.J. Brooker, 'Genetics Analysis and Principles', Jim Green, 1999.
4. A.G. Antherly, J.R. Girton, 'The Science of Genetics', Harcourt College Publishers, 1999.
5. D. Freifelder, 'Microbial Genetics', Narosa Publishing House, 2000.
6. D.L. Hartl, E.W. Jones, 'Genetics; Analysis of Genes & Genomes', 5th Edn., Jones & Bartlett Publishers, 2001.
7. P.K. Gupta, 'Genetics', Rastogi Publications, 2007.
8. Snustad and Simmons (2010) Principles of Genetics: 5th Edn., John Wiley & Sons.

ORGANIC CHEMISTRY

Subject Code: BBOT1-103

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To learn about the basic of organic chemistry and their role in daily life.

UNIT-1 (11 Hrs.)

Structure and properties of organic compounds: Ionic and covalent bonds, atomic orbitals, electronic orbital, molecular orbitals, covalent bond length and angles, hybrid orbitals- double and triple bonds.

UNIT-II (13 Hrs.)

Isomerism: Geometric isomerism, free rotation about single bond, conformational isomers, polarity of bonds and molecules, structure and physical properties of organic compounds, solubility, stereochemistry, optical activity, enantiomers and optical activity, chiral centre, stereoisomers, racemization.

UNIT-III (9 Hrs.)

Different types of Organic Compounds: Structure and properties of alkanes, alkyl halides, alkenes, alkynes, aliphatic cyclic compounds, aromatic compounds, resonance structures.

UNIT-IV (12 Hrs.)

Functional Groups and Reaction Mechanisms: Free radical reaction mechanism, nucleophilic and electrophilic substitution, organic molecules with different functional groups; alcohols, aldehydes, esters, ethers, primary, secondary and tertiary amines, amides.

Recommended Books

1. R.T. Morrison and R.N. Boyd, 'Organic Chemistry', 6th Edn., Prentice-Hall of India, Pvt. Ltd., 2006.
2. I.L. Finar, 'Organic Chemistry', Vol. 1 and 2, 6th Edn., Pearson Education.

BASICS OF BIOSCIENCES

Subject Code: BBOTI-104

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To impart basic knowledge about the Bio- world in relation to their types, structure and growth.

UNIT-1 (13 Hrs.)

Diversity in the Living World: Biotechnological values of biodiversity, five kingdom classification of living world, classification of plants & animals in general.

UNIT-II (17 Hrs.)

Structural Organization in Plants & Animals: Morphology of flowering plants (Root, stem, Inflorescence, flower, fruit, seed) Semi-technical description of a flower plant. Anatomy of plants (Tissues, anatomy of dicots & monocots). Structural organisation in animals (Animal tissues, organ & organ system)

UNIT-III (15 Hrs.)

Cell Structure, Functions & Biomolecule: Cell theory, overview of Prokaryotes/Eukaryotes, Plant cell/Animal cell. Bio macromolecules- Proteins, polysaccharides, nucleic acids, nature of bond linking monomers in a polymer, metabolism concept, Cell cycle, Mitosis & Meiosis.

Recommend Books

1. K.N. Bhatia & M. Tyagi, 'Trueman's Elementary Biology', Vol. 1, Trueman Book Publishers.
2. B.B. Arora & A.K. Sabharwal, 'Modern abc of Biology', Modern Publications.

COMPUTER APPLICATIONS

Subject Code: BCAP0-195

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To give basic knowledge about the various parts of the computer in terms of their functions.

UNIT-1 (13 Hrs.)

Computer Fundamentals: Block structure of a computer, characteristics of computers, problem solving with computers, generations of computers, and classification of computers, Memory Types; Magnetic core, RAM, ROM, Secondary, Cache, Bubble Memory, Input and Output Units; Keyboard, Mouse, Monitor (CRT, LCD & LED), Light pen, joystick, Mouse, Touch screen; OCR, OMR, MICR, Overview of storage devices; Floppy Disk, hard disk, compact disk, tape, Pen drives, Memory Card and Types, Printers; Impact, non-impact, working mechanism of Drum printer, Dot Matrix printer, Inkjet printer and Laser printer.

UNIT-II (9 Hrs.)

Graphical OS: Operating System and its types, Fundamentals of windows, types of windows, anatomy of windows, windows explorer, customizing windows, control panel, taskbar setting, Network, Internet and its Applications; E-mail, World Wide Web, Search Engines, Web Browsers, Internet, Audio and Video chatting, Video and audio Conferences, uploading and Downloading of files from the web.

UNIT-III (11 Hrs.)

Word Processing: Examine word processing concepts and explore the Microsoft Office Word environment, create a new document, open, save and print a document. Edit and format text. Change the page layout, background and borders. Insert headers and footers. Insert and edit tables. Insert clip art and pictures to documents. Perform a mail merge. Share and review shared document files. Editing features, formatting features, saving, printing, table handling, Graph preparation, page settings, spell-checking, macros, mail-merge, and equation editors.

UNIT-IV (12 Hrs.)

Spreadsheet: Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, Graph preparation, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs, Presentation Graphics Software; Introduction to PowerPoint, what is PowerPoint? Create new presentations from scratch, using beautiful template, working with Shapes and Pictures, Adding Objects and Effects, Outlining Proofing and Printing, Delivering Your Presentation.

Recommended Books

1. Sunita Goel, 'Computer Fundamentals', Pearson.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
3. P.K. Sinha, 'Introduction to Computers', BPB Publications.
4. Raymond Greenlaw, 'Fundamentals of the Internet & the World Wide Web'.
5. Sunjay Saxsena, 'Introduction to Computers and MS office'.

ORGANIC CHEMISTRY LAB.

Subject Code: BBOT1-105

L T P C

0 0 2 1

1. Synthesis of organic compounds (Aspirin / para-bromoacetanilide / anthraquinone)
2. Determination of melting points (Naphthalene / Benzoic acid / Urea / Succinic acid / Salicylic acid / Aspirin)
3. Determination of boiling points (Ethanol / Cyclohexane / Toluene)
4. Crystallization of Phthalic acid from hot water
5. Complete identification including derivation of following organic compounds: Aromatic hydrocarbons, Aldehydes, Ketones, Carbohydrates, Amides, Amines, Carboxylic acids and phenols.

Recommended Books

1. W. Moor, A. Winston, 'Laboratory Manual for Organic Chemistry: A Microscale Approach', Publishers Mc- Graw Hill Science.
2. D.L. Pavia, G.M. Lampanana, G.S. Kriz Jr., 'Introduction to Organic Laboratory Techniques', 3rd Edn., Pubs: Thomson Brooks/Cole, 2005.
3. A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford, P.W.G. Smith, 'Vogel's Text Book of Practical Organic Chemistry', 5th Edn., Pubs: ELBS.

COMPUTER APPLICATION LAB.

Subject Code: BCAP0-196

L T P C

0 0 2 1

Introduction to Personal Computing:

1. Introduction to Computer Hardware and Peripherals.
2. Familiarization with Windows Operating System
3. Working with Files and Folders (Cut, Copy, Paste etc.)
4. Desktop Personalization using Control Panel (Changing wallpaper, Screen Saver, Screen Resolution, Mouse Pointer, speed etc.)
5. Working with Notepad, Calculator, Paint and utilities programs.

Introduction to Word:

1. Introduction to Word and its basic editing
2. Text Formatting, Copying and moving text and objects
3. Working with tables and its formatting
4. Working with paragraph and Clipboard
5. Send Emails using Mail Merge and create hyperlinks in it.
6. Printing documents with header and footers

Introduction to Spreadsheets:

1. Introduction to Spread Sheets and its basic editing
2. Modifying Spreadsheets, formatting cells
3. Working with formula and functions,
4. Working with Charts and Graphs
5. Sorting and filtering with different Conditions
6. Printing selected cells and sheets

Introduction to Power Point:

1. Introduction to PowerPoint and its basic Features
2. Working with slides, adding template and contents to slides
3. Working with charts, Graphs and Tables in Slides
4. Adding animations, Videos and Audio to slides
5. Printing of Presentation
6. Creating a full Presentation with all features of PowerPoint.

Introduction to Internet:

1. Introduction to Internet and its Benefits
2. Browsing Internet with Internet Explorer, Firefox and Chrome with Bookmarks
3. Creating and Using Email, Text, Audio and Video Messages/ chat. Placing Video and PC to PC Calls.
4. Downloading files using Different Web Browsers such as Rar, ZIP. docs, exe etc.,
5. Printing of Web Pages

Recommended Books

1. Sunita Goel, 'Computer Fundamentals', Pearson.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
3. P.K. Sinha, 'Introduction to Computers', BPB Publications.
4. Raymond Greenlaw, 'Fundamentals of the Internet & the World Wide Web'.
5. Sunjay Saxena, 'Introduction to Computers and MS Office'.

MATHEMATICS

Subject Code: BMAT0-102

L T P C
3 0 0 3

Duration: 36 Hrs.

Course Objectives

1. The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects.
2. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

UNIT-1 (7 Hrs.)

Algebra: Arithmetic and Geometric progression, Linear and quadratic equations, complex numbers, polar representation of a complex number, square root of a complex number.

UNIT-II (10 Hrs.)

Coordinate Geometry and Trigonometry: Rectangular Coordinate system, Straight lines, Circles. Trigonometric functions, sum and product formulae for trigonometric functions, trigonometric equations and C- D formulae for trigonometric functions, identities related to $\sin(2x)$, $\cos(2x)$ and $\tan(2x)$.

UNIT-III (8 Hrs.)

Determinants and Matrices: Matrices, Operations on Matrices, Determinants and its properties, singular and non-singular matrices, Adjoint and inverse of a matrix and its properties, Solution of system of linear equations using Cramer's rule and inverse of a matrix.

UNIT-IV (11 Hrs.)

Calculus (Differentiation & Integration): Differentiation, review of sets, relations and functions, limit, continuity and differentiability, differentiation of standard functions (polynomials, trigonometric, inverse trigonometric exponentials and logarithmic); product rule, quotient rule, applications of derivatives in Graphing, maxima and minima. Integration - Integral as anti-derivative, integration by substitution, partial fractions and by parts. Definite integral and its properties, areas of bounded regions.

Recommended Books

1. 'Mathematics, A Text Book', (Parts I & II), NCERT, New Delhi, 2011.
2. G.B. Thomas and R.L. Finney, 'Calculus and Analytical Geometry', 10th Edn., Pearson Education, 2007.
3. S. Narayan, 'Differential and Integral Calculus', S. Chand, 2005.
4. N.P. Bali, 'Engineering Mathematics', Laxmi Publications.

LIFE SCIENCES

Subject Code: BBIO0-103

L T P C
3 0 0 3

Duration: 36 Hrs.

Course Objectives

To understand the real concepts of biology in relation to study of the various body parts and their role.

UNIT-1 (8 Hrs.)

Biological Diversity: Diversity in the living world, Outline classification of plants, animals & microorganisms: Important criteria used for classification in each taxon.

Classification of plants, animals and microorganisms. Evolutionary relationships among taxa.

UNIT-II (10 Hrs.)

Plant Physiology: Structural organization in plants, Anatomy of plants. Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization Events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixes, parthenocarpy, polyembryony; Significance of seed and fruit formation.

UNIT-III (8 Hrs.)

Chemical Structures and their role in Biology: Structure of atoms, molecules and chemical bonds. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins; Structural organization in animals. Structural organization in animals – animal tissues, morphology and anatomy of animals.

UNIT-IV (10 Hrs.)

Cellular Organization: Membrane structure and function (Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes). Structural organization and function of intracellular organelles (Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility). Cell division and cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle). Microbial Physiology (Growth yield and characteristics, strategies of cell division, stress response).

Recommended Books

1. Rastogi and Dubey, 'Life Sciences', S. Chand and Co., N. Delhi, 2001.
2. Sobti and Sharma, 'Basics of Bio-Tech.: Introduction to Life Sciences', Vishal Publishing Co. Jalandhar, 2005.
3. R.C. Sobti, 'Animal Physiology', Narosa Publishings, N. Delhi.
4. Bhatia and Tyagi, 'Trueman's Elementary Biology', Trueman Book Company Publishers.
5. Arora and Sabharwal, 'Modern Biology'.

COMMUNICATION SKILLS

Subject Code: BBOT1- 206

**L T P C
2 0 0 2**

Duration: 24 Hrs.

Course Objectives

The objective of this course is to make students understand that both oral & written communication is equally important.

UNIT-I (6 Hrs.)

Basics of Technical Communication

Meaning, Internal & External functions, Shannon & weaver's model of Communication, Importance of Communication Barriers to communication & ways to improve these barriers, Essentials (7c's & other principles)

UNIT-II (4 Hrs.)

Writing Skills

Writing styles of applications, resume & CV, Personal letters, Official/Business letters, Memo, Notice, Report writing, Project writing, Quotation & Tender.

UNIT-III (6 Hrs.)

Speaking Skills

Presentation Techniques, Principles of Presentation, Types of Interview, G.D, Extempore speaking, Speech Mechanism, Organs of speech, Production & Classification of Speech sounds, skills of effective speaking.

UNIT-IV (8 Hrs.)

Tech Communication & Listening Skills

MS Word, Excel, PowerPoint, Process, Types of listening, Barriers to effective listening, Barriers to effective listening & ways to improve these Barriers

Recommended Books

1. Loveleen Kaur, 'Communication Skills', Satya Prakashan Publication.
2. Narinder Kumar Bodhraj, 'Business Communication', Kalyani Publishers, 2011.
3. S.P. Dhanavel, 'English & Communication Skills for the Students of Science & Engineering', (with audio C.D) Orient Blackswan Publication, 2009.
4. Indrajit Bhattacharya, 'An Approach to Communication Skills'.
5. Wright, Chissie, 'Handbook of Practical Communication Skills'.

FUNDAMENTALS OF BIOTECHNOLOGY

Subject Code: BBOT1- 207

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. Students will learn the basics and applied areas of biotechnology.

UNIT- I (11 Hrs.)

Role of Microbes in Biotechnology

Advent, scope and basis of biotechnology. Bacteria as work horses of biotechnology, E-coli as the model bacteria. Role of yeast, viruses and bacteriophages in biotechnology.

UNIT- II (13 Hrs.)

Introduction to Bioinformatics & Biotechnological Techniques

Introduction to genomics, transcriptomics, proteomics and metabolomics; bioinformatics and its role in biotechnology. Introduction to basic techniques like sterilization, centrifugation, electrophoresis, chromatography, sonication, lyophilisation, basic microscopy, radioscopy, spectroscopy. Fundamentals of recombinant DNA technology: restriction enzymes, vectors and their properties.

UNIT-III (12 Hrs.)

Applications of Biotechnology

Biotechnology in fermentation and pharmaceutical processes. Green technology to control pollution. Role of biotechnology in diagnostics, introduction to gene therapy.

UNIT-IV (9 Hrs.)

Biotechnology and Society

Genetically modified organisms (GMOs)-transgenic plants and animals and their applications in biotechnology. Public concern and risks associated with genetic engineering: bioterrorism and biowarfare. Ethical, social and legal implication of biotechnology.

Recommended Books

1. Murray Moo-Young, 'Comprehensive Biotechnology', 2nd Edn., Pergamon Press, 2011.
2. William J. Thieman and Michael A. Palladino, 'Introduction to Biotechnology', 3rd Edn., Benjamin Cummings.
3. B.D. Singh, 'Biotechnology Expanding Horizons', 4th Edn., Kalyani Publishers, 2012.

- Jonathan Morris, 'The Ethics of Biotechnology (Biotechnology in the 21st Century)', 1st Edn., Chelsea House Publication (L), 2005.
- Sandy B. Primrose, 'Molecular Biotechnology', 2nd Edn., Blackwell Scientific Publications, 1991.
- Bourgaize, Thomas R. Jewell and Rodolfo G. Buiser, 'Biotechnology: Demystifying the concepts', 1st Edn., Benjamin Cummings, 1999.
- Richard Sherlock and John D. Merrey, 'Ethics issues in Biotechnology', 1st Edn., Rowman and Littlefield Publishers, 2002.

MICROBIOLOGY

Subject Code: BBOT1- 208

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

- Discovery origin and evolution of different forms of bacteria, fungi, protozoa and viruses constitute the basics of biotechnology.

UNIT-I (12 Hrs.)

History of Microbiology

Spontaneous Generation versus Biogenesis, Germ Theory of Fermentation and diseases. Applied areas of Microbiology. Microscopy: Bright field, dark field, phase contrast, fluorescent and electron microscopy.

UNIT-II (13 Hrs.)

Morphology and Fine Structures

Bacteria: size, shape, internal and external structures, cell wall of Gram positive and Negative bacteria, sporulation, Fungi and viruses.

UNIT-III (9 Hrs.)

Microbial Nutrition and Growth

Nutritional requirements and types, culture media preparation and sterilization, growth patterns, growth curve, generation time, synchronous growth and chemostat. Culture collection, purification and preservation. Microbes in extreme environments.

UNIT-IV (11 Hrs.)

Control of Microorganisms and Normal Micro Flora

Physical agents, chemical agents, antibiotics and other chemotherapeutic agents. Normal micro flora of the soil, microbial interactions (positive and negative). Nitrogen cycle, Carbon Cycle, Sulphur cycle, Phosphorus cycle.

Recommended Books

- M.J. Pelczar Jr., Chan E. C.S., and R. Krieg, 'Microbiology', Mac Graw Hill.
- G.J. Tortora, B.R. Funke, and C.L. Case, 'Microbiology-An Introduction', Benjamin Cummings.
- B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsber, 'Microbiology', Harper & Row Publisher.
- R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd.
- M.T. Madiga, J.M. Martinko, D.A. Stahl, D.P. Clark, 'Brock Biology of Microorganisms', Benjamin Cummings
- R.P. Gupta, A. Kalia, S.K. Kapoor, 'Bioinoculants: A Step towards Sustainable Agriculture', New India Publishers.

INORGANIC & PHYSICAL CHEMISTRY

Subject Code: BBOT1- 209

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To understand the basic concepts of inorganic and physical chemistry in terms of their utilization in various applications.

UNIT-I (12 Hrs.)

Atomic Structure and Periodic Properties

Atomic spectra of hydrogen, Bohr theory and its refinement, dual nature of electrons, Heisenberg uncertainty principle, Schrödinger wave equation, Pauli's exclusion principle, Hund's rule, energy levels, arrangement of elements in groups in periodic table, types of bonds - ionic, covalent, coordinate bonds, oxidation number, metallic bonds, conductivity, melting point, solubility.

UNIT-II (11 Hrs.)

Periodic Table and Properties

Long form of periodic table, alkali and alkaline earth metals and their biological properties, ionization and electronegativity, p-block elements, oxidation states, halogens and noble gases, transition elements, variability in oxidation state, complex formation, f-block elements.

UNIT-III (9 Hrs.)

Thermodynamics

Properties of gases, perfect gas, gas laws, kinetic theory of gases, mole concept, real gases, van der Waals equation, laws of thermodynamics, enthalpy, relation between C_v and C_p , entropy, Gibbs energy, phase rule and phase diagrams.

UNIT-IV (13 Hrs.)

Chemical Equilibrium

Spontaneous chemical reaction, Gibbs energy minimum, effect of pressure and temperature on equilibria, acids and bases, biological activity, thermodynamics of ATP, thermodynamic properties of ions in solution, ion activities, electrochemical cells, electrochemical series, solubility constants, measure of pH and pK, potentiometric titrations.

Recommended Books

1. J.D. Lee, 'Concise Inorganic Chemistry, 5th Edn., Blackwell Science.
2. P.W. Atkins, 'Physical Chemistry' ELBS Oxford University Press.

BIOCHEMISTRY- I

Subject Code: BBOT1- 210

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To aware students about the different types of biomolecules, their structure, functions and metabolism.

UNIT-I (13 Hrs.)

Carbohydrate Metabolism and Energy Production

Biosynthesis and degradation of carbohydrates, glycolysis, pentose pathway, Kreb's cycle (enzymes, regulation), substrate level, oxidative and photo- phosphorylation, mitochondrial electron transport chain, regulation of ATP synthesis.

UNIT-II (11 Hrs.)

Lipids and Vitamins

Classification and functions of lipids and fatty acids, digestion, absorption, biosynthesis and degradation of fatty acids, metabolism of triacyl glycerol, cholesterol, ketone bodies, structure of water soluble & fat soluble vitamins and their functions.

UNIT-III (12 Hrs.)

Proteins

Structure of amino acids and their chemical reactions, biosynthesis and degradation of amino acids, classification and functions of protein, enzyme classification, properties and factors affecting enzyme activity, regulation of enzyme activity.

UNIT-IV (9 Hrs.)

Nucleic Acids

Sugar (ribose, deoxyribose), nucleoside, nucleotide, DNA structure, types of DNA, Chargaff's rule, RNA structure and its types, replication, transcription, translation.

Recommended Books

1. U. Satyanaryana, U. Chkrapani, 'Biochemistry', 4th Edn., Elsevier
2. D.L. Nelson, L.A. Lehninger, M. Cox, Lehninger, 'Principles of Biochemistry', 5th Edn., W.H. Freeman.
3. J.M. Berg, J.L. Tymoczko, L. Stryer, 'Biochemistry', 5th Edn., W.H. Freeman.
4. D. Voet, J.G. Voet, 'Biochemistry', 4th Edn., John Wiley & Sons.

TECHNIQUES IN BIOTECHNOLOGY

Subject Code: BBOT1-211

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To impart knowledge about the various techniques used in biotechnology in terms of their principle, working and applications.

UNIT-I (13 Hrs.)

Chromatography

Distribution coefficient, stationary and mobile phases, paper chromatography, thin layer chromatography, column chromatography, packing a column, loading a sample, chromatographic development, elution of separated analytes, detector and fraction collector, normal phase and reverse phase chromatography, ion exchange chromatography, gel exclusion chromatography, affinity chromatography.

UNIT-II (12 Hrs.)

Electrophoresis

Agarose gel electrophoresis, separation of DNA and RNA by electrophoresis, polyacrylamide gel electrophoresis, native PAGE, SDS-PAGE, Isoelectric focusing and 2D gel electrophoresis, separation of DNA and proteins using PAGE, Southern blot, northern blot and western blot analysis urea PAGE for DNA sequencing. Apparatus for casting/polymerizing gels and carrying out electrophoresis, power supply. Visualizing methods such as ethidium bromide, coomassie brilliant blue, acridine orange and silver staining.

UNIT-III (11 Hrs.)

Spectroscopy, Radioactive Isotopes & Microscopy

Source of monochromatic light, UV and visible spectroscopy, Beer-Lambert law, applications of UV and visible spectrophotometry in biotechnology, spectrofluorometry, Infra-red spectroscopy. Radioactive decay, half-life, ionizing radiations, their energy and

penetration, application of radioactive isotopes in biotechnology, detection and quantification of radioactivity. Simple and compound microscopes, parts of a microscope, magnification and resolution of a microscope, staining procedures, introduction to electron microscopy.

UNIT-IV (9 Hrs.)

Centrifugation

Centrifugal force and RCF, rotors of centrifugation machines, types of centrifuges, ultracentrifuge, applications of centrifugation in biotechnology, precautions and safety guidelines for operating centrifuges.

Recommended Books

1. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', Cambridge University Press.
2. A. Pingoud, C. Urbanke, J. Hoggett and A. Jeltsch, 'Biochemical Methods', Wiley-VC.

MICROBIOLOGY LAB.

Subject Code: BBOT1-212

**L T P C
0 0 2 1**

1. Introduction to the instruments use in the microbiology, aseptic techniques.
2. Cleaning of glass wares, Preparation of media, Cotton plugging and sterilization.
3. Isolation of microorganisms from air, water and soil samples.
4. Preparation of Serial dilution, colony purification.
5. Staining: Methylene blue, Gram, Negative and Spore.
6. Growth curve of bacteria.
7. Testing of water quality.

Recommended Books

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.

INORGANIC & PHYSICAL CHEMISTRY LAB.

Subject Code: BBOT1-213

**L T P C
0 0 2 1**

Inorganic Chemistry

1. Volumetric Analysis: Iodimetry, Iodometry, Redox titrations using $K_2Cr_2O_7$ and $KMnO_4$. Complexometric titration using EDTA, Ca^{2+} and Mg^{2+}
2. Four ions (Two cations two anions)
3. Preparation of copper tetra-ammine complex. $[Cu(NH_3)_4]SO_4$

Physical Chemistry

1. Determination of surface tension of a given liquid by Stalagmometer (number of drops and weight of drops methods)
2. Determination of coefficient of viscosity of a pure liquid (Acetone, Ethanol, Propanol, Butanol, Glycol)
3. Verification of Lambert beer's law for solution of $CoCl_2 \cdot H_2O$ (in water) and $K_2Cr_2O_7$ (in water)
4. pH of buffer solution
5. Acid base titration HCl vs. NaOH

6. Determination of ionization constant of a weak acid (CH₃COOH)

Recommended Books

1. S. Rattan, 'Engineering Chemistry', S.K. Kataria & Sons.
2. G. Svelha, S. Mittal, 'Vogel's, Qualitative Inorganic Chemistry', Pearson Education.

FUNDAMENTALS OF INDUSTRIAL BIOTECHNOLOGY

Subject Code: BBOT1-314

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To make the students aware of the overall industrial bioprocesses, so as to help them to manipulate the process to the requirement of the industrial needs.

UNIT- 1

Introduction to Industrial important microbes (9 Hrs.)

Role of Yeast in biotechnological based processes: improvement through genetic manipulation. Role of other microbes like *E. coli*, *Bacillus* and *Aspergillus* in industrial applications.

UNIT- 2

Fermentation process and production media (10 Hrs.)

Design and operation of fermenter & criteria for selection and preparation of ideal media for production of biomass and microbial products.

UNIT- 3

Microbial products (14 Hrs.)

Microbial production of vitamins, organic acids; fermented beverages: Beer, whisky, wine and vinegar.

UNIT- 4

Microbes in Agro farming (12 Hrs.)

Production of bio-fertilizers: Rhizobium, Azotobacter, Blue green algae; Bio- control agents: bacteria, viruses and fungi; role of microbes in Bio- fuel production.

Recommended Books

1. L.E. Casida, 'Industrial Microbiology', New Age International Publishers, 1996.
2. Prescott and Dunn, 'Industrial Microbiology', 1991.
3. W. Crueger and A. Crueger. 'Biotechnology', 2nd Edn., Panima Publishers, 1992.
4. Peppler and Perlman, 'Microbial Technology', Vol. I and II, Academic Press, 1979.

FUNDAMENTALS OF IMMUNOLOGY- I

Subject Code: BBOT1- 315

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To learn the fundamental working knowledge of the basic principles of immunology and immunological techniques in prognosis/diagnosis.

UNIT- 1

Overviews of the Immune system (10 Hrs.)

Historical perspectives, Innate and acquired immunity, Clonal nature of immune response; Hematopoiesis and differentiation; lymphocyte trafficking; B lymphocytes, T-lymphocytes, macrophages, dendritic cells, Natural killer cells and lymphocyte activated killer cells, eosinophils, neutrophils & mast cells.

UNIT- 2

Organs of Immune System, Antigen & Antibodies (14 Hrs.)

Primary, secondary and tertiary lymphoid organs; Immunogenicity Vs. antigenicity, factors affecting immunogenicity, nature of immunogen, epitopes, heptans and antigenicity, pattern recognition receptors; Structure of antibody, antibody effector function, antibody classes and biological activities, antigenic determinants on Immunoglobulins, Immunoglobulins superfamilies, Production of Monoclonal Antibodies, applications of polyclonal and monoclonal antibodies.

UNIT- 3

Antigen–Antibody Interactions & Major Histocompatibility Complex (12 Hrs.)

Strength of interaction: cross reactivity, antibody affinity, avidity. Antigen-antibody interactions as tools for research and diagnosis: precipitation and agglutination reactions, immunodiffusion, immunoelectrophoresis, immunoassays, Enzyme linked immunosorbent assay (ELISA), Radioimmunoassay (RIA), western blot, Immunofluorescence; General organization and inheritance, MHC molecules, regulation of MHC expression and disease susceptibility, antigen presentation.

UNIT- 4

Cytokines & Cell- Mediated Effector Response (9 Hrs.)

Properties of cytokines, cytokine receptor, cytokine secretion by T_H1 and T_H2 subsets; General properties of effector T cell, cytotoxic T cell, Natural killer cell, Antibody-dependent cell- mediate cytotoxicity.

Recommended Books

- 1.Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby ‘Kuby Immunology’, W.H. Freeman, 2006.
- 2.Ivan Maurice Roitt, Jonathan Brostoff, David K. Male ‘Immunology’, Mosby, 2001.

BIOCHEMISTRY- II

Subject Code: BBOT1-316

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To learn the basic principles of enzymology to know how enzymes functions in the biological systems and strategies/ applications of enzyme technology.

UNIT- 1

Introduction to Enzyme (10 Hrs.)

Enzyme nomenclature & classification, Enzyme Kinetics, effect of substrate concentration on Michaelis – Menten equation, determination of K_m & its significance, Introduction to enzymes & coenzymes, units of enzymes activity.

UNIT- 2

Mechanism of Enzyme Action (12 Hrs.)

Nature of active site: identification of functional groups at active site; enzyme substrate complex; Factors responsible for catalytic efficiency of enzymes; Covalent catalysis, Acid base catalysis; Strain and distortion theory, Induced fit hypothesis.

UNIT- 3

Enzyme Inhibition (14 Hrs.)

Reversible and irreversible inhibition, Kinetics of competitive, uncompetitive and non-competitive inhibition; Effect of pH and temperature on rate of enzyme catalyzed reactions; Reversible covalent modification; zymogen activation; Isozymes as well as their importance.

UNIT- 4

Nucleic Acid Metabolism (9 Hrs.)

Biosynthesis of purine and pyrimidine nucleotides; salvage reactions; Catabolism of purines and pyrimidines, urea cycle.

Recommended Books

1. 'Principles of Biochemistry', 3rd Edn., Lehninger, Nelson & Cox.
2. Luberts Stryer. 'Biochemistry', 4th Edn., W.H. Freeman and Company, New York, 1995.
3. K. Rangnathan Rao, 'Text Book of Biochemistry', 3rd Edn., **1986**.
4. J.L. Jain, Fundamentals of Biochemistry, 5th Edn., Chand and Co., New Delhi.

MOLECULAR BIOLOGY

Subject Code: BBOT1- 317

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. To know about the genetic material and basic genetic molecular mechanisms to develop analytical and quantitative skills.

UNIT- 1

Genetic material and replication (12 Hrs.)

Structure and properties of nucleic acids, double helical structure DNA and its alternate structures, superhelical DNA, semi-conservative replication of double stranded DNA, DNA polymerases, Initiation of DNA replication, origin of replication, semi-discontinuous replication, DNA replication in bacteria, phages and eukaryotes, DNA damage, DNA repair, mismatch repair, excision repair, recombination repair.

UNIT- 2

Transcription (14 Hrs.)

Bacterial and eukaryotic promoters, transcription initiation, elongation and termination in prokaryotes and eukaryotes, structure and function of RNA polymerases in prokaryotes and eukaryotes, regulation of transcription, regulation of lac and trp operons, regulatory elements, activators and repressors, general transcription factors in eukaryotes, PRE, NRE, enhancers, insulators and regulatory *trans*-factors, RNA interference.

UNIT- 3

Post-translational modification and genetic code (10 Hrs.)

Classes of RNA molecules, 5' capping and polyadenylation of mRNA, splicing and spliceosome; Genetic code, open reading frame, degeneracy of codon system, wobble concept.

UNIT- 4

Translation (9 Hrs.)

Ribosome structure and role in polypeptide synthesis, tRNA structure and function in translation, start and termination codons, initiation, elongation and termination of translation, post translational modifications.

Recommended Books

1. G.M. Malacinski, 'Freifelder's Essentials of Molecular Biology', 4th Edn., Narosa Publishing House.
2. B. Lewin, 'Genes VIII', International Edition, Pearson Education International.
3. S.B. Primrose and R.M. Twyman, 'Principles of Gene Manipulation and Genomics, Blackwell Publishing', 7th Edn., ISBN 1-4051-3544-1, **2006**.

IMMUNOLOGY LAB.- I

Subject Code: BBOT1- 318

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Differential leucocytes count.
2. Total leucocytes count.
3. Separation of serum and plasma from blood.
4. Agglutination (Blood group testing).
5. Radial and double immuno diffusion test using specific antibody and antigen.

Recommended Books

1. Arti Nigam, Archana Ayyagri, 'Lab. Manual in Biochemistry, Immunology and Biotechnology', McGraw Hill Education (India), **2008**.
2. G.P. Talwar, S.K. Gupta, 'Hand Book of Practical and Clinical Immunology', CBS, 2nd Edn., **2006**.

BIOCHEMISTRY LAB.- II

Subject Code: BBOT1-319

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Estimation of α -amylase activity from saliva.
2. Effect of temperature on enzyme activity.
3. Purification of protein using salt precipitation.
4. Paper chromatography for separation of macromolecules.
5. Verification of Beer's Law and Determination of Absorption Maxima.
6. Qualitative Estimation of Carbohydrates.
7. Qualitative Estimation of Amino Acids.
8. Quantitative Estimation of Proteins.
9. Amino Acid and Carbohydrate Separation by Paper Chromatography.

Recommended Books

1. Arti Nigam, Archana Ayyagri, 'Lab. Manual in Biochemistry, Immunology and Biotechnology', McGraw Hill Education (India), **2008**.
2. David T. Plummer, 'An Introduction to Practical Biochemistry', 3rd Edn., Tata McGraw Hill Education, **2006**.

MOLECULAR BIOLOGY LAB.

Subject Code: BBOT1-320

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Transformation of bacterial cells with plasmid DNA.
2. Agarose gel electrophoresis.
3. Plasmid isolation.
4. Genomic DNA isolation.
5. Quantification of DNA and protein samples using UV spectrophotometer.
6. Qualitative analysis of DNA sample using UV spectrophotometry ($Q_{260/280}$).

Recommended Books

1. J. Fritsch and E.F. Maniatis, 'Molecular Cloning, A laboratory Manual', Cold Spring Harbor Laboratory, **1999**.
2. G.M. Malacinski, 'Freifelder's Essentials of Molecular Biology', 4th Edn., Narosa Publishing House.

PLANT TISSUE CULTURE

Subject Code: BBOT1-421

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To teach set of in vitro techniques, methods and strategies related to plant tissue culture.
2. Students will learn how to create genetic variability for the improvement of crops and secondary metabolite products.

UNIT- 1

Micropropagation (12 Hrs.)

Methods of micropropagation (axillary bud, shoot-tip and meristem culture), Stages of micropropagation, Factors affecting micropropagation, Applications of micropropagation, Acclimatization of tissue culture raised plants. Modes of regeneration: somatic embryogenesis and organogenesis, Types of somatic embryogenesis and their applications.

UNIT- 2

Haploid and Triploid Plants Production (9 Hrs.)

Production through tissue culture; ovary and ovule culture; embryo culture and rescuing hybrid embryos; somaclonal variations, selection of variant cell lines and its applications.

UNIT- 3

Concept of Protoplast (10 Hrs.)

Protoplast isolation and culture, viability of protoplasts, protoplast fusion, selection of somatic hybrids and cybrids, applications of somatic cell hybridization.

UNIT- 4

Metabolites Production (14 Hrs.)

Cell suspension culture, production of secondary metabolites (Flavonoids, Terpenoids) by plant tissue culture, immobilized plant cell culture, use of bioreactors in secondary metabolite production, transgenic approaches in secondary metabolite production.

Recommended Books

1. S.S. Bhajwani & M.K. Razdan, 'Plant Tissue Culture. Theory and Practice', Elsevier, 1996.
2. M.K. Razdan, 'Introduction to Plant Tissue Culture', Science Publishers, 2003.
3. B.D. Singh, 'Biotechnology Expanding Horizons', Kalyani Publishers, New Delhi, 2004.

ANIMAL TISSUE CULTURE

Subject Code: BBOT1-422

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To introduce the students to Animal cell-culture its advantages and disadvantages.

UNIT- 1

Concepts of Animal Tissue Culture (12 Hrs.)

Historical background, advantages & disadvantages of animal tissue culture, Design and layout of ATC Lab, Equipment used in ATC Lab, Aseptic Techniques in ATC- Sterilization of culture media, glassware & tissue culture laboratory. Growth and viability of cells in culture, cryopreservation and retrieval of cells from frozen storage, transportation of cells. Characteristics of normal and transformed cells.

UNIT- 2

Contamination and Safety (10 Hrs.)

Sources, Types, monitoring and eradication of contamination, Cross Contamination. Safety considerations in ATC laboratory, Clean Environment – P1, P2, P3 facility and their applications.

UNIT- 3

Culture Media (9 Hrs.)

Types of cell culture media, physiochemical properties, balanced salt solution, constituents of serum, serum free media (SFM), design of SFM, advantages and disadvantages of serum supplemented and serum free media, conditioned media.

UNIT- 4

Cell Culturing Process (14 Hrs.)

Primary culture and Established cell line Culture (Finite & continuous cell lines), Isolation of Cells-Enzyme digestion, perfusion and mechanical disaggregation. Culture of anchorage dependent cells and cells in suspension, phases of cell growth and determination of cell growth data (calculation of *in vitro* age, multiplication rate, population doubling time, cell counting, phases of cell cycle).

Recommended Books

1. E.J. Gareth, 'Human Cell Culture Protocols', Humara Press, 1996.
2. M. Butler, 'The Animal Cell Culture and Technology', IRL Oxford Univ. Press, 1996.
3. E. Julio, Celis, 'Cell Biology-A Laboratory Hand Book, Vol. I-IV, 2nd Edn., Academic Press, New York, 1998.'
4. R.T. Freshney, 'Culture of Animal Cells 5th Edn., John Wiley and Sons, New York, 2006.

RECOMBINANT DNA TECHNOLOGY

Subject Code: BBOT1-423

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

1. To teach the students about the different techniques used in rDNA Technology.

UNIT- 1

Molecular cloning (14 Hrs.)

Cutting and joining DNA using restriction enzymes and DNA ligase, other enzymes used in recombinant DNA technology such as, DNA polymerase I, Taq DNA polymerase, Klenow fragment, reverse transcriptase, terminal transferase, RNaseH, DNaseI, alkaline phosphatase and polynucleotide kinase. Cloning vectors based on plasmids, phasmids, phages, cosmids and artificial chromosomes, expression vectors, host systems for cloning and recombinant protein expression.

UNIT- 2

Library construction and recombinant protein expression (10 Hrs.)

Genomic library construction and screening, cDNA synthesis, conversion into double stranded cDNA, cDNA library construction and screening, merits of the two libraries, cDNA expression library.

UNIT- 3

PCR and other techniques (9 Hrs.)

Polymerase chain reaction, concept and applications, DNA labelling (end labelling and body labelling), DNA sequencing, Southern blot, northern blot.

UNIT- 4

Site directed mutagenesis (12 Hrs.)

Basic principle of site directed mutagenesis and its comparison with random mutagenesis, oligonucleotide based mutagenesis, cassette mutagenesis, application of PCR in site directed mutagenesis, applications of site directed mutagenesis.

Recommended Books

1. S.B. Primrose and R.M. Twyman, 'Principles of Gene Manipulation and Genomics', Blackwell Publishing, **2006**.
2. J.E. Krebs, E.S. Goldstein and S.T. Kilpatrick, 'Lewin's GENES X', Jones and Bartlett Publishers, **2011**.
3. J. Fritsch and E.F. Maniatis, 'Molecular Cloning, A laboratory Manual', Cold Spring Harbor Laboratory, **1999**.

FUNDAMENTALS OF IMMUNOLOGY- II

Subject Code: BBOT1-424

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. To teach the students regarding importance of immune system, its disease and vaccines.

UNIT- 1

Antigen Processing and Presentation & Complement System (10 Hrs.)

Role of antigen processing T cells, cytosolic and endosytic pathway, presentation of nonpeptidic antigens; functions of complement, components of complement, classical, alternative and lectin pathways.

UNIT- 2

Hypersensitivity & Immune response to infectious diseases (14 Hrs.)

Gell and Coombs classification, Type I, II, III and IV hypersensitivity; viral, bacterial infections, protozoan disease and emerging infectious diseases.

UNIT- 3

Vaccines & Immunodeficiencies (12 Hrs.)

Active and passive immunization, types of vaccines, Immunization Programme schedule; Primary and secondary immunodeficiencies.

UNIT- 4

Autoimmunity & Cancer (9 Hrs.)

Organ- specific autoimmune and systemic autoimmune diseases; Cancer: origin and terminology, malignant transformation of cell, tumor antigens, immune response to tumors.

Recommended Books

1. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby 'Kuby Immunology', W.H. Freeman, **2006**.
2. Ivan Maurice Roitt, Jonathan Brostoff, David K. Male, 'Immunology', Mosby, **2001**.

PLANT TISSUE CULTURE LAB.

Subject Code: BBOT1-425

**L T P C
0 0 2 1**

1. Micropropagation and its different steps.
2. Significance of growth hormones in culture medium.
3. Induction of callus from different explants.

4. To study regeneration of shoots/embryos.
5. Raising of cell suspension cultures.
6. Anther Culture, Ovary culture and embryo rescue.

Recommended Books

1. Santosh Nagar, Madhavi Adhav, 'Practical Book of Biotechnology & Plant Tissue Culture', Kindle edition, S. Chand, 2010.
2. C.C. Giri, Archana Giri, 'Plant Biotechnology Practical Manual', I.K. International, 2007.

ANIMAL TISSUE CULTURE LABORATORY

Subject Code: BBOT1-426

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Sterilization techniques: Theory and Practical - Glassware Sterilization-Media sterilization -Laboratory Sterilization.
2. Sources of contamination and decontamination measures.
3. Preparation of Hanks Balanced salt solution.
4. Preparation of Minimal Essential Growth medium.
5. Isolation of lymphocytes for culturing.
6. Isolation of macrophages from blood for culturing.

Recommended Books

1. Sudha Gangal, 'Principles and Practice of Animal Tissue Culture', 2nd Edn., Universities Press, 2010.

RECOMBINANT DNA TECHNOLOGY LABORATORY

Subject Code: BBOT1-427

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Preparation of competent cells.
2. Transformation of bacterial cells using plasmid DNA.
3. Ethanol precipitation of DNA.
4. Plasmid isolation.
5. Genomic DNA.
6. Restriction digestion of plasmid DNA and genomic DNA.
7. RNA degradation by RNase A after plasmid isolation.
8. Molecular cloning.
9. PCR amplification.

Recommended Books

1. J. Fritsch and E.F. Maniatis, 'Molecular Cloning, A Laboratory Manual', Cold Spring Harbor Laboratory, 1999.
2. S.B. Primrose and R.M. Twyman, 'Principles of Gene Manipulation and Genomics', Blackwell Publishing. 2006.

IMMUNOLOGY LABORATORY- II

Subject Code: BBOT1-428

L T P C
0 0 2 1

Duration: 36 Hrs.

1. Performing enzyme linked immunosorbent assay.
2. Rocket immuno-electrophoresis for antigen antibody interaction.
3. Isolation of mononuclear cells from peripheral blood.

4. Study of Lymph nodes in rats.

Recommended Books

1. Arti Nigam, Archana Ayyagri, 'Lab Manual in Biochemistry, Immunology and Biotechnology', McGraw Hill Education (India), **2008**.
2. G.P. Talwar, S.K. Gupta, 'Hand Book of Practical and Clinical Immunology', CBS, 2nd Edn., **2006**.

MRSPTU

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

Total Contact Hours = 28

Total Marks = 800

Total Credits = 24

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BMLS1-101	Cell Biology & Human Genetics	4	0	0	40	60	100	4
BMLS1-102	Haematology & Haematological Techniques-I	4	0	0	40	60	100	4
BMLS1-103	Microbiology	4	0	0	40	60	100	4
BMLS1-104	Human Anatomy & Physiology- I	4	0	0	40	60	100	4
BMLS1-105	Basics of Biochemistry	4	0	0	40	60	100	4
BMLS1-106	Microbiology Lab	0	0	4	60	40	100	2
BMLS1-107	Haematology & Haematological Techniques- I Lab.	0	0	2	60	40	100	1
BMLS1-108	Basics of Biochemistry Lab.	0	0	2	60	40	100	1
Total		20	0	8	380	420	800	24

Total Contact Hrs. = 24

Total Marks = 700

Total Credits= 21

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BMLS1-209	Systematic Bacteriology	4	0	0	40	60	100	4
BMLS1-210	Haematology & Haematological Techniques- II	3	0	0	40	60	100	3
BMLS1-211	Biochemical Metabolism	4	0	0	40	60	100	4
BMLS1-212	Human Anatomy & Physiology- II	4	0	0	40	60	100	4
BMLS1-213	Environmental Sciences	3	0	0	40	60	100	3
BMLS1-214	Systematic Bacteriology Lab.	0	0	4	60	40	100	2
BMLS1-215	Haematology & Haematological Techniques- II Lab.	0	0	2	60	40	100	1
Total		18	0	6	320	380	700	21

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Total Contact Hrs. = 31

Total Marks = 1100

Total Credits = 25

Semester 3 rd		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-316	Applied Bacteriology	4	0	0	40	60	100	4
BMLS1-317	Analytical Biochemistry	4	0	0	40	60	100	4
BMLS1-318	Basic Cellular Pathology	4	0	0	40	60	100	4
BMLS1-319	Applied Haematology-I	4	0	0	40	60	100	4
BHUM0-301	Communication Skills	3	0	0	40	60	100	3
BMLS1-320	Applied Bacteriology Lab.	0	0	2	60	40	100	1
BMLS1-321	Analytical Biochemistry Lab.	0	0	2	60	40	100	1
BMLS1-322	Basic Cellular Pathology Lab.	0	0	2	60	40	100	1
BHUM0-302	Communication Skills Lab.	0	0	2	60	40	100	1
BMLS1-323	Applied Haematology-I Lab.	0	0	2	60	40	100	1
BMLS1-324	Seminar	0	0	2	100	0	100	1
Total		19	0	12	600	500	1100	25

Total Contact Hrs. = 31

Total Marks = 1100

Total Credits= 25

Semester 4 th		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
BMLS1-425	Immunology & Mycology	4	0	0	40	60	100	4
BMLS1-426	Histopathology- I	4	0	0	40	60	100	4
BMLS1-427	Clinical Biochemistry-I	4	0	0	40	60	100	4
BMLS1-428	Applied Haematology-II	4	0	0	40	60	100	4
BCAP0-401	Fundamentals of Computer	3	0	0	40	60	100	3
BMLS1-429	Immunology & Mycology Lab.	0	0	2	60	40	100	1
BMLS1-430	Histopathology- I Lab.	0	0	2	60	40	100	1
BMLS1-431	Clinical Biochemistry-I Lab.	0	0	2	60	40	100	1
BMLS1-432	Applied Haematology-II Lab.	0	0	2	60	40	100	1
BCAP0-402	Fundamentals of Computer Lab.	0	0	2	60	40	100	1
BMLS1-433	Seminar	0	0	2	100	0	100	1
Total		19	0	12	600	500	1100	25

CELL BIOLOGY & HUMAN GENETICS

Subject Code: BMLS1-101

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

To make aware the students regarding various cell organelles and their functioning with special stress on human chromosome.

UNIT-I (9 Hrs.)

Cell as a Basic Unit of Living Systems: Cell Theory. Prokaryotic and Eukaryotic Cell, Eukaryotic Cell – Shape Size, Volume, and Number. Broad Classification of Cell Types: Pplos, Bacteria, Plant and Animal Cells. A Detail Classification of Cell Types within an Organism. Cell, Tissue, Organ and Organisms at Different Levels of Organization

UNIT-II (11 Hrs.)

Structure and Functions of Cell Organelles: Ultra Structure of Cell Membranes, Cytosol, Golgi bodies, Endoplasmic Reticulum (Rough and Smooth), Ribosome, Cytoskeletal Structure (Actins, Microtubule etc.), Mitochondria, Chloroplasts, Lysosomes, Peroxisomes, and Nucleus (Nuclear Membrane, Nucleoplasm, Nucleolus and Chromatin). Cell Division, Cell Cycle and Cell Growth.

UNIT-III (12 Hrs.)

Nature of Genetic Material: Nucleic Acids, DNA Replication, Mendelian Laws of Inheritance, Gene Interaction. Sex Determination in Plants and Animals. Sex Linkage, Non-Disjunction as a Proof of Chromosomal Theory of Inheritance. Linkage Mapping of Genes, Interference, Coincidence in Prokaryotes and Eukaryotes.

UNIT-IV (13 Hrs.)

Chromosome: Chemical Composition: Structural Organization of Chromatids, Centromeres, Chromatin, Telomeres, Nucleosomes, Euchromatin and Heterochromatin. Special Types of Chromosomes (E.G. Polytene and Lampbrush Chromosomes); Mutations; Spontaneous and Induced; Chemical and Physical Mutagens, Banding Patterns in Human Chromosome, Structural and Numerical Changes in Chromosomes, Hereditary Defects. Extra-Chromosomal Inheritance, Sex-Linked Inheritance in Humans, Mutation at Phenotypic Level, Biochemical Level and Molecular Level. Gene Frequencies in Population, Hardy-Weinberg Law.

Recommended Books

1. E.D.P. De Robertis., E.M.F. Jr. De Robertis, 'Cell and Molecular Biology', 8th Edn., Lea & Febiger Publishers.
2. H.F. Lodish, A. Berk, C.A. Kaiser, M. Krieger, M.P. Scott, 'Molecular Cell Biology', 6th Edn., W.H. Freeman & Co.
3. P.K. Gupta, 'Genetics', Rastogi Publications, 2007.
4. R.J. Brooker, 'Genetics Analysis and Principles', Jim Green, 1999

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HEMATOLOGY & HEMATOLGICAL TECHNIQUES-I

Subject Code: BMLS1- 102

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

To introduce regarding various components of blood, their functions and techniques for their study.

UNIT-I (10 Hrs.)

Introduction to Haematology: Definition, Importance, Important Equipment Used, Lab safety and Instrumentation, Blood, its Components Formation (Erythropoiesis, Leucopoiesis, Thrombopoiesis), Composition, Function.

UNIT-II (9 Hrs.)

Anticoagulants, Preservation of Blood: Various Anticoagulants, Their Uses, Mode of Action, Their Merits and Demerits, Collection and Preservation of Blood for Various Haematological Investigations.

UNIT-III (15 Hrs.)

Haematological Instrumentations: Clinical Significance, Errors involved in the Haemoglobinometry, Haemocytometry, Procedures for Cell Counts I.E. TLC, DLC, ESR, PCV/Haematocrit Value, Red Cell Indices (RCI), Absolute Eosinophil Count, Reticulocyte Count Platelet Counts (Visual as well as Electronic).

UNIT-IV (11 Hrs.)

Blood Morphology & Staining's: Morphology of Normal Blood Cells and Their Identifications, Romanowsky's Dyes (Giemsa, Leishman, Wright's, Field's, Jsb)- Principle, Composition, Preparation and Procedure, Preparation of Blood Films- Types, Methods of Preparation), Thick and Thin Smear.

Recommended Books

1. K.L. Mukherjee, 'Med. Lab. Technology', Volume-I.
2. Paraful B. Godkar, 'Med. Lab. Technology'.
3. Ramnik Sood, 'Med. Lab. Technology Methods and Interpretation', 5th Edn.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. Ramnik Sood, 'Hematology for Students Practitioners'.
6. Stephen M. Robinson, 'Hematology (Pathophysiological basis for Clinical Practice)'.

MICROBIOLOGY

Subject Code: BMLS1- 103

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

To introduce to the students regarding various kinds of microbes in terms of their structure, growth etc. & collection of clinical samples their processing and identification.

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UNIT-I (13 Hrs.)

Introduction to Microbiology & Microscopy: Brief History of Microbiology- Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Characteristics of Bacteria and Fungi, Bright Field, Dark Field, Phase Contrast and Fluorescence and Electron Microscope, Gram, Negative, Spore and Acid- Fast Staining.

UNIT-II (11 Hrs.)

Nutrition and Growth of Bacteria: Types of Nutritional Requirements, Types and Preparation of Culture Media, Bacteria Cell Division, Growth Phase, Batch and Continuous Culture, Growth of Aerobic and Anaerobic Bacteria.

UNIT-III (12 Hrs.)

Principles and Method of Sterilization: Physical (Heat, Temperature, Radiation, Filtration) and Chemical Agents (Alcohol, Aldehyde, Halogens, Phenols, Gases) to Control Growth of Microbes.

UNIT-IV (9 Hrs.)

Collection and Transportation of Specimens, Disposal of Laboratory/ Hospital Waste: General Principles, Collection, Transportation (Urine, Faeces, Sputum, Pus, Body Fluids, Swab and Blood), Non- Infectious Waste, Infected Sharp Waste Disposal, Infected Non- Sharp Waste Disposal.

Recommended Books

1. M.J. Jr., Pelczar, E.C.S., Chan and R. Krieg, 'Microbiology', McGraw Hill.
2. G.J. Tortora, B.R. Funke and C.L. Case, 'Microbiology-An Introduction', Benjamin Cummings.
3. B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsber, 'Microbiology', Harper & Row, Publishers.
4. R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd.

HUMAN ANATOMY & PHYSIOLOGY-I

Subject Code: BMLS1-104

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

UNIT-I (11 Hrs.)

General Anatomy, Cell & Tissue: Introduction to Anatomical Terms and Organization of the Human Body, Structure, Classification and Function. Cell Division (Mitosis and Meiosis), Tissues Definitions, Types, Characteristics, Classification, Location, Functions and Formation.

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

UNIT-II (9 Hrs.)

Systemic Anatomy: Musculoskeletal System: Bones – Types, Structure, Axial & Appendicular Skeleton. Bone Formation and Growth, Joints – Classification and Structure. Role of Ligaments, Cartilages.

UNIT-III (13 Hrs.)

Muscle & Respiratory System: Structure in Brief, Mechanism of Muscle Contraction, Isotonic and Isometric Contractions, Energy Sources of Muscle Contractions, Motor Unit, Components; Structure, Function and Mechanism of Respiration, Transport of Respiratory Gases, Lung Function Test. Definition of Various Terms Involved in Respiratory System, Methods of Artificial Respiration.

UNIT-IV (12 Hrs.)

Blood, Cardiovascular & Lymphatic System: Haematocrit, ESR, Blood Volume Measurements. RBC, WBC & Platelet Counts, Developmental Stages and Fate of RBC. Functions of RBC, WBC and Platelets. Study of Blood Groups and Coagulation., Anatomy and Physiology of Heart, Cardiac Cycle, Heart Sounds, Definition and Measurements of Cardiac Output, Stroke Volume, ECG – Methods of Recording and ECG Waves. Normal Values of Blood Pressure, Heart Rate and Their Regulation in Brief, Gross and Microscopic Structure of Lymphatic Tissue and Function.

Recommended Books

1. Ross and Wilson, 'Anatomy & Physiology'.
2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
3. Evelyn Pearce, 'Anatomy and Physiology for Nurses'.
4. Sears, 'Anatomy and Physiology for Nurses'.
5. 'Anatomy and Physiology for Nurses', Pearson.

BASICS OF BIOCHEMISTRY

Subject Code: BMLS1-105

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

The main objective of the subject is to impart the knowledge of apparatus, units, equipment's, and volumetric analysis in the laboratory of clinical Biochemistry.

UNIT-I (11 Hrs.)

Introduction to Medical Laboratory Technology: Study of Medical Laboratory Technologies, Ethics and Ethical Responsibilities, Safety Measures (First Aid and Emergency Treatment).

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UNIT-II (9 Hrs.)

Cleaning, Care of Glassware & Equipment, Distilled Water: Preparation of Washing Reagents and Solutions for Cleaning of Soda Lime and Borosil Glasses, Types of Distilled Water, Preparation and Storage.

UNIT-III (13 Hrs.)

Units of Measurements, Measurements of Volumes and Analytical Balance: S. I. Units, Measurements of Volume, Volumetric Apparatus (Pipettes, Flasks, Cylinders) and their Calibrations, Principle, Working and Maintenance of Balance.

UNIT-IV (12 Hrs.)

Concept of pH, Standard Solution Preparations, Osmosis: Definition of pH, Henderson–Hassel Balch Equation, Principle, Working, Maintenance & Calibration of pH Meter, Mole Concept, Molar and Normal Solutions Preparations; Definition of Osmosis, Dialysis, Types of Osmosis, Factor affecting of Osmotic Pressure, Applications of Osmosis & Dialysis.

Recommended Books

1. U. Satyanaryna, U. Chkrapani, 'Biochemistry', 4th Edn., Elsevier.
2. D.L. Nelson, L.A. Lehninger, M. Cox, M., Lehninger 'Principles of Biochemistry', 5th Edn., W.H. Freeman.
3. P.B. Godkar and D.P. Godkar, 'Text Book of Medical Laboratory Technology', Vol. 1 and 2, 3rd Edn., Bhalani.
4. M.K. Sateesh, 'Bioethics and Biosafety', I.K. International Pvt. Ltd.
5. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', 7th Edn., Cambridge University Press.
6. D.T. Plummer, 'An Introduction to Practical Biochemistry', 3rd Edn., Tata McGraw Hill,
7. J.B. Yadav, 'Practical Physical Chemistry', Krishn's Educational Publishers.

MICROBIOLOGY LAB.

Subject Code: BMLS1-106

L T P C

0 0 4 2

EXPERIMENTS

1. Introduction to Use of Different Laboratory Instruments and Their Safety Precautions.
2. To Demonstrate the Working & Handling of Compound Microscope.
3. Washing, Cleaning and Sterilization Glassware.
4. Media Preparation and Sterilization.
5. To Prepare Working Dilution of Commonly Used Disinfectants.
6. To Demonstrate Aerobic Culture.
7. To Demonstrate of Anaerobic Culture.

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Recommended Books

1. G. James, G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.

HEMATOLOGY & HEMATOLOGICAL TECHNIQUES- I LAB.

Subject Code: BMLS1-107

L T P C

0 0 2 1

EXPERIMENTS

1. Demonstration of equipment used in clinical field: Microscope, Blood cell, counter, Sahil's apparatus, calorimeter.
2. Hb Estimation: Sahil's methods, Cyanmethaemoglobin, Oxyhaemoglobin methods.
3. TLC, DLC, platelet and Reticulocyte, Absolute Eosinophil counts.
4. Preparation of smear and staining with Giemsa and Leishman stain.
5. Calculation of Red Cell Indices (RCI).
6. Packed cell volume (Macro and Micro methods).
7. ESR (Wintrobe and Westergren methods).

Recommended Books

1. K.L. Mukherjee, 'Med. Lab. Technology', Volume-I.
2. Paraful B. Godkar, 'Lab. Technology'.
3. Ramnik Sood, 'Med. Lab. Technology Methods and Interpretation', 5th Edn.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. Ramnik Sood, 'Hematology for Students Practitioners'.
6. Stephen M. Robinson, 'Hematology (Pathophysiological Basis for Clinical Practice)'.

BASICS OF BIOCHEMISTRY LAB.

Subject Code: BSMLT-108

L T P C

0 0 2 1

1. Methods of Cleaning of the Laboratory Glassware.
2. Distillation of The Water.
3. Principle, Working & Maintenance of pH Meter.
4. Principle, Working & Maintenance Analytical Weighing Balance.
5. To Prepare 0.1N NaOH Solution
6. To Prepare 0.2N HCl Solution.
7. To Prepare 0.2N H₂SO₄ and 0.2M Na₂CO₃ Solution.
8. Demonstration of Osmosis and Dialysis.

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

Recommended Books

1. P.B. Godkar and D.P. Godkar 'Text Book of Medical Laboratory Technology', volume 1 & 2, 3rd Edn., Bhalani.
2. D.T. Plummer, 'An Introduction to Practical Biochemistry', 3rd Edn., Tata McGraw Hill.
3. K. Wilson, J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', 7th Edn., Cambridge University Press.
4. J.B. Yadav, 'Practical Physical Chemistry', Krishna's Educational Publishers.

SYSTEMATIC BACTERIOLOGY

Subject Code: BMLS1-209

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

Students will learn the morphology cultural characteristics, biochemical characteristics & laboratory diagnosis of various bacteria.

UNIT-I (5 Hrs.)

Staining Techniques in Bacteriology: Principle, Procedures and Interpretation: Simple, Negative, Gram, Albert's, Ziehl-Nelsen, Capsule, Flagella and Spore stainings.

UNIT-II (16 Hrs.)

Biochemical Tests for the Identification of Different Bacteria: Catalase, Coagulase, Indole, Methyl Red, Voges Proskauer, Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, H₂S production, Decarboxylases, CAMP.

UNIT-III (10 Hrs.)

Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram Positive Bacteria: Staphylococci, Streptococci, Corynebacteria, Mycobacteria, Clostridium.

UNIT-IV (14 Hrs.)

Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram Negative Bacteria: Pseudomonas, Enterobacteriaceae: Escherichia, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia; Neisseria, Vibrio, Mycoplasma, Rickettsia & Chlamydia.

Recommended Books

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.
3. M. Cheesbrough, 'District Laboratory Practice in Tropical Countries', Cambridge University Press.
4. R. Ananthanarayan, C.K.J. Panikar, 'Textbook of Microbiology', 6th Edn., Orient Longman Private Limited.

HEMATOLOGY & HEMATOLOGICAL TECHNIQUES-II

Subject Code: BMLS1-210

L T P C

Duration: 36 Hrs.

3 0 0 3

Course Objectives

To understand the detailed aspects of blood and its coagulation behaviour.

UNIT-I (6 Hrs.)

Blood Group Systems: History and discovery of blood group system; ABO and Rhesus blood group system; Compatibility tests in blood transfusion, complications and hazards of blood transfusion.

UNIT-II (8 Hrs.)

Hemoglobin Studies: Hemoglobin, its synthesis, functions and degradation; Hemoglobin, pigments and their measurements; Abnormal hemoglobin's, their identification and estimation.

UNIT-III (10 Hrs.)

Blood Coagulation: Hemostatic mechanism and theories of blood coagulation; Classification and physio- chemical properties of coagulation factors.

UNIT-IV (12 Hrs.)

Blood Coagulation Reagents and Procedures: Preparation and standardization of various coagulation; Screening coagulation procedures such as Bleeding and clotting time, Hess test, prothrombin time (PT) and Activated Partial Thromboplastin time (APTT).

Recommended Books

1. Paraful B. Godkur, 'Text Book of Med. Lab. Technology'.
2. V.H. Talib, 'Hand Book of Med. Lab. Technology', 2nd Edn.
3. J.B. Dacie, 'Med. Lab. Tech. Methods and Interpretation', Practical Hematology.
4. Christopher A. Ludlam, 'Clinical Haematology'.
5. G.A. McDonald, 'Atlas of Hematology'.
6. Stephen M. Robinson, Hematology (Pathophysiological basis for clinical practice 3rd Edn.).

BIOCHEMICAL METABOLISM

Subject Code: BMLS1-211

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives: To introduce the students regarding various pathways of metabolism of carbohydrates, lipids, proteins, amino acids and to relate these with body functions.

UNIT-I (12 Hrs.)

Carbohydrates: Outline of Glycolysis, TCA, and Gluconeogenesis, Glycogen metabolism (glycogenesis, glycogenolysis, glycogen storage diseases, and hormone regulation), biomedical importance of HMP, GTT and its regulation.

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UNIT-II (11 Hrs.)

Lipids: β fatty acid oxidation along with inborn errors, fatty acid synthesis, Cholesterol synthesis, catabolism & regulation, brief about atherosclerosis, Lipoproteins, ketosis, lipid peroxidation and role of antioxidants.

UNIT-III (13 Hrs.)

Amino Acids: Oxidative and nonoxidative deamination, transamination and decarboxylation, transamination, transport and function of ammonia, urea cycle, metabolism of specialized products like glycine, phenylalanine, tyrosine, tryptophan, methionine, cysteine, histidine and branched chain amino acids, creatine metabolism.

UNIT-IV (9 Hrs.)

Nucleic acids, Enzymes and Vitamins: Types of nucleic acids, functions, importance of nucleosides and nucleotides, properties and classification of enzymes, Factor affecting the enzymes activity, applications of enzymes, concept of water soluble & fat soluble vitamins.

Recommended Books

1. U. Satyanaryana, U. Chkrapani, 'Biochemistry', 4th Edn., Elsevier.
2. D.L. Nelson, L.A. Lininger, M. Cox, M., Lehninger, 'Principles of Biochemistry', 5th Edn., W.H. Freeman.
3. J.M. Berg, J.L. Tymoczko, L. Stryer, 'Biochemistry', 5th Edn., W.H. Freeman.
4. D. Voet, J.G. Voet, 'Biochemistry', 4th Edn., John Wiley & Sons.

HUMAN ANATOMY & PHYSIOLOGY- II

Subject Code: BMLS1-212

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

Students will be able to learn the terminology of the subject and basic knowledge of the cell structure and function of organs, organ systems and body fluids in normal human body.

UNIT-I (11 Hrs.)

Body Fluids: Important terms, types of body fluid, total body water, avenues by which water leaves and enters body, general principles for fluid balance, cardinal principle, how body fluids maintain Homeostasis, Electrolytes & ions Function of electrolytes, how electrolyte imbalance leads to fluid imbalance

UNIT-II (9 Hrs.)

Digestive System: Structure & Function (Mouth, Tongue, Teeth, Oesophagus, Pharynx, Stomach, Intestine, Rectum, Anus; Digestive glands; physiology of digestion of carbohydrates, lipids & proteins, Structure and function of liver.

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UNIT-III (13 Hrs.)

Genitourinary System: Structure & function of kidney; structure of Nephron; physiology of excretion & mechanism of urine formation; renal function test Structure and Gametogenesis of male and female reproductive system; menstrual cycle

UNIT-IV (12 Hrs.)

Nervous & Endocrine System: Structure of neuron, nerve impulse; structure & function of brain & spinal cord, Spinal & Cranial nerves; all & none principal, role of neurotransmitters in transmission of nerve impulse, Structure & Functions of different types of glands, their location, secretions and metabolic disorders

Recommended Books

1. Ross and Wilson, 'Anatomy & Physiology.
2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
3. Pearce, 'Human Anatomy for Nurses'.

ENVIRONMENTAL SCIENCES

Subject Code: BMLS1-213

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Course Objectives

To impart knowledge concerned with those aspects of human behaviour which are more directly related to man's interaction with bio- physical environment and ability to understand the pollution and environmental degradation.

UNIT-I (10 Hrs.)

Ecosystem Inter- relationship: Basic concepts, components of ecosystem, Trophic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, energy efficiencies, Importance of gaseous and sedimentary cycles; Carbon, Nitrogen, Phosphorus and Sulphur Cycles, Global Oxygen Cycles, Hydrological cycles.

UNIT-II (8 Hrs.)

Natural Resources & Sustainable Management: Water resources; Surface water and ground water, watershed management, water harvesting, Land resources; Land use pattern, eco generation of wastelands, soil erosion and conservation, soil reclamation, The concept of sustainable development; Environmental degradation and conservation issue; Global change and sustainability issues.

UNIT-III (8 Hrs.)

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management; Causes, effects and control measure of urban and industrial wastes.

UNIT-IV (10 Hrs.)

Environmental Health Science & Toxicology: Concept of toxins, toxicity and toxicology, Classification of toxic compounds, Dose effect and Dose response relationship, levels of toxicity – acute, sub-acute and chronic, Types of toxicants, classification of toxicants – factors that affect environmental concentration of toxicants, Chemical and biological factors influencing toxicity, physiological responses of man to relevant stresses in the environment, industrial toxicology and its relationship with occupation and hygiene and also diseases.

Recommended Books

1. D.B. Botkin and E.A. Keller, 'Environment Science: Earth as a Living Planet', 3rd Edn., John Wiley and Sons Inc.
2. D.K. Asthana, M. Asthana, 'A Text Book of Environmental Studies', S. Chand & Co., 2006.
3. L.G. Cockerham and B.S. Shane, 'Basic Environmental Toxicology', CRC Press, Boca Raton, USA.
4. J.P. Shukla and Pandey, 'Elements of Toxicology', Radha Publications, New Delhi.
5. I. Sethi, 'Environmental Pollution Causes, Effects & Control', Neha Publishers & Distributors.

SYSTEMATIC BACTERIOLOGY LAB.

Subject Code: BMLS1-214

L T P C

0 0 4 2

EXPERIMENTS

1. Demonstration of Staining Procedures: Simple Stain

- a) Negative stain
- b) Gram stain
- c) Albert's stain
- d) Ziehl-Nelsen stain
- e) Capsule stain
- f) Flagella stain
- g) Spore stain

2. Demonstration of Biochemical Test: Catalase

- a) Coagulase
- b) Indole
- c) Methyl Red
- d) Voges Proskauer
- e) Urease
- f) Citrate
- g) Oxidase
- h) TSIA

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- i) Nitrate reduction
- j) Carbohydrate fermentation
- k) H₂S production
- l) Decarboxylases
- m) CAMP

3. Morphology, culture characteristics of commonly bacterial isolates: Escherichia coli, Enterobacter aerogenes, Staphylococcus aureus, Klebsiella pneumoniae, Vibrio.

Recommended Books

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual', Benjamin Cummings.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.
3. M. Cheesbrough, 'District Laboratory Practice in Tropical Countries', Cambridge University Press.
4. J.G. Collee, A.G. Fraser, B.P. Marimon, A. Simmons, 'Mackie & McCartney Practical Medical Microbiology', 4th Edn., Churchill Livingstone.

HEMATOLOGY & HEMATOLOGICAL TECHNIQUES- II LAB.

Subject Code: BMLS1-215

L T P C

0 0 2 1

EXPERIMENTS

1. To measure the levels of Met, Carboxy and Sulpha-haemoglobin
2. To determine PT, PTI, INR and APTT of the given sample
3. To determine platelet count of the given sample using phase contrast microscope
4. To prepare the following in lab: Thromboplastin, Cephalin, Thrombin, M/uo Calc₂ and Kaolin solution.

Recommended Books

1. Paraful B. Godkur, 'Text Book of Med. Lab. Technology'.
2. V.H. Talib, 'Hand Book of Med. Lab. Technology', 2nd Edn.
3. J.B. Dacie, 'Med. Lab. Tech. Methods and Interpretation', Practical Haematology.
4. Christopher A. Ludlam, 'Clinical Hematology'.
5. G.A. McDonald, 'Atlas of Hematology'.
6. Stephen M. Robinson, 'Hematology' (Pathophysiological basis for Clinical Practice) 3rd Edn.

APPLIED BACTERIOLOGY

Subject Code: BMLS1- 316

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. The student will understand the role of bacteria in different applications that directly or indirectly affect the human's life.

UNIT- I (12 Hrs.)

Sample Collection, Transportation and Processing: Upper and lower respiratory tract; gastro intestinal tract infections; urinary tract infections; genital tract infections; Septicemia and bacteraemia.

UNIT- II (9 Hrs.)

Examination of Water, Milk & Food Product: Presumptive coliform count (Eijkman test), Membrane filtration tests of water; various tests for Bacteriological quality of milk and its product; classification of food like frozen food, canned food, raw food, cooked food, Bacteriological examination with special reference to food poisoning bacteria.

UNIT- III (10 Hrs.)

Examination of Air, Nosocomial Infection & Epidemiological Markers: Significance of air bacteriology in healthcare facilities, types of air sampling methods, collection processing and reporting of an air sample; sources and types of nosocomial infections, Role of microbiology laboratory in control of nosocomial infections; Serotyping and phage typing.

UNIT- IV (14 Hrs.)

Microbial Preservation & Antibiotic Susceptibility Testing: Basic concepts of preservation of microbes, Principle and procedures of various preservation methods with special reference to lyophilization; Definition of antibiotics, Preparation and standardization of inoculums, Choice of antibiotics, MIC and MBC determination, Stokes method and Kirby-Bauer method; test for production of β - lactamase.

Recommended Books

1. Mackie & MacCartney, 'Practical Medical Microbiology', Vol. 1 and 2.
2. Ananthanereyan, 'Text book of Microbiology'.
3. Paniker & Satish Gupte, 'Medical Microbiology'.
4. Mukherjee, 'Medical Laboratory Technology', Vol. I, II, III.
5. Monia Cheesbrough, 'Medical Laboratory Manual for Tropical Countries', Vol. II.
6. V. Muralidhar, 'Hospital Acquired Infections'.

ANALYTICAL BIOCHEMISTRY

Subject Code: BMLS1 - 317

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. Student will know about the various techniques used in the biochemistry laboratories for the detection of the diseases and disorders.

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

UNIT- I (12 Hrs.)

Spectrophotometry & Colorimetry: Theories of spectrophotometry and colorimetry; Lambert's law and Beer's law; Construction and working of spectrophotometry and colorimetry and their clinical applications.

UNIT- II (9 Hrs.)

Photometry: Introduction, Principle of Flame photometry; body construction, working; clinical applications and limitations.

UNIT- III (14 Hrs.)

Chromatography: Types of chromatography: Paper, Thin Layer, Column, Gas, Ion exchange, Gel; their principles, working and applications.

UNIT- IV (10 Hrs.)

Electrophoresis: Introduction, principle, Instrumentation; types of electrophoresis: paper and gel electrophoresis and their applications.

Recommended Books

1. Harold Varley, 'Practical Clinical Biochemistry'.
2. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', Cambridge University Press.
3. P.B. Godker, 'Text book of Medical Laboratory Technology'.
4. Mukherjee, 'Medical Laboratory Technology'.
5. Chatwal Anand, 'Instrumental Analysis'.
6. Shinde Chaterjee, 'Text book of Medical Biochemistry'.

BASIC CELLULAR PATHOLOGY

Subject Code: BMLS1-318

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. The student will learn about the diseases associated with different body organs and systems.

UNIT- I (12 Hrs.)

Digestive & Accessory System Complications: Diseases: mouth, oesophagus, gastritis, peptic ulceration, intestinal abstrictions; Microbial complications: Food poisoning, malabsorption, hepatitis, appendicitis; liver cirrhosis, pancreatitis, jaundice.

UNIT- II (10 Hrs.)

Respiratory System Problems: Upper respiratory tract infections: Bronchi, Asthma; Lower respiratory Infections: Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

UNIT- III (13 Hrs.)

Urinary & Reproductive System Problems: Glomerulonephritis, Nephrotic syndrome, Renal failure, Renal calculi, Urinary obstruction, Urinary tract infection; Sexually transmitted diseases, Disease of ovaries, ectopic pregnancy, prostatitis, Infertility.

UNIT- IV (10 Hrs.)

Circulatory System Complications: Disease of the blood vessels: Atheroma, Arteriosclerosis, heart block; blood pressure: hyper and hypotension.

Recommended Books

1. Ross and Wilson, 'Anatomy & Physiology'.

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ONWARDS**

2. Pearce, 'Human Anatomy and Physiology'.
3. Di Fiore, 'Atlas of Histology'.
4. 'Medical Laboratory Technology' Vol. III.
5. 'Color Atlas of Basic Histopathology'.

APPLIED HAEMATOLOGY- I

Subject Code: BMLS1-319

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

The students are made aware of Safety precautions, Quality assurance, biomedical waste management and automation in haematology.

UNIT- I (12 Hrs.)

Quality Assurance & Safety Precautions in Haematology: Internal and external quality control, routine quality assurance protocol; statistical analysis: Standard deviation, Co-efficient variation, accuracy and precision; standard guidelines related to safety precautions.

UNIT- II (10 Hrs.)

Bone Marrow Examination: Composition and function of bone marrow; aspiration procedure and processing of bone marrow; processing and staining of trephine biopsy specimens.

UNIT- III (10 Hrs.)

Blood Cells Anomalies: Red Blood Cells: Morphological changes such as variation in size shape & staining character; Leucocytes: Abnormal morphology i.e. shift to left & shift to right.

UNIT- IV (13 Hrs.)

Biomedical Examinations & Biomedical Waste Management: Routine examination of Urine, seminal fluid, CSF and other body fluids; biomedical waste classification and segregation; treatment procedure.

Recommended Books

1. Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.
2. J. B. Dacie, 'Practical Haematology'
3. V.H. Talib, 'Hand book of Medical Laboratory Technology'.
4. Emmanuel C.Besa, 'Haematology' (International Edition) Harwal Publisher.
5. Sir John, 'Practical Haematology' 8th Edn.
6. Christopher A. Ludlam, 'Clinical Haematology'.
7. John Bernard Henary, 'Clinical Diagnosis & Management by Laboratory Methods'.
8. Ramnik Sood, 'Medical Laboratory Technology Methods & Interpretation'.

COMMUNICATION SKILLS

Subject Code: BHUM0-

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Course Objectives

The objective of this course is to make students understand that both oral & written communication is equally important.

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ONWARDS**

UNIT- I (8 Hrs.)

Basics of Technical Communication: Meaning, Internal & External functions, Shannon & weaver's model of Communication, Importance of Communication Barriers to communication & ways to improve these barriers, Essentials (7c's & other principles)

UNIT- II (8 Hrs.)

Writing Skills: Writing styles of applications, resume & CV, Personal letters, Official/Business letters, Memo, Notice, Report writing, Project writing, Quotation & Tender.

UNIT- III (12 Hrs.)

Speaking Skills: Presentation Techniques, Principles of Presentation, Types of Interview, G.D, Extempore speaking, Speech Mechanism, Organs of speech, Production & Classification of Speech sounds, skills of effective speaking.

UNIT- IV (8 Hrs.)

Tech Communication & Listening Skills: MS Word, Excel, PowerPoint, Process, Types of listening, Barriers to effective listening, Barriers to effective listening & ways to improve these Barriers.

Recommended Books

1. Loveleen Kaur, 'Communication Skills' Satya Prakashan Publication.
2. Narinder Kumar Bodhraj, 'Business Communication', Kalyani Publishers, 2011.
3. S.P. Dhanavel, 'English & communication Skills for the Students of Science & Engineering' Orient blackswan publication, 2009.
4. Indrajit Bhattacharya, 'An Approach to Communication Skills'.
5. Chissie Wright, 'Handbook of Practical Communication Skills'.

APPLIED BACTERIOLOGY LAB.

Subject Code: BMLS1 - 320

L T P C

0 0 4 2

EXPERIMENTS

1. Isolation of pure cultures by spread plate, pour plate and streak plate method.
2. Culturing of blood, urine, throat swab, csf and other body fluids.
3. Microbiological examination of water by MPN
4. Microbiological examination of milk by MBRT.
5. To perform antibiotic susceptibility testing of clinical isolates by using Stokes and Kirby-Bauer method.
6. β - lactamase production test.

Recommended Books

1. James G. Cappuccino and Natalie Sherman, 'Microbiology: A Laboratory Manual, Benjamin Cummings'.
2. K.R. Aneja, 'Experiments in Microbiology, Plant Pathology and Biotechnology', New Age Publishers.

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

ANALYTICAL BIOCHEMISTRY LABORATORY

Subject Code: BMLS1 - 321

**L T P C
0 0 2 1**

Duration: 24 Hrs.

EXPERIMENTS

1. Working & maintenance of spectrophotometer.
2. To demonstrate the working & maintenance of colorimeter.
3. To demonstrate the working & maintenance of flame photometer.
4. To demonstrate the procedure of paper chromatography.
5. To demonstrate the procedure of Gas chromatography.
6. Demonstration of TLC.
7. To demonstrate the procedure of column chromatography.
8. Electrophoresis of the given DNA sample.

Recommended Books

1. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology' Cambridge University Press.
2. A. Pingoud, C. Urbanke and A. Jeltsch, 'Biochemical Methods', John Wiley.

BASIC CELLULAR PATHOLOGY LAB.

Subject Code: BMLS1 - 322

**L T P C
0 0 2 1**

1. To study squamous cell from cheek cells.
2. To study stained slide preparation from organs of digestive system.
3. Study of stained slides of liver, pancreas, gall bladder.
4. To study stained slide preparation from organs of circulatory system.
5. To study stained slide preparation from organs of Respiratory system.
6. To study stained slide preparation from organs of Urinary system.

Recommended Books

1. Medical Laboratory Technology-Vol. III.
2. Color atlas of basic Histopathology.

COMMUNICATION SKILLS LAB.

Subject Code: HUM0-302

**L T P C
0 0 2 1**

1. To study propose text book.
2. Precise writing and simple passage from a prescribed text books. At least 100 words should be chosen and few questions from the passage may be said to answer.
3. To practice all forms communication i.e. drafting report, agenda notes, précis writing, telegram, circular, representations, press release, telephonic communication, practice of writing resume and writing application of employment.

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ONWARDS**

Recommended Books

1. S.P. Dhanavel, 'English & Communication Skills for the Students of Science & Engineering', Orient Blackswan Publication, 2009.
2. Indrajit Bhattacharya, 'An Approach to Communication Skills'.
3. Chissie Wright, 'Handbook of Practical Communication Skills'.

APPLIED HAEMATOLOGY- I LAB.

Subject Code: BMLS1- 323

L T P C

0 0 2 1

EXPERIMENTS

1. To prepare a bone marrow smear and stain by Leishman's, May Grunwald Giesma and Perl's stain.
2. To study the RBCs abnormal morphological forms.
3. Physical, Chemical and Microscopic examination of urine.
4. Cytological examination of CSF and other body fluids.
5. Physical and Microscopic examination of seminal fluid including sperm Count.

Recommended Books

1. J.B. Dacie, 'Practical Haematology'.
2. V.H. Talib, 'Hand Book of Medical Laboratory Technology'.
3. Emmanuel C. Besa, 'Haematology', Harwal Publisher.
4. Sir John, 'Practical Haematology'.

IMMUNOLOGY & MYCOLOGY

Subject Code: BMLS1-425

L T P C

4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To teach the concepts of immunological mechanisms.
2. To teach medically important fungi and diagnosis of their diseases.

UNIT- I (12 Hrs.)

Introduction to Immunology & Its Techniques: Innate and acquired immunity including basic concepts about their mechanisms; types of antigens and Determinants of antigenicity; structure and properties of immunoglobulins; complement system; humoral and cellular immune response; principles, procedure and applications of Complement fixation test, Immunofluorescence, ELISA, CCIEP, and RIA, SDS-PAGE and western blotting, agglutination tests.

UNIT- II (10 Hrs.)

Hypersensitivity, autoimmunity & Vaccine: Definition and types of hypersensitivity reactions; Basic concepts of autoimmunity and brief knowledge about autoimmune diseases; Types of vaccine, schedule and brief knowledge about '*Extended programme of immunization*' (EPI) in India.

UNIT- III (09 Hrs.)

Introduction to Medical Mycology: Basic concepts about superficial and deep Mycoses, Taxonomy and classification and general characteristics of various medically important fungi, Normal fungal flora.

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ONWARDS**

UNIT- IV (14 Hrs.)

Laboratory Procedures: Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids; Direct microscopy; Culture media used in mycology; Techniques used for isolation and identification of medically important fungi; Use of laboratory animal for diagnosis of fungal infections; Preservation of fungal cultures.

Recommended Books

1. Ivan Roitt, Jonathaan Brostoff and David Male, 'Immunology'.
2. Kuby, 'Immunology'.
3. Dr Jagdish Chander, 'Medical Mycology'.
4. Paniker & Satish Gupte, 'Medical Microbiology'.
5. Mackie & MacCartney, 'Practical Medical Microbiology' Vol. 1 and 2.

HISTOPATHOLOGY - I

Subject Code: BMLS1- 426

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Student will learn about the various techniques used in the histopathology.

UNIT-I (09 Hrs.)

Basic Concepts of Histopathology and Methods of Tissues Examination: Introduction to histopathology: Safety measures in a histopathology laboratory, Care and maintenance of laboratory equipment used, Collection and transportation of specimens, various types of fixatives used in a routine histopathology laboratory.

UNIT-II (14 Hrs.)

Decalcification & Embedding: Criteria of a good decalcification agent; Technique of decalcification with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing; various types of decalcifying fluids. Types of embedding media; Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue; Components & principles of various types of automatic tissue processors.

UNIT- III (10 Hrs.)

Section Cutting: Equipment used for sectioning: Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, Freezing Microtome, Cryostats; Faults in paraffin section cutting with reasons and remedies, spreading the sections and attachment or mounting of sections to glass slides.

UNIT- IV (09 Hrs.)

Staining, Impregnation and Mountants: Principles of staining, types of Stains, nuclear Stains and cytoplasmic stains. Role of impregnation and types; Commonly used mountants & mounting the slides.

Recommended Books

1. Culling Histopathology techniques.
2. Bancroft Histopathology techniques.

**MRSPTU B.Sc. MEDICAL LABORATORY SCIENCE SYLLABUS 2016 BATCH
ONWARDS**

CLINICAL BIOCHEMISTRY- I

Subject Code: BMLS1-427

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

To teach the principles and procedures of biochemical test.

UNIT-I (9 Hrs.)

Introduction to Clinical Biochemistry: Hazards & safety measures in clinical Biochemistry laboratory; Quality control and quality assurance; management and maintenance of records; principles of assay procedure for the estimation of glucose, protein, urea, uric acid, creatinine, bilirubin, lipids in the blood, serum, plasma and urine and their normal range.

UNIT-II (14 Hrs.)

Principles, procedures for the estimation of the various biochemical components: Sodium, Potassium, Chloride, Iodine, Calcium, Phosphorus and Phosphates.

UNIT- III (12 Hrs.)

Clinical Toxicology: Screening procedures for detection of drugs. Drugs of abuse and their evaluation. Toxic metals – Lead, Mercury, Arsenic, Cadmium and Chromium – Toxicity and their evaluation.

UNIT- IV (10 Hrs.)

Instrumentations: Detection of radioactivity; applications of radioisotopes in clinical biochemistry; Immunodiffusion Techniques, Radioimmunoassay & ELISA; Autoanalysers.

Recommended Books

1. P.B. Godkar, 'Text book of Medical Laboratory Technology'.
2. A. Kolhatkar, 'Medical Laboratory Sciences, Theory & Practical'.
3. Harold Varley, 'Practical Clinical Biochemistry'.
4. U. Satyanarayan. & U. Chakrapani, 'Biochemistry'.
5. Chaterjee & Shinde, 'Text book of Medical Biochemistry'.

APPLIED HAEMATOLOGY- II

Subject Code: BMLS1-428

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Students will understand the different haematological diseases and disorders and role of laboratories for the identification of such abnormalities.

UNIT-I (9 Hrs.)

Anemia Disorder: Classification of Anemia: Morphological & etiological; Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency; Megaloblastic Anemia; Hemolytic Anemia.

UNIT-II (10 Hrs.)

Leukemia: Classification: general, specific; signs and symptoms; causes: radiation, genetic conditions; laboratory diagnosis; treatment: Acute lymphoblastic, chronic lymphocytic, acute myelogenous, hairy cells.

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ONWARDS**

UNIT-III (14 Hrs.)

Blood Disorders: Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis; intravascular coagulation, hemophilia, idiopathic thrombocytopenic purpura their mechanisms and laboratory identification; platelet function test; measurement of blood volume, red cell volume.

UNIT-IV (12 Hrs.)

Radioactive Isotopes Their Uses and Management: Source, half life and their applications; various apparatus used for measurement of radiation; radiation hazards its prevention; disposal of radioactive materials.

Recommended Books

1. Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.
2. J.B. Dacie, 'Practical Haematology'
3. V.H. Talib, 'Hand book of Medical Laboratory Technology'.
4. Emmanuel C. Besa, 'Haematology' Harwal Publisher.
5. Sir John, 'Practical Haematology'.
6. Christopher A. Ludlam, 'Clinical Haematology'.
7. John Bernard Henry, 'Clinical Diagnosis & Management by Laboratory Methods'.

FUNDAMENTALS OF COMPUTER

Subject Code: BCAP0-401

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

Student will know the theoretical and working knowledge about the use of computers in medical laboratory science.

UNIT-I (14 Hrs.)

Introduction to Various Computer Parts: Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices); output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

UNIT-II (12 Hrs.)

MS- Word, Excel, Power Point: Components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge; worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs; creation and manipulation presentation, formatting and enhancing text, slide with graphs.

UNIT-III (10 Hrs.)

Introduction of Windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

UNIT- IV (09 Hrs.)

Application of Computers in Various Fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

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ONWARDS**

Recommended Books

1. Sunita Goel, 'Computer Fundamentals', Pearson Publication.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
3. P.K. Sinha, 'Introduction to Computers' BPB Publications.
4. Raymond Greenlaw, 'Fundamentals of the Internet & the World Wide Web'.
5. Sunjay Saxena, 'Introduction to Computers and MS Office'.

IMMUNOLOGY & MYCOLOGY LAB.

Subject Code: BMLS1-429

L T P C

0 0 4 2

EXPERIMENTS

1. Performance of Serological tests *i.e.* Widal, VDRL, Rheumatoid factor (RF) Latex agglutination.
2. Demonstration of antigen / antibody determination by Immunodiffusion, ELISA.
3. To prepare culture media used routinely in mycology.
4. To perform the staining techniques for identification of fungi.
5. To process clinical samples for laboratory diagnosis of fungal infections *i.e.* skin, nail hair.

Recommended Books

1. Mackie & MacCartney, 'Practical Medical Microbiology', Vol. 1 and 2.
2. G.P. Talwar, S.K. Gupta, 'Hand Book of Practical and Clinical Immunology', CBS, 2006.

HISTOPATHOLOGY- I LAB.

Subject Code: BMLS1-430

L T P C

0 0 2 1

EXPERIMENTS

1. Demonstration of instruments used for dissection.
2. Reception and labeling of histopathological specimens.
3. Preparation of various fixatives: Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid.
4. To perform embedding and casting of block.
5. To process a bone for decalcification.
6. Processing of tissue by manual and automated processor method.
7. To perform section cutting.
8. To perform & practice the Haematoxylin and Eosin staining technique.
9. To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH).
10. To learn mounting of stained smears.

Recommended Books

1. Culling Histopathology techniques.
2. Bancroft Histopathology techniques.

CLINICAL BIOCHEMISTRY- I LAB.

Subject Code: BMLS1-431

L T P C

0 0 2 1

EXPERIMENTS

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum bilirubin.
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG.
10. Estimation of Creatinine in Blood.
11. Estimation of serum calcium.
12. To measure electrolytes Sodium, Potassium & Chloride.

Recommended Books

1. Harold Varley, 'Practical Clinical Biochemistry'.
2. A. Kolhatkar, 'Medical Laboratory Sciences, Theory & Practical'.

APPLIED HAEMATOLOGY- II LAB.

Subject Code: BMLS1-432

L T P C

0 0 2 1

EXPERIMENTS

1. To estimate serum iron and total iron binding capacity.
2. To detect whether the given specimen is G6PD deficient or normal.
3. To estimate Hb-F in a given blood sample.
4. To estimate plasma and urine Haemoglobin in the given specimens.
5. To demonstrate the presence of Hb-S by Sickling and solubility tests.
6. To test the given blood sample for its osmotic red cell fragility.
7. Cytochemical staining on the given smears such as PAS, SBB, MPO, LAP and Perl's reaction.
8. Estimation of Fibrinogen, Fibrin degradation products (FDPs) and Euglobulin clot lysis test (ELT).
9. Urea clot solubility test for factor XIII.
10. To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.

Recommended Books

1. J.V. Dacie, 'Practicals in Hematology'.
2. Lynch, 'Medical Laboratory Technology'

FUNDAMENTAL OF COMPUTER LAB.

Subject Code: BCAP0-402

L T P C

0 0 2 1

Introduction to Word

1. Introduction to Word and its basic editing
2. Text Formatting, Copying and moving text and objects
3. Working with tables and its formatting
4. Working with paragraph and Clipboard
5. Send Emails using Mail Merge and create hyperlinks in it.
6. Printing documents with header and footers

Introduction to Spreadsheets

1. Introduction to Spread Sheets and its basic editing
2. Modifying Spreadsheets, formatting cells
3. Working with formula and functions,
4. Working with Charts and Graphs
5. Sorting and filtering with different Conditions
6. Printing selected cells and sheets

Introduction to Power Point

1. Introduction to Power Point and its basic Features
2. Working with slides, adding template and contents to slides
3. Working with charts, Graphs and Tables in Slides
4. Adding animations, Videos and Audio to slides
5. Printing of Presentation
6. Creating a full Presentation with all features of PowerPoint.

Recommended Books

1. Sunita Goel, 'Computer Fundamentals, Pearson Publications.
2. Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
3. P.K. Sinha, 'Introduction to Computers', BPB Publications.
4. Sunjay Saxena, 'Introduction to Computers and MS Office'.

MRSPTU BCA SYLLABUS 2016 BATCH ONWARDS

BCA (1st YEAR)

Total Contact Hours = 25

Total Marks = 700

Total Credits = 21

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-101	Problem Solving using C	3	1	0	40	60	100	4
BCAP1-102	Information Technology and Office Automation	3	1	0	40	60	100	4
BCAP1-103	Digital Electronics	3	1	0	40	60	100	4
BCAP1-104	Software Lab-I (Problem Solving using C based on BCAP1-101)	0	0	4	60	40	100	2
BCAP1-105	Software Lab-II (Information Technology and Office Automation based on BCAP1-102)	0	0	4	60	40	100	2
BHUM0-101	Communicative English	2	1	0	40	60	100	3
BHUM0-103	Human Values and Professional ethics	2	0	-	40	60	100	2
Total	Theory = 5 Labs = 2	13	4	8	320	380	700	21

Total Contact Hours = 28

Total Marks = 700

Total Credits = 24

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-206	Object Oriented Programming Using C ++	3	1	0	40	60	100	4
BCAP1-207	Computer Organization and Architecture	3	1	0	40	60	100	4
BCAP1-208	Internet and its Applications	3	1	0	40	60	100	4
BCAP1-209	Multimedia and Applications	3	1	0	40	60	100	4
BCAP1-210	Software Lab-III (Object Oriented Programming Using C ++ based on BCAP1-206)	0	0	4	60	40	100	2
BCAP1-211	Software Lab-IV (Internet and its Applications based on BCAP1-208)	0	0	4	60	40	100	2
BMAT0-204	Fundamentals of Mathematics	3	1	0	40	60	100	4
Total	Theory = 5 Labs = 2	15	5	8	320	380	700	24

MRSPTU BCA SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 27

Total Marks = 700

Total Credits = 23

SEMESTER 3 rd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-312	Data Structures	3	1	0	40	60	100	4
BCAP1-313	Web Technologies	3	1	0	40	60	100	4
BCAP1-314	Software Lab-V (Data Structures based on BCAP1-312)	0	0	4	40	60	100	2
BCAP1-315	Software Lab-VI(Web Technologies based on BCAP1-313)	0	0	4	60	40	100	2
BHUM0-106	Technical skills	3	1	0	60	40	100	4
Departmental Elective - I (Select any one)		3	1	0	40	60	100	4
BCAP1-356	Introduction to Microprocessors							
BCAP1-357	Emerging Trends in Information Technology							
Open Elective-I (Select any One)		3	0	0	40	60	100	3
Total	Theory = 5 Labs = 2	15	4	8	320	380	700	23

Total Contact Hours = 27

Total Marks = 700

Total Credits = 23

SEMESTER 4 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-416	Operating System	3	1	0	40	60	100	4
BCAP1-417	Programming in Java	3	1	0	40	60	100	4
BCAP1-418	Database Management Systems	3	1	0	40	60	100	4
BCAP1-419	Software Lab-VII (Programming in Java based on BCAP1-417)	0	0	4	60	40	100	2
BCAP1-420	Software Lab-VIII(Database Management Systems based on BCAP1-418)	0	0	4	60	40	100	2
Departmental Elective – II (Select any one)		3	1	0	40	60	100	4
BCAP1-458	Discrete Structures							
BCAP1-459	Embedded Systems							
Open Elective-II (Select any One)		3	0	0	40	60	100	3
Total	Theory = 5 Labs = 2	15	4	8	320	380	700	23

MRSPTU BCA SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 27

Total Marks = 700

Total Credits = 23

SEMESTER 5 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-521	Mobile Computing	3	1	0	40	60	100	4
BCAP1-522	Programming in ASP.Net	3	1	0	40	60	100	4
BCAP1-523	Computer Networks	3	1	0	40	60	100	4
BCAP1-524	Software Lab-IX(Mobile Computing based on BCAP1-521)	0	0	4	60	40	100	2
BCAP1-525	Software Lab-X(Programming in ASP.Net based on BCAP1-522)	0	0	4	60	40	100	2
Departmental Elective – III (Select any one)		3	1	0	40	60	100	4
BCAP1-560	Network Security							
BCAP1-561	Artificial Intelligence							
Open Elective-III (Select any One)		3	0	0	40	60	100	3
Total	Theory = 5 Labs = 2	15	4	8	320	380	700	23

Total Contact Hours = 25

Total Marks = 700

Total Credits = 21

SEMESTER 6 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCAP1-626	Computer Graphics	3	1	0	40	60	100	4
BCAP1-627	Software Engineering	3	1	0	40	60	100	4
BCAP1-628	Seminar	0	0	4	60	40	100	2
BCAP1-629	Software Lab-XI(Computer Graphics based on BCAP1-626)	0	0	4	60	40	100	2
BESE0-101	Environmental Science	2	0	0	40	60	100	2
Departmental Elective - IV (Select any one)		3	1	0	40	60	100	4
BCAP1-662	Wireless Communication							
BCAP1-663	Cloud Computing							
Open Elective-IV (Select any One)		3	0	0	40	60	100	3
Total	Theory = 5 Labs = 2	14	3	8	320	380	700	21

Overall

Semester	Marks	Credits
1 st	700	21
2 nd	700	24
3 rd	700	23
4 th	700	23
5 th	700	23
6 th	700	21
Total	4200	135

PROBLEM SOLVING USING C

Subject Code: BCAP1-101

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming).
2. Students will learn to write algorithm for solutions to various real life problems and converting the algorithms into computer programs using C language.

UNIT-I (10 Hrs.)

1. Problem Solving and Programming Languages

Problem Solving Aspects, Program Development Steps, Introduction to Programming Languages, Types and Categories of Programming Languages, Program Development Environments.

2. Logic development and algorithms

Types of Problems, Data Centric and Process Centric, Problem Solving Strategies, Problem analysis, formal definition of problem, Top- Down design and Bottom-Up design, Algorithms, Flow charts, Flow chart symbols, Pseudo codes, illustrative examples.

UNIT-II (11 Hrs.)

3. Introduction to C Programming Language

Introduction to C Language, Evolution and Characteristics of C Language, Compilation Model, Character Set, Keywords, Identifiers, Data Types, Variables, Constants, Operators, Expressions, Type conversion and Type Casting, Overview of Pre-processors, Structure of a C Program, Input and Output Statements.

4. Control Statements

Basic Programming Constructs, Sequence, Selection Statements 'if' Statement, Conditional / Ternary /?: Operator, Switch Statement, Iteration Statements, 'for' statement, 'while' statement, 'do - while' statement, break, continue Statement.

UNIT-III (12 Hrs.)

5. Arrays and Strings

Need for an Array, Memory Organization of an Array, Declaration and Initialization, Basic Operations on Arrays, Multi-dimensional Array, Strings.

6. Pointers

Introduction, Declaration and Initialization, Pointer Arithmetic, Pointers and Arrays, Dynamic Memory Allocation.

UNIT - IV (12 Hrs.)

7. Functions and Storage Classes

Need for Functions, Function Prototype, Function Definition, Function Call Passing Arguments, Functions and Arrays, Functions and Pointers, Command Line Arguments, Recursive Functions, String Functions, Automatic Storage Class, Register Storage Class, Static Storage Class, External Storage Class.

8. Structures

Declaration and Initialization, Structures and Arrays, Structures and Pointers, Structures and Functions, Introduction to Unions, Enumeration, Typedef Statement.

9. Files

Introduction, File Operations, Character I/O, String I/O, Numeric I/O, Formatted I/O, Block I/O.

Recommended Books

1. Shubhnandan Jamwal, 'Programming in C', 6th Edn., Pearson, 2010.
2. E. Balagurusamy, 'Programming in ANSI C', 8th Edn., Tata McGraw Hill, 2008.
3. Brian Kernighan and Dennis Ritchie, 'C Programming Language', 2nd Edn., PHI, 1988.
4. Byron Gottfried, 'Programming with C', 3rd Edn., Tata McGraw Hill, 2006.
5. ISRD Group, 'Programming and Problem Solving Using C', 3rd Edn., Tata McGraw Hill, 2008.
6. Yashvant P. Kanetkar, 'Let us C', 8th Edn., BPB Publications, 2008.
7. R.S. Salaria, 'Application Programming in C', 3rd Edn., Khanna Book Publishing, 2008.

INFORMATION TECHNOLOGY AND OFFICE AUTOMATION

Subject Code: BCAP1-102

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. This course will enable the student to gain and understanding of the core concepts and technologies which constitute Information Technology.
2. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology and Office Tools.

UNIT-I (11 Hrs.)

1. Computer Fundamentals

Block diagram of a computer, Characteristics of Computers, Hardware, Software, Machine Language, Assembly Language and Assembler, High Level Language and Compiler v/s Interpreter.

2. Input Devices

Keyboard, Mouse, Joy tick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Speech Recognition Devices, Optical Recognition devices – OMR, OBR, OCR.

3. Output Devices

Monitors, Impact Printers - Dot matrix, Character and Line printer, Non-Impact Printers – Desk Jet and Laser printing, Plotter.

4. Memories

Main Memories - RAM, ROM and Secondary Storage Devices - Hard Disk, Compact Disk and DVD.

UNIT-II (10 Hrs.)

5. Windows

Installing Windows with set-up, Starting and Quitting windows, Basic Elements of Windows, working with menus dialogue boxes, Window Applications, Program Manager, File Manager, Print Manager, Control Panel, Write, Paint Brush, Accessories including Calculator, Calendar, Clock, Card file, Note pad, Recorder etc.

UNIT-III (12 Hrs.)

6. Word Processing Tool

Salient features of Word Processing, File, Edit, View, Insert, Format, Tools, Tables, Window, help options and all of their features, Options and Sub Options etc., Transfer of files between Word Processors and Software Packages.

7. Presentation Tool

Making Presentations, Inserting objects, and Narration.

UNIT-IV (12 Hrs.)

8. Spreadsheet Tool

Excel Worksheet, Data Entry, Editing, Cell Addressing ranges, Commands, Menus, Copying & Moving cell content, Inserting and Deleting rows and column, Column formats, Cell Protection, Printing, Creating, Displaying and Printing Graphs, Statistical Functions.

9. Introduction to Internet

Evolution of Internet, Internet Applications, WWW, E-mail, FTP, TELNET, Web Browsers.

Recommended Books

1. V. Rajaraman, 'Fundamentals of Computers', 5th Edn., PHI, 2010.
2. Satish Jain, 'Information Technology Concepts', 4th Edn., BPB Publications, 2006.
3. Turban, Mclean and Wetherbe, 'Information Technology for Management', 4th Edn., John Wiley & Sons, 2006.
4. Courter G, 'Mastering MS Office 2000 Professional', 3rd Edn., BPB Publication, 2006.
5. Steve Sagman, 'MS- Office 2000 For Windows', 3rd Edn., Addison Wesley, 2008.
6. Indian Institute of Banking and Finance (IIBF), 'Information Technology, Data Communication and Electronic Banking', 2nd Edn., Macmillan India Ltd., 2007.

DIGITAL ELECTRONICS

Subject Code: BCAP1-103

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. Digital circuits, which are the basic building blocks of a computer, are introduced in this module to let the students know what activities it does behind the computing environment.
2. This course portrays excellent ideas of the logic gates available and data processing to make students understand the concept better with the analog and digital signals while computing.

UNIT-I (11 Hrs.)

1. Number System & Logic Gates

Decimal, Binary, Octal and Hexadecimal number system and conversion, Codes: Straight Binary code, BCD Code, Excess-3 Code, Grey Code, ASCII, Integer and Floating point representation, Binary Arithmetic, 1's Complement and 2's Complement, Overflow and Underflow, Logic gates, Universal Gates.

UNIT-II (12 Hrs.)

2. Boolean Algebra

Boolean Algebra Theorems, Truth-Table, Realization of switching functions using AND, OR, NOT logic gates, SOP and POS forms, 2-Variable, 3-Variable, 4-Variable, Karnaugh maps, Simplification of expressions.

UNIT-III (12 Hrs.)

3. Combinational Circuits

Design of Binary Adder, Full Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder.

4. Sequential Circuits

R-S, J-K, D and T Flip-flops, Clocks and Timers, Registers, Counters.

UNIT-IV (10 Hrs.)

5. Semiconductor Memories

Introduction, Static and Dynamic devices, read only & Random access memory chips, PROMS and EPROMS, Address selection logic, Read and write control timing diagrams for ICs.

Recommended Books

1. R.P. Jain, 'Modern Digital Electronics', 4th Edn., Tata Mcgraw-Hill, **2003**.
2. M. Morris Mano, 'Digital Logic and Computer Design', 10th Edn., Pearson, **2008**.
3. Albert Malvino, 'Digital Computer Electronics', 3rd Edn., Tata Mcgraw-Hill, **2008**.
4. William H. Gothmann, 'Digital Electronics: An Introduction to Theory and Practice', 2nd Edn., Prentice Hall, **1992**.
5. Anil K. Maini, 'Digital Electronics: Principles and Integrated Circuit', 1st Edn., Wiley, **2007**.
6. T.C. Bartee, 'Digital Computer Fundamentals', 3rd Edn., Tata Mcgraw-Hill, **1972**.

**PROBLEM SOLVING USING C LAB BASED ON BCAP1-101
(SOFTWARE LAB – I)**

Subject Code: BCAP1-104

**L T P C
0 0 4 2**

Duration: 20 Hrs.

Implement the following concepts in C Programming:

1. **Keywords and Identifiers:** Introduction, Purpose
2. **Variables and constants:** Data Types, Initialization, Declaration, Scope, Memory limits
3. **Input-output statements:** Formatted and Non-Formatted statements
4. **Operators:** Arithmetic, Logical, Conditional, Assignment, Bitwise, Increment/Decrement operators
5. **Decision Making:** Switch, if-else, nested if, else-if ladder, Break, Continue, Goto
6. **Loops:** While, Do-while, For
7. **Functions:** Definition, Declaration, Variable Scope, Parameterized Functions, Return statement, Call by value, Call by reference, Recursive functions
8. **Pre-processor Directives:** Pre-processor directives like INCLUDE, IFDEF, DEFINE, etc
9. **Header Files:** STDIO.H, MATH.H, STRING.H, PROCESS.H etc
10. **Arrays:** Array declarations, Single and Multi-dimensional, Memory limits, Strings and String functions
11. **Pointers:** Pointer declarations, Pointer to Function, Pointer to Array/String
12. **Files:** Creation and Editing of various types of files, closing a file (using functions and without functions).

**INFORMATION TECHNOLOGY AND OFFICE AUTOMATION LAB
BASED ON BCA1-102 (SOFTWARE LAB – II)**

Subject Code: BCAP1-105

**L T P C
0 0 4 2**

Duration: 20 Hrs.

1. WINDOWS OPERATING SYSTEM

Installing WINDOWS with set-up, Starting and Quitting WINDOWS, Basic Elements of WINDOWS, working with menus dialogue boxes, Window Applications, Windows Explorer, My Computer, Recycle bin, Programs, Favorites, My Documents.

Settings- Control Panel, Printers, Taskbar and Start menu, Folder Options, Active Desktop, Find, Help, Run.

Accessories – Entertainment, Games, System tools, Internet Tools, Calculator, Calendar, Clock, Card file, Note pad, Write pad, Recorder etc.

2. WORD PROCESSING & PRESENTATION TOOL

Salient Features of Word, Installation of Word, Starting and Quitting of Word, File, Edit, View, Insert, Format, Tools, Tables, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Word Processors and Software Packages.

Salient Features of Power Point, Installation, Starting and Quitting, File, Edit, View, Insert, Format, Tools, Slide Show, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Presentation Tool and Software Packages.

3. SPREADSHEET TOOL

Spread Sheet. Getting started with Excel worksheet, entering data into Work Sheet, editing cell addressing, Ranges and range names, Commands, Menus, Copying and Moving cell contents, Inserting and Deleting rows and columns, Column width control, Cell protection, Printing reports, Creating and Displaying Graphs, Statistical functions.

4. INTERNET

Internet Applications, WWW, compose an E-mail, Draft an E-mail, FTP, TELNET, Web Browsers.

COMMUNICATIVE ENGLISH

Subject Code: BHUM0-101

L T P C

Duration: 45 Hrs.

2 1 0 3

Course Objectives and Expected Outcomes

1. To expose the students to effective communication strategies and different modes of communication.
2. To enable the students to analyze his/her communication behavior and that of others.
3. To enable student to apply effective communication skills professionally and socially.

UNIT-I (12 Hrs.)

Communication: Meaning, its types, Significance, Process, Channels, Barriers to Communication, Making Communication Effective, Role in Society.

Business Correspondence: Elements of Business Writing, Business Letters: Components and Kinds, Memorandum, Purchase Order, Quotation and Tenders, Job Application Letters, Resume Writing etc.

UNIT-II (10 Hrs.)

Discussion Meeting and Telephonic Skills: Group Discussion, Conducting a Meeting, Telephone Etiquettes, Oral Presentation: Role of Body Language and Audio Visual Aids.

Grammar: Transformation of Sentences, Words used as Different Parts of Speech One Word Substitution, Abbreviations, Technical Terms etc.

UNIT-III (11 Hrs.)

Reading Skills: Process of reading, Reading Purposes, Models, Strategies, Methodologies, Reading Activities.

Writing Skills: Elements of Effective Writing, Writing Style, Technical Writing: Report Writing.

UNIT-IV (12 Hrs.)

Listening Skills: The process of Listening, Barriers to Listening, Effective Listening Skills and Feedback Skills.

Speaking Skills: Speech Mechanism, Organs of Speech, Production and Classification of Speech Sound, Phonetic Transcription, Skills of Effective Speaking, Components of Effective Talk.

Course Outcomes

The students after undertaking this course will be able to:

- i) Understand and appreciate the need of communication training.
- ii) Use different strategies of effective communication and select the most appropriate mode of communication for a given situation.
- iii) Speak effectively and assertively
- iv) Correspond effectively through different modes of written communication.
- v) Present himself/herself professionally through effective resumes and interviews.

Recommended Books

1. M.V. Rodrigues, 'Effective Business Communication', Concept Publishing Company New Delhi, 1992, reprint 2000.
2. Adhikari Sethi, 'Business Communication', McGraw Hill.
3. Indrajit Bhattacharya, 'An Approach to Communication Skills', Dhanpat Rai Co., (Pvt.) Ltd. New Delhi.
4. Chrissie Wright, 'Handbook of Practical Communication Skills', Jaico Publishing House, Mumbai.
5. L. Gartside, 'Modern Business Correspondence', Pitman Publishing, London.
6. Rizvi M. Ashraf, 'Effective Technical Communication', McGraw Hill.

HUMAN VALUES & PROFESSIONAL ETHICS

Subject Code: BHUM0-103

L T P C
2 0 0 2

Duration: 24 Hrs.

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 IITM, 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” - *Sukhand 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: *Sanyamand Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyamand 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-astitvaas comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*) - 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.

2. Ivan Illich, 'Energy & Equity', The Trinity Press, Worcester and Harper Collins, 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 Vidyaek Parichay', Divya Path Sansthan, Amarkantak, 1998.
5. Sussan George, 'How the Other Half Die's', Penguin Press. 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 Edition, Prentice Hall of India Ltd.
12. B.P. Banerjee, 'Foundations of Ethics and Management', Excel Books, 2005.

OBJECT ORIENTED PROGRAMMING USING C++

Subject Code: BCAP1-206

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. The objective of this course is to learn programming from real world examples and understand object oriented approach for finding solutions to various problems with the help of C++ language.
2. Students will learn to create computer based solutions to various real-world problems using C++ and will learn various concepts of object oriented approach towards problem solving.

UNIT-I (10 Hrs.)

1. Evolution of OOP

Procedure Oriented Programming, OOP Paradigm, Advantages and Disadvantages of OOP over its predecessor paradigms.

2. Characteristics of OOP

Abstraction, Encapsulation, Data hiding, Inheritance, Polymorphism, Code Extensibility and Reusability, User defined Data Types.

3. Introduction to C++

Identifier, Keywords, Constants

4. Operators

Arithmetic, Relational, Logical, Conditional, Assignment, Sizeof operator, Operator precedence and Associativity.

Type conversion, Variable declaration, Expressions, Statements, Manipulators, Input and Output statements, Stream I/O, Conditional and Iterative statements, Breaking control statements.

UNIT-II (12 Hrs.)

5. Storage Classes

Automatic, Static, Extern, Register.

6. Arrays

Arrays as Character Strings, Structures, Unions, Enumerations and User defined types.

7. Pointers

Pointer Operations, Pointer Arithmetic, Pointers and Arrays.

8. Functions

Prototyping, Definition and Call, Scope Rules, Parameter Passing: by value, by address and by reference, Functions returning references, Const functions, Recursion, Function Overloading, Default Arguments, Const arguments.

9. Classes

Class Declaration and Class Definition, defining member functions, making functions inline, Nesting of member functions, Members access control, this pointer.

10. Objects

Object as function arguments, Array of objects, Functions returning objects, Const member functions, Static data members, Static member functions, Friend functions and Friend classes.

UNIT-III (12 Hrs.)

11. Constructors

Properties, Types of constructors (Default, Parameterized and Copy), Dynamic constructors, Multiple constructors in classes.

12. Destructors

Properties, Virtual destructors, Destroying objects, Rules for constructors and destructors. Array of objects, Dynamic memory allocation using new and delete operators, Nested and container classes.

13. Inheritance

Defining derived classes, Inheriting private members, Single inheritance, Types of derivation, Function redefining, Constructors in derived class.

14. Types of Inheritance

Single, Multiple, Multilevel and Hybrid.

15. Types of Base classes

Direct, Indirect, Virtual, Abstract, Code Reusability.

UNIT-IV (11 Hrs.)

16. Polymorphism

Methods of achieving polymorphic behavior.

17. Operator Overloading

Overloading binary operator, overloading unary operators, Rules for Operator Overloading, Operator Overloading using friend function, Function Overloading: Early binding, Polymorphism with pointers, Virtual functions, Late binding, Pure virtual functions and Abstract base class.

18. Files and Streams

Classes for file stream operations, Opening and Closing of files, Stream state member functions, Binary file operations, Structures and file operations, Classes and File operations, I/O with multiple objects, Error handling, Sequential and Random access file processing.

Recommended Books

1. E. Balagurusamy, 'Object Oriented Programming with C++', 14th Edn., Tata McGraw-Hill, 2008.
2. Robert Lafore, 'Object Oriented Programming in C++', 4th Edn., Galgotia Publications, 2001.
3. D. Ravichandran, 'Programming in C', 1st Edn., New Age International, 1996, reprint 2011.
4. Herbert Schildt, 'C++: The Complete Reference', 4th Edn., Tata McGraw-Hill, 2003.
5. Stanley B. Lippman, Josee Lajoie, 'C++ Primer', 5th Edn., Pearson Education, 2011.
6. Deital and Deitel, 'C++ How to Program', 7th Edn., Pearson Education, 2010.

COMPUTER ORGANIZATION AND ARCHITECTURE

Subject Code: BCAP1-207

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. To make students aware about the basic building blocks of computer system and how the different components are interfaced together.
2. Students will come to know about the basic functioning of various parts of computer system from hardware point of view and interfacing of various peripheral devices used with the system.

UNIT-I (11 Hrs.)

1. Introduction to Computer Organization

Introduction to Computer and CPU (Computer Organization, Design and Architecture), Stored Program Concept - Von Neumann Architecture, Introduction to Flynn's Classification-SISD, SIMD, MIMD.

2. Register Transfer

Introduction to Registers, Register Transfer Language, Data movement among Registers and Memory.

3. Micro operations

Introduction to micro operations, Types of micro operations - Logic Operations, Shift operations, Arithmetic and Shift operations.

4. Common Bus System

Introduction to Common Bus System, Types of Buses (Data Bus, Control Bus, Address Bus), 16-bit Common Bus System, Data Movement among registers using Bus.

UNIT-II (10 Hrs.)

5. Basic Computer Instructions

Introduction to Instruction, Types of Instructions, Instruction Cycle, Instruction Formats (Direct, Indirect, Zero, One, Two and Three-Address Instructions).

6. Interrupt

Introduction to Interrupt and Interrupt Cycle.

7. Design of Control Unit

Introduction to Control Unit, Types of Control Unit.

8. Addressing Modes

Introduction & different types of Addressing Modes

UNIT-III (12 Hrs.)

9. I/O Organization

I/O Interface Unit, Types of ports (I/O port, Network Port, USB port, Serial and Parallel Port), Concept of I/O bus, Isolated I/O versus Memory-Mapped I/O.

10. I/O Data Transfer Techniques

Programmed I/O, Interrupt Initiated I/O, DMA Controller and IOP.

11. Synchronous and Asynchronous Data Transfer

Concept of strobe and handshaking, Source and Destination initiated data transfer.

UNIT-IV (12 Hrs.)

12. Stack Organization

Memory Stack and Register Stack.

13. Memory organization

Memory Hierarchy, Main Memory (RAM and ROM chips, Logical and Physical Addresses, Memory Address Map, Memory Connection to CPU), Associative Memory.

14. Cache Memory

Cache Memory (Initialization of Cache Memory, writing data into Cache, Locality of Reference, Hit Ratio), Replacement Algorithms (LRU and FIFO).

15. Cache Memory Mapping Techniques

Direct Mapping, Associative Mapping and Set-Associative Mapping, Harvard Architecture, Mobile Devices Architecture (Android, Symbian and Windows Lite), Layered Approach Architecture.

Recommended Books

1. M. Morris Mano, 'Computer System Architecture', 3rd Edn., Pearson, 1993.
2. William Stallings, 'Computer Organization and Architecture', 9th Edn., Pearson, 2013.
3. P.V.S. Rao, 'Computer System Architecture', 1st Edn., PHI, 2008.

INTERNET AND ITS APPLICATIONS

Subject Code: BCAP1-208

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. This subject covers computer concepts and internet skills.
2. It also uses a software suite which includes Emails, Internet Protocols, Search Engine, Introduction of Intranet and Extranet.

UNIT-I (10 Hrs.)

1. Introduction

Internet and its working, Business use of Internet, Services offered by Internet, Evaluation of Internet, Internet Service Provider (ISP), Windows environment for dial up networking (connecting to Internet), Audio on Internet, Internet Addressing (DNS) and IP addresses).

UNIT-II (11 Hrs.)

2. E-Mail

Introduction, Advantage and Disadvantage, Structure of an e-mail message, working of e-mail (sending and receiving messages), Managing e-mail (creating new folder, deleting messages, forwarding messages, filtering messages), Implementation of Outlook Express.

3. Internet Protocol

Introduction, File transfer protocol (FTP), Gopher, Telnet, other protocols like HTTP and TCP/IP.

UNIT-III (12 Hrs.)

4. WWW

Introduction, Working of WWW, Web browsing (opening, viewing, saving, printing a web page and bookmark), Web designing using HTML, DHTML with programming techniques.

UNIT-IV (12 Hrs.)

5. Search Engine

About search engine, Component of search engine, working of search engine, Difference between search engine and web directory.

6. Intranet and Extranet

Introduction, Application of Intranet, Business value of Intranet, working of Intranet, Role of Extranet, working of Extranet, Difference between Intranet and Extranet.

Recommended Books

1. Keith Sutherland, 'Understanding the Internet', 1st Edn., Butterworth Heinemann, 2000.
2. S. K. Bansal, 'Internet and Web Designing', 1st Edn., APH Publishing Corporation, 2013.
3. Behrouz A. Forouzan, 'Data Communications and Networking', 4th Edn., Tata McGraw Hill, 2006.

4. Paul, "Multicasting on the Internet and Its Applications", 1st Edn., Springer, eBook, 1998.

MULTIMEDIA AND APPLICATIONS

Subject Code: BCAP1-209

**L T P C
3 0 0 3**

Duration: 30 Hrs.

Course Objectives and Expected Outcomes

1. This Course introduces the multimedia systems and their applications to students.
2. This course covers the different compression standards used in multimedia, some current technology and related issues.

UNIT-I (10 Hrs.)

1. Introduction

Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia.

2. Multimedia Technology

Multimedia Systems Technology, Multimedia Hardware devices, Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, Multimedia Software for different media.

UNIT-II (06 Hrs.)

3. Storage Media

Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers.

UNIT-III (08 Hrs.)

4. Audio

Basics of Digital Audio, Application of Digital Audio, Digitization of Sound, Sample Rates and Bit Size, Typical Audio Formats, Introduction to MIDI (Musical Instrument Digital Interface), Components of a MIDI System, Hardware Aspects of MIDI, MIDI Messages.

UNIT-IV (06 Hrs.)

5. Image and Graphics Compression

Color in Images, Types of Color Models, Graphic/Image File Formats: TIFF, RIFF, BMP, PNG, PDF, Graphic/Image Data, and JPEG Compression, GIF Compression.

Recommended Books

1. Ralf Steinmetz and Klara Nahrstedt, 'Multimedia Computing Communications and Applications', 3rd Edn., Pearson Educations, 2012.
2. Parag Havaldar, Gerard Medioni, "Multimedia Systems: Algorithms, Standards and Industry Practices", 1st Edn., Cengage Learning, 2009.
3. John F. Koegel Buford, 'Multimedia Systems', 1st Edn., Pearson Educations, 1994.
4. Jeffcoate, 'Multimedia in Practice', 1st Edn., Prentice Hall, 1995.

**OBJECT ORIENTED PROGRAMMING USING C ++ LAB
(SOFTWARE LAB – III)**

Subject Code: BCAP1-210

**L T P C
0 0 4 2**

Duration: 20 Hrs.

Implement the following concepts in C++ Programming:

1. **Arrays:** Definition, declaration, scope, functions
2. **Structures:** Definition, declaration, scope, functions
3. **Union:** Definition, declaration, scope, functions

4. **Class:** Definition, declaration, members, scope of members.
5. **Class Function:** Definition (Inside class, Outside class), Inline functions, Static function, Friend functions, Scope of functions (public, private), and Nesting of member functions.
6. **Class Data members:** Creating objects, accessing member functions, Array of objects, Objects as arguments (pass by value, pass by reference)
7. **Constructor and destructor:** Creating default constructor, Parameterized constructor, Copy constructor, Destructor.
8. **Inheritance:** Base class, Derived class, Visibility mode (public, private, protected), Single Inheritance, Multi-level Inheritance, Multiple Inheritance, Nesting of classes, Access control to functions (with different scope), Function Overloading and Overriding, Operator Overloading.
9. **Polymorphism:** Early binding, Late binding, Virtual functions, Pure virtual functions.
10. **Input/Output Files:** Streams, Buffers and I/O-streams, various input-output functions, processing files using class functions.

**INTERNET AND ITS APPLICATIONS LAB
(SOFTWARE LAB – IV)**

Subject Code: BCAP1-211

**L T P C
0 0 4 2**

Duration: 20 Hrs.

Implement the following concepts in Lab:

Introduction: Internet, Use of Internet

E-Mail: Structure of an e-mail message, working of e-mail (sending and receiving messages), Managing e-mail (creating new folder, deleting messages, forwarding messages, filtering messages), Implementation of Outlook Express.

Internet Protocol: File transfer protocol (FTP), Gopher, Telnet, HTTP, TCP/IP.

WWW: Working of WWW, Web browsing (opening, viewing, saving, printing a web page and bookmark), Web designing using HTML, DHTML with programming techniques.

Search Engine: Working of Search Engine.

Intranet and Extranet: Working of Intranet, Working of Extranet.

FUNDAMENTALS OF MATHEMATICS

Subject Code: BMAT0-204

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives and Expected Outcomes

1. This syllabus is specially designed to help the students to understand the mathematical concepts like matrices, differential calculus and integral calculus which have applications in various subjects of Computer Applications.
2. Also Statistics has been added to help them understand the topics like central tendency, deviations, and moments etc. which are very useful in many computer applications.
3. After learning these topics, students will be able to apply these concepts in designing the software applications for some specific devices.

UNIT-I (11 Hrs.)

1. MATRIX ALGEBRA

Matrices, types of matrices, operations on matrices, determinants, inverse of a matrix, Elementary transformations, Rank of a matrix, solution of simultaneous linear equations using Cramer's rule and matrix inversion method.

Consistency of linear equations by Rank Method.

UNIT-II (10 Hrs.)

2. STATISTICS

Introduction to statistics, measures of central tendency - Mean, Median and Mode, measures of dispersion, mean deviation, standard deviation and coefficient of Variation, correlation and regression analysis. Definition of probability, Addition and Multiplication Laws. Simple problems.

UNIT-III (12 Hrs.)

3. DIFFERENTIAL CALCULUS

Introduction to differentiation, Differentiation of standard functions including trigonometric functions. Differentiation by method of substitution, maxima and minima.

UNIT-IV (12 Hrs.)

4. INTEGRAL CALCULUS

Indefinite Integral, Integration by substitution, Integration by parts, Integration by partial Fractions, Definite Integral. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules, Simpson's 3/8 rule.

Recommended Books

1. D.C. Sancheti and V.K. Kapoor, 'Business Mathematics', 11th Edn., Sultan Chand & Sons, 2015.
2. B.S. Grewal, 'Higher Engineering Mathematics', 43rd Edn., Khanna Publishers, 2014.
3. B.S. Grewal, 'Numerical Methods in Engineering & Science', 10th Edn., Khanna Publishers, 2010.
4. Rajaraman, 'Computer Oriented Numerical Methods', 3rd Edn., PHI Publications, 2013.

DATA STRUCTURES

Subject Code: BCAP1-312

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes

1. Understanding of data structures, its objectives, times and space complexity.
2. Understanding of various linear data structure, like linked list, stacks, queues and their implementation.
3. Understanding of non-linear data structures, trees and its implementation.
4. Implementation of various searching and sorting algorithms.

UNIT-I (10 Hrs.)

Basic concepts and notations - Types of data structures, Data structure operations, Problem Analysis, Algorithmic complexity, Big O notation, Time and space trade off.

Arrays - Linear array, representation of array in memory, Two-dimensional array, row major and column major orders, Traversal of Arrays, Insertion and Deletion from Array, Linear search, Binary search, Sorting of Arrays, sparse matrix.

UNIT-II (11 Hrs.)

Linked list - Representation of linked list using static and dynamic data structures, insertion and deletion of a node from linked list, searching in link list, searching in sorted link list.

UNIT-III (12 Hrs.)

Stacks - Representation of stacks in memory (linked and sequential), operations on stacks, Applications of stacks.

Queues - Representation of queues in memory (linked and sequential), operations on queues, Applications of Queues.

UNIT – IV (12 Hrs.)

Trees - Definition and basic concepts, linked representation and representation in contiguous storage, binary tree, binary tree traversal, Binary search tree, searching, insertion and deletion in binary search tree. Searching and sorting algorithms: Linear and binary search, bubble sort, insertion sort, selection sort, quick sort, merge sort.

Recommended Books

1. Shubhnandan Jamwal, 'Programming in C', 1st Edn., Pearson, 2014.
2. E. Balagurusamy, 'Programming in ANSI C', 3rd Edn., Tata McGraw Hill, 2002.
3. Brian Kernighan and Dennis Ritchie, 'C Programming Language', 2nd Edn., PHI, 1990.
4. 3rd Edn., Byron Gottfried, 'Programming with C', Tata McGraw Hill, 2002.

PROGRAMMING IN JAVA

Subject Code: BCAP1-313

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes

1. Understand the concept of OOPs as well as the purpose and usage principles of Inheritance, polymorphism, encapsulation etc.
2. Understand JVM Concept, Data types and Operators, Strings.
3. Understand the basic concepts of classes and objects.

UNIT-I (11 Hrs.)

Basics of Java - History, Object Oriented Concepts: Object, Object oriented programming, Abstraction, Encapsulation, Inheritance, Polymorphism Security and portability, Byte Code, Java Virtual Machine, Basic Constructs: Data types, Variables, Array, Operators, Control Statements, Looping Statements.

UNIT-II (12 Hrs.)

Introduction to Classes - Classes, Declaring Objects, Methods in a Class, Constructors, Inner and Outer class, Access Control: Public, Private and Protected, static, this, super, final keywords.

UNIT-III (11 Hrs.)

Interfaces & Packages - Interfaces and Implementing Multiple Inheritance through Interfaces, Packages, Multithreaded Programming, Synchronization, Exception Handling.

UNIT-IV (11 Hrs.)

Applet and Graphics Programming - Introduction to Interface, Packages, Exception Handling, Multithreaded Programming, Applets, Event Handling.

Recommended Books

1. E. Balagurusamy, 'Programming with Java', 5th Edn., Tata McGraw Hill, 2014.
2. Herbert Schildt, 'Java: The Complete Reference', 9th Edn., Tata McGraw Hill, 2014.
3. Cay Horstmann, 'Computing Concepts with Java 2 Essentials', 2nd Edn., Wiley, 2006.
4. Matha Mahesh P, 'Core Java: A Comprehensive Study', 1st Edn., PHI, 2011.

DISCRETE STRUCTURES

Subject Code: BCAP1-314

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

Mathematical Logic - Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, predicates, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theory Proving.

UNIT-II (11 Hrs.)

Set Theory - Properties of binary Relations, equivalence, compatibility and partial ordering relations, Hasse diagram, Functions, Inverse functions, Composition of functions, Recursive functions, Lattice and its properties.

UNIT-III (12 Hrs.)

Graph Theory - Definition, Representation, path Matrix Warshalls. Algorithm, MINIMA Algorithm, Isomorphism, sub graphs, connected components, cyclic graph, Bipartite graph, Planar graph, Euler's formula, Euler circuit, Hamiltonian Graph, Chromatic number, Trees, Spanning tree of a Graph, Breadth – First & Depth – First Spanning trees, Binary Tree, Conversion of a tree to binary tree. Tree traversals, Representation of Expressions by Binary tree, Forest, Binary search trees.

UNIT-IV (11 Hrs.)

Combinatorics & Recurrence Relations - Disjunctive & Sequential counting, Combinations & Permutations, Enumeration without repetition Recurrence relation, Fibonacci relation, solving recurrence relation by substitution, solving non-linear recurrence relation by conversion to linear recurrence relation.

Recommended Books

1. J.P. Trembly, P. Manohar, 'Discrete Mathematical Structures with Applications to Computer Science', McGraw-Hill, 1st Edn., 2001.
2. J.L. Mott, A. Kandel, T.P. Baker, 'Discrete Maths for Computer Scientists & Mathematicians', Prentice Hall, 2nd Edn., 1986.

**DATA STRUCTURES BASED ON BCAP1-312
(SOFTWARE LAB – V)**

Subject Code: BCAP1-315 **L T P C**
0 0 4 2

This laboratory course will comprise the exercises to supplement that is learnt under the paper Data Structures (BCAP1-312).

**PROGRAMMING IN JAVA BASED ON BCAP1-313
(SOFTWARE LAB – VI)**

Subject Code: BCAP1-316 **L T P C**
0 0 4 2

This laboratory course will comprise the exercises to supplement that is learnt under the paper Programming in Java (BCAP1-313).

TECHNICAL ENGLISH

Subject Code: BHUM0-106 **L T P C** **Duration: 45 Hrs.**
2 1 0 3

INTRODUCTION TO MICROPROCESSORS

Subject Code: BCAP1-356 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

Learning Outcomes

1. Recognize the Concepts of Microprocessor.
2. Discuss 8085 Assembly Language Programming, Programming model of 8085.

3. Demonstrate the use of Instruction Set, Instruction Word Size and Data Formats.
4. Understanding of functional Block Diagram and Pin Description, Bus Structure.

UNIT-I (10 Hrs.)

Basic Concepts- Microcomputer Structure and Operation, Organization of a Microprocessor-based System, Instruction Set and Computer Languages, 8085 Assembly Language Programming, Programming model of 8085, Instruction Set, Instruction word size and data formats.

UNIT-II (12 Hrs.)

Assembly Language- Assembly Language Programming, Data Transfer, Arithmetic and Logical Instructions, branching Instructions

Functional Block Diagram: Pin description, Bus Structure. De-multiplexing the Bus, Generating Memory Control Signals.

UNIT-III (12 Hrs.)

Operations 8085 - Microprocessor-initiated Operations, Internal Data Operations, Externally-initiated Operations

Memory and I/O Devices- Introduction to Memory devices, I/O devices, Logic Devices for Interfacing, Interfacing Memory with 8085.

UNIT – IV (12 Hrs.)

I/O Interfacing- Interfacing I/O Devices: Peripheral-I/O instructions and I/O Execution, IN/OUT Instructions and Timing Diagrams, Device Selection and Data Transfer. Interfacing Output displays & Input devices

Advance Microprocessors- Introduction to 8086, 80386 and 80486.

Recommended Books

1. Douglas V Hall, 'Microprocessors and Interfacing', 2nd Edn., Tata McGraw Hill, 2013.
2. Ramesh Goankar, 'Microprocessor Architecture, Programming and Applications with 8085', 5th Edn., PHI, 1999.
3. A.K. Ray and K.M. Bhurchandi, 'Advanced Microprocessors and Peripherals', 3rd Edn., Tata Mcgraw Hill, 2013.
4. Barry B. Brey, 'The Intel Microprocessors', 7th Edn., Pearson, 2006.

EMBEDDED SYSTEM

Subject Code: BCAP1-357

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. Describe the differences between the general computing systems and the embedded system, also recognize the classification of embedded systems.
2. Become aware of the recent trends in embedded systems design and embedded software design issues.
3. Design real time embedded system using the PIC microcontroller 16F877A.
4. Analyze various examples of embedded systems based on PIC Microcontroller 16F877A.
5. Understand the different applications of embedded system.

UNIT-I (12 Hrs.)

Introduction to Embedded Systems - Overview of embedded systems, features, requirements and applications of embedded systems, recent trends in the embedded system design, common architectures for the ES design, embedded software design issues, introduction to development and testing tools.

UNIT-II (11 Hrs.)

Embedded System Architecture - Basics of 8-bit and 16-bit Low Pin Count PIC microcontrollers, Pin Diagram, Architecture, memory organization, Special Function Registers, GPIO, Timer Comparator and A/D Convertor, Bus Architecture, data operations, addressing modes, timers and counters.

UNIT-III (11 Hrs.)

Assembly language programming - Memory-Mapped I/O, Interrupt handling, PIC16F877A Instruction Set, Assembler Directives, Programming of PIC Microcontrollers

UNIT-IV (11 Hrs.)

Applications of Embedded Systems - Industrial and control applications, networking and telecom applications, Digital Signal Processing and multimedia applications, Applications in the area of consumer appliances.

Recommended Books:

1. Steve Heath, 'Embedded Systems Design', 2nd Edn., Newnes, **2002**.
2. Jane W.S. Liu, 'Real-Time Systems', 1st Edn., Prentice Hall, **2000**.
3. John B. Peatman, 'Design with PIC Microcontrollers', 2nd Edn., Pearson Education, **1998**.
4. Pearson Education, 1997 PIC 12F629/675 Manual.

OPERATING SYSTEM

Subject Code: BCAP1-417

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. Outline the basics of operating systems and its working.
2. Analyze the core components of operating systems including memory management, networks, processor management, system security etc.
3. Illustrate the device management, systems management and file management.

UNIT-I (10 Hrs.)

Introduction: Computer-System Architecture, Operating-System Structure, Operating-System Operations, Types of Operating Systems, System Structures: Operating System Services, System Calls, Types of System Calls.

UNIT-II (12 Hrs.)

Processes: Process Concept, Process Scheduling, Operation on Processes, Interprocess Communication, Multithreaded Programming, Threading Issues, Process Scheduling, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Round Robin, Priority), Thread Scheduling, Multiprocessor Scheduling, Process Synchronization: Background, The Critical – Section Problem, Semaphores, Classical Problems of Synchronization, Deadlocks:, Deadlock Characterization, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-III (12 Hrs.)

Memory Management Strategies – Swapping, Contiguous Memory Allocation, Paging, Segmentation, Demand Paging, Page Replacement, Memory Mapped Files, Thrashing.

UNIT-IV (11 Hrs.)

Protection and Security – Security Problems, Program Threats, System and Network Threats, User Authentication, Firewalls to Protect Systems, Computer Security Classification, Case Study of Linux and Windows XP.

Recommended Books

1. Silberschatz, Galvin and Gagne, 'Operating System Concepts', 9th Edn., Wiley, **2015**.

MRSPTU BCA SYLLABUS 2016 BATCH ONWARDS

2. Mukesh Singhal and Niranjan Shivaratri, 'Advanced Concepts in Operating Systems', 1st Edn., Tata McGraw Hill, 2001.
3. Achyut Godbole and Atul Kahate, 'Operating Systems', 3rd Edn., Tata McGraw Hill, 2010.
4. Dhananjay Dhamdhare, 'Operating Systems a Concept Based Approach', 3rd Edn., Tata McGraw Hill, 2012.

ANDROID APPLICATION DEVELOPMENT

Subject Code: BCAP1-418

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Introduction to Android - Installing Android Studio, Layouts, Views and Resources, Scrolling Views, Working with TextView Elements.

Activities and Intents - Create and Start Activities, Lifecycle and State Callbacks, Testing and Debugging, and Backwards Compatibility: Debugging and Testing app, Support libraries.

UNIT-II (9 Hrs.)

User Interaction and Navigation - User Input Controls: Use Keyboards, Input Controls, Alerts, and Pickers, Menus and Radio Buttons, Screen Navigation.

Themes and Styles: Theme, Custom Styles, Drawables.

UNIT-III (13 Hrs)

Connect to the Internet -Google APIs Explorer, JSON, Use AsyncTaskLoader, Triggering, Scheduling, and Optimizing, Background Tasks: Alarm Manager.

UNIT- IV (11 Hrs)

Data Saving, Retrieving, Loading - Storing Data using SQLite, Sharing Data: Implement a Content Provider, Loading Data using Loaders, Publishing app: Permissions and Libraries, Making and publishing APKs.

1. Jeff Mcwherter, Scott Gowell, 'Professional Mobile Application Development', 1st Edn., Wrox Publisher, 2012.
2. Lauren Darcy and Shane Conder 'Teach Yourself Android Application Development in 24 Hrs', 1st Edn., Sams Publications, 2009.
3. Himanshu Dwivedi, Chris Clark, David Thiel, 'Mobile Application Security', 1st Edn., Tata McGraw Hill, 2010.

DATABASE MANAGEMENT SYSTEM

Subject Code: BCAP1-419

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. Describe fundamental elements of DBMS.
2. Explain the basic concepts of data models and database language SQL.
3. Design E-R diagram to represent simple database applications scenarios.
4. Criticize a database and improve the design by normalization.

UNIT-I (11 Hrs.)

Introduction: DBMS: Characteristics, Advantages of DBMS, Database Architecture, Conceptual, Physical and Logical database models, Role of DBA, Keys: super key, candidate key, primary key.

UNIT-II (11 Hrs.)

Relational data Model and Languages: Relational data Model Concepts, Tuple domain Calculus. Generalization and Specialization, Aggregation, Extended ER diagrams

UNIT-III (12 Hrs.)

Functional Dependencies: First Normal Form, Pitfalls in Relational-Database Design, Decomposition, Desirable properties of Decomposition, Normal Forms: Second, Third, BCNF, Fourth and Fifth normal forms.

UNIT-IV (11 Hrs.)

MySQL - Operators in MySQL, Retrieving, Updating, Inserting, Deleting, Sorting and Filtering User Data, Advanced Filtering, Grouping Data, Using Subqueries, Joining Tables, Using Views, Using Cursors, Using Transactions.

Recommended Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', 6th Edn., Tata McGraw Hill, 2010.
2. Ramez Elmasri and Shamkant B. Navathe, 'Fundamentals of Database Systems', 6th Edn., Pearson, 2010.
3. Ivan Bayross, 'SQL, PL/SQL the Programming Language of Oracle', 2nd Edn., BPB Publications, 2003.

SOFTWARE LAB-VII (ANDROID APPLICATION DEVELOPMENT BASED ON BCAP1-418)

Subject Code: BCAP1-420

L T P C
0 0 4 2

This laboratory course will comprise of exercises to supplement that is learnt under paper BCAP1-418.

SOFTWARE LAB-VIII (DATABASE MANAGEMENT SYSTEMS BASED ON BCAP1-419)

Subject Code: BCAP1-421

L T P C
0 0 4 2

This laboratory course will comprise as exercises to supplement that is learnt under paper BCAP1-419.

SOFTWARE ENGINEERING

Subject Code: BCAP1-458

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. Basic Software Engineering Methods and Practices.
2. A general understanding of software process models and software requirements, SRS document and software architectural styles.
3. An understanding of basic software testing techniques like approaches such as unit black-box testing, white-box testing and unit testing.

UNIT-I (12 Hrs.)

Introduction - Software Crisis, software Myths, Software Processes & Characteristics, Software Life Cycle Models: Waterfall, Prototype, Evolutionary, Spiral and Agile Models (Scrum, XP)

UNIT-II (11 Hrs.)

Software Requirements analysis & specifications - Requirement Engineering, Requirements Analysis using DFD (with case studies), Data Dictionaries, Requirements Documentation, Nature of SRS, Characteristics & Organization of SRS.

UNIT-III (11 Hrs.)

Software Testing - Testing Process, White Box Testing: Basis Path, Control Structure, Black Box Testing: Graph Based Testing Models, Equivalence Partitioning Functional, Unit Testing, Integration Testing and System Testing

UNIT-IV (11 Hrs.)

Software Maintenance - Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management.

Recommended Books

1. K.K. Aggarwal & Yogesh Singh, 'Software Engineering', New Age International, 2nd Edn., **2005**.
2. Rajib Mall, 'Fundamental of Software Engineering', 3rd Edn., PHI, **2009**.
3. I. Sommerville, 'Software Engineering', 9th Edn., Pearson, **2010**.
4. R.S. Pressman, 'Software Engineering – A Practitioner's Approach', McGraw Hill, 5th Edn., **2001**.

SOFT COMPUTING

Subject Code: BCAP1-459

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes

1. To know about the basics of soft computing techniques and also their use in some real life situations.
2. To learn the key aspects of computing.
3. To understand the features of neural network and its applications.

UNIT-I (10 Hrs.)

Introduction - Soft Computing, Introduction to fuzzy sets and fuzzy logic systems, Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving.

UNIT-II (13 Hrs.)

Artificial Neural Networks - Different artificial neural network models, Learning in artificial neural networks, Neural network applications in control systems, Neural Nets and applications of Neural Network.

Machine Learning - Learning Form Examples - Inductive Concept Learning - Sequence Prediction - Effect of Noise in Input.

UNIT-III (11 Hrs.)

Fuzzy Systems - Fuzzy sets, Fuzzy reasoning, Fuzzy inference systems, Fuzzy control, Fuzzy clustering, Applications of fuzzy systems, Neuro-fuzzy systems, Neuro-fuzzy modeling, Neuro-fuzzy control.

UNIT-IV (11 Hrs.)

Preambles - Pattern Recognitions, Image Processing, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Recommended Books

1. S. Rajasekaran and G.A. Vijaylakshmi Pai, 'Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications', 1st Edn., Prentice Hall India, **2007**.

2. J.S.R. Jang, C.T. Sun and E. Mizutani, 'Neuro-Fuzzy and Soft Computing', 1st Edn., Pearson Education, **2015**.
3. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 3rd Edn., Wiley, **2011**.

LINUX ADMINISTRATION

Subject Code: BCAP1-522

**L T P C
3 1 0 4**

Duration: 45 Hrs.

PROGRAMMING IN ASP.Net

Subject Code: BCAP1-523

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. Set up a programming environment for ASP.net programs.
2. Configure an asp.net application.
3. Creating ASP.Net applications using standard .net control
4. Develop a data driven web application.

UNIT-I (11 Hrs.)

Introduction - ASP.Net Introduction-The .Net framework, The .Net Languages, CLR, Types, Objects and Namespaces, Settings for ASP.Net and IIS.

UNIT-II (12 Hrs.)

Developing ASP.Net Application - Developing ASP.Net Application - Asp.Net Application, Differences Between Web based and Windows Based Application, Web Form fundamentals, Web Controls, Working With Events – Rich Web Controls – Custom Web Controls.

UNIT-III (10 Hrs.)

Form Validation - Form Validation: Client Side Validation, Server Side Validation, Validation Controls: Required Field Comparison Range. Calendar Control, Ad rotator Control, Internet Explorer Control. State Management - View State, Session State, Application State.

UNIT-IV (12 Hrs.)

Architecture of ADO.NET - Architecture of ADO.NET, Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class, DataAdapter Class, Dataset Class. Display data on Data Bound Controls and Data Grid. Database Accessing on Web Applications: Data Binding Concept with Web, Creating Data Grid, Binding Standard Web Server Controls. Display Data on Web Form using Data Bound Controls.

Recommended Books:

1. Mridula Parihar, Essam Ahmed, Jim Chandler, Bill Hatfield, Rick Lissan, Peter MacIntyre, Dave Wanta 'ASP .NET Bible', Wiley-Dreamtech India Pvt. Ltd, 2nd Edn., **2002**.
2. Andrew Troelsen, 'C# and the .Net Platform', Apress, Special Edn., 2001 (Unit I and II)
3. David S. Platt, 'Introducing.Net', 3rd Edn., Microsoft Press, **2003**.
4. Alex Homer et. al. 'Professional ASP .NET 1.1', 2nd Edn., Wiley-Dreamtech India Pvt. Ltd., **2005**.

COMPUTER NETWORKS

Subject Code: BCAP1-524

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. Understanding network models.
2. Understand different network technologies.
3. Be familiar with various hardware components.

UNIT-I (11 Hrs.)

Basic Concepts - Components of Data Communication, Distributed Processing, Topology, Transmission Mode, and Categories of Networks. OSI and TCP/IP Models: Layers and their Functions, Comparison of Models.

UNIT-II (11 Hrs.)

Transmission Media - Guided and unguided, Attenuation, Data Link Control Protocols, Flow Control, Error Control, Overview of Synchronous and Asynchronous Protocols.

UNIT-III (12 Hrs.)

Devices - Repeaters, Bridges, Gateways, Routers, Network Layer, Design Issues, Network Layer Addressing and Routing Concepts (Forwarding Function, Filtering Function), Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing).

UNIT-IV (11 Hrs.)

Multiplexing, Error Detection and Correction - Many to One, One to Many, WDM, TDM, FDM, Circuit Switching, Packet Switching and Message Switching.

Recommended Books:

1. Andrew S. Tanenbaum, 'Computer Networks', 4th Edn., Prentice Hall, 2007.
2. Behrouz A. Forouzan, 'Data Communication and Networking', 4th Edn., Tata McGraw Hill, 2006.
3. Douglas E. Comer, 'Internetworking with TCP/IP Principles, Protocols and Architecture', 4th Edn., PHI, 2013.
4. William Stallings, 'Cryptography and Network Security', 3rd Edn., Pearson, 2002.

SOFTWARE LAB-IX (LINUX ADMINISTRATION BASED ON BCAP1-522)

Subject Code: BCAP1-525

**L T P C
0 0 4 2**

This laboratory course will comprise as exercises to supplement that is learnt under paper BCAP1-522.

SOFTWARE LAB-X (PROGRAMMING IN ASP.NET BASED ON BCAP1-523)

Subject Code: BCAP1-526

**L T P C
0 0 4 2**

This laboratory course will comprise as exercises to supplement that is learnt under paper BCAP1-523.

NETWORK SECURITY

Subject Code: BCAP1-560

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. Understand Security Concepts, Ethics in Network Security.
2. Understand Security Threats, and the Security Services and Mechanisms to counter them.
3. Comprehend and apply Authentication Services and Mechanisms.

UNIT-I (11 Hrs.)

Basic Concepts - Introduction: Attack, Services and Mechanism, Model for Internetwork Security. Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

UNIT-II (11 Hrs.)

IP Security Architecture - Overview, Authentication Header, Encapsulating Security Payload combining Security Associations, Key Management. Web Security: Requirement, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

UNIT-III (12 Hrs.)

Network Management Security - Overview of SNMP Architecture-SMMPV1 Communication Facility, SNMPV3.

UNIT-IV (11 Hrs.)

System Security - Intruders, Viruses and Related Threats, Firewall Design Principles. Comprehensive Examples using available Software Platforms/case tools, Configuration Management.

Recommended Books

1. W. Stallings, Networks Security Essentials: Application & Standards, Pearson Education, 2nd Edn., 2000.
2. W. Stallings, Cryptography and Network Security, Principles and Practice, Pearson Education, 3rd Edition, 2000.
3. John E. Canavan, 'The Fundamentals of Network Security', Artech House, 2nd Edition, 2001.

ARTIFICIAL INTELLIGENCE

Subject Code: BCAP1-561

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. Understand different types of AI Agents.
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
3. Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.

UNIT-I (12 Hrs.)

Basic Concepts - Introduction to AI, Importance of AI, AI Techniques, Criteria for Success, Problem Space and Search, Production System and its Characteristics, Issues in the Design of the Search Problem.

UNIT-II (12 Hrs.)

Heuristic Search Techniques: Hill Climbing, Best First Search Technique: OR Graph, A*, Problem Reduction: AND-OR Graph, AO*, Constraint Satisfaction.

UNIT–III (11 Hrs.)

Knowledge Representation - Definition and Importance of Knowledge, Knowledge Representation, Various Approaches used in Knowledge Representation, Issues in Knowledge Representation.

UNIT–IV (10 Hrs.)

Expert System - Introduction, Architecture, Types of Experts System, representing using Domain Specific Knowledge, Expert System Shells, LISP and other AI Programming Language.

Recommended Books

1. E. Rich and K. Knight, 'Artificial intelligence', 2nd Edn., McGraw Hill, 1999.
2. David W. Rolston 'Principles of Artificial Intelligence and Expert System Development', 2nd Edn., McGraw Hill, 2003.
3. D.W. Patterson, 'Introduction to AI and Expert Systems', 1st Edn., PHI, 1999.
4. Nils J. Nilsson, 'Artificial Intelligence -A New Synthesis', 2nd Edn., Harcourt Asia Ltd, 2000.

COMPUTER GRAPHICS

Subject Code: BCAP1-627

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.

UNIT–I (12 Hrs.)

Basic Concepts - Graphics Primitives, Introduction to Computer Graphics, Application Areas of Computer Graphics, Overview of Graphics Systems, Video-display Devices, and Raster-Scan Systems, Random Scan Systems, Graphics Monitors and Workstations and Input Devices.

UNIT–II (11 Hrs.)

Output Primitives - Points and Lines, Line Drawing Algorithms: Direct Use of Line Equation, DDA, Bresenham Mid-Point Circle and Ellipse Algorithms.

UNIT– III (10 Hrs.)

Filled Area Primitives: Scan Line Polygon Fill Algorithm, Boundary Fill and Flood Fill Algorithms.

Geometrical Transforms - Translation, Scaling, Rotation, Reflection and Shear Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transforms Transformations Between Coordinate Systems.

UNIT–IV (12 Hrs.)

2-D Viewing - The Viewing Pipeline, Viewing Coordinate Reference Frame, window to Viewport Coordinate Transformation, Viewing Functions, Cohen-Sutherland Line Clipping Algorithms, Sutherland –Hodgeman Polygon Clipping Algorithm.

Recommended Books

1. Donald Hearn and M. Pauline Baker, 'Computer Graphics', 2nd Edn., PHI Publications, 2004.

MRSPTU BCA SYLLABUS 2016 BATCH ONWARDS

2. Plastock, 'Theory & Problem of Computer Graphics', Schaum Series, 2nd Edn., McGraw-Hill, 2011.
3. Foley & Van Dam, 'Fundamentals of Interactive Computer Graphics', 1st Edn., Addison-Wesley, 1982.

EMERGING TRENDS IN INFORMATION TECHNOLOGY

Subject Code: BCAP1-628

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. Recognize the concepts of emerging technologies.
2. Analyze the components of cloud computing.
3. Critically analyze case studies to derive the best practice model to apply when developing and deploying parallel, distributed, cloud and IoT based applications.

UNIT-I (10 Hrs.)

Introduction to Computing- Emerging Trends in Computing like Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, High Performance Computing.

UNIT-II (10 Hrs.)

Cloud Computing- Web 2.0 and the Cloud, Cloud Types, Uses of Cloud, Components of Cloud Computing - Software as a Service, Platform as a Service, Infrastructure as a Service.

UNIT-III (12 Hrs.)

Soft Computing- Soft Computing VS Hard Computing; Introduction to Neural Networks – Intelligence, Neurons, Artificial Neural Networks, Application Scope of Neural Network, Brain VS Computer.

UNIT-IV (12 Hrs.)

IoT architecture- Topologies, Edge Routers, Client-Server Architecture, P2P, M2M.

Recommended Books

1. Joshy Joseph, Craig Fellenstein, 'Grid Computing', 1st Edn., Prentice Hall Professional, 2004.
2. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms' 1st Edn., Wiley, 2011.
3. Tettamanzi, Andrea, Tomassini and Macro, 1st Edn., 'Soft Computing', Springer, 2001.
4. Rajkumar Buyaa, Vecchiola, Selvi, 'Mastering Cloud Computing', 1st Edn., McGraw Hill, 2013.
5. Arshdeep Bahga, Vijay Madiseti, 'Internet of Things (A Hands -on- Approach)', 1st Edn., VPT, 2014.

SEMINAR

Subject Code: BCAP1-629

L T P C
0 0 4 2

Presentation/Seminar based on Major Project.

SOFTWARE LAB-XI (COMPUTER GRAPHICS BASED ON BCAP1-626)

Subject Code: BCAP1-630

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BCAP1-626.

ENVIRONMENTAL SCIENCE

Subject Code: BESE0-101

L T P C

Duration: 48 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 (2 Hrs.)

Definition, scope and importance. Need for public awareness.

2. Natural Resources (Hrs.)

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-II

3. Ecosystems (8 Hrs.)

- (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 (6 Hrs.)

- (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 option values.
- (d) 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-III

5. Environmental Pollution (8Hrs.)

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 (8 Hrs.)

- (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 (7 Hrs.)

- (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 (6 Hrs.)

- (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.

BIG DATA

Subject Code: BCAP1-662

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (10 Hrs.)

Introduction to Big Data - Introduction – distributed file system – Big Data and Its Importance, Four Vs, Drivers for Big Data, Big Data Applications, Algorithms using Map Reduce, Clustering

UNIT-I (10 Hrs.)

Big Data Technology Landscape - Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses.

UNIT-I (10 Hrs.)

Big Data Analytics - Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Understanding Text Analytics and Big Data, Predictive analysis on Big Data.

UNIT-I (15 Hrs.)

Big Data Implementation - Big Data Workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a Business Scenario, Security and Governance for Big Data.

Recommended Books:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, 'Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses', 1st Edn., Wiley, 2013,
2. T. White, Hadoop, 'The Definitive Guide', 3rd Edn., O'Reilly Media, 2012.

CLOUD COMPUTING

Subject Code: BCAP1-663

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes

1. To understand the basic concepts cloud computing.
2. To understand the taxonomy and types of Cloud Computing.
3. To understand different hypervisors of clouds for the virtualization.

UNIT-I (10 Hrs.)

Cloud Computing - Vision of Cloud Computing, Definition, Deployment models, Reference models, Benefits and challenges to cloud computing, Characteristics of Clouds, Historical developments; Distributed Systems, Virtualization, Web 2.0, Service Oriented Computing, Utility oriented Computing, Building Cloud Computing Environments; Application development, Infrastructure and System development.

UNIT-II (10 Hrs.)

Virtualization - Introduction, Characteristics of Virtualized Environment; Increased Security, Managed Execution, Portability, Taxonomy of Virtualization techniques; Execution of Virtualization, Other types of Virtualization. Pros and Cons of Virtualization, Taxonomy of virtualization, XEN, QEMU, VMware, Hyper-V etc., Server Consolidation.

UNIT-III (13 Hrs.)

Data Centre - Classic Data Centre, Virtualized Data Centre (Compute, Storage, Networking and Application), Business Continuity in VDC.

Cloud Monitoring - Architecture for Federated Cloud Computing, Service Oriented Architecture, Foundation for SLA, Components of the SLA, Selected Business Use Cases.

UNIT-IV (12 Hrs.)

Advanced Topics in Cloud Computing - Energy efficiency in Clouds, Market-based Management of Clouds, Federated Clouds/InterCloud, Third-Party Cloud Services

Recommended Books:

1. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms', 1st Edn., Wiley, 2011.
2. David E.Y. Sarna, 'Implementing and Developing Cloud Computing Applications', 1st Edn., CRC, 2011.
3. Chris Wolf, Erick M. Halter, 'Virtualization: From the Desktop to the Enterprise', 1st Edn., A Press, 2005.
4. George Reese, 'Cloud Application Architectures: Building Applications and Infrastructure in the Cloud', 1st Edn., O'Reilly Publishers, 2009.

MRSPTU B.Sc. FASHION TECHNOLOGY SYLLABUS 2016 BATCH ONWARDS**Total Contact Hours = 29****Total Marks = 800****Total Credits = 19**

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2-101	Elements of Fashion	3	0	0	40	60	100	3
BFTE2-102	Communication and Soft Skills	3	0	0	40	60	100	3
BFTE2-103	Introduction to Textiles-1	3	0	0	40	60	100	3
BFTE2-104	Elements and Principles of Design-1 Lab	0	0	4	60	40	100	2
BFTE2-105	Pattern Making-1 Lab	0	0	4	60	40	100	2
BFTE2-106	Fundamentals of Computer Lab	0	0	4	60	40	100	2
BFTE2-107	Garment Construction-1 Lab	0	0	4	60	40	100	2
BFTE2-108	Basic Sketching-1 Lab	0	0	4	60	40	100	2
Total		9	0	20	420	380	800	19

Total Contact Hours = 31**Total Marks = 900****Total Credits = 23**

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2-209	Fashion Studies	3	0	0	40	60	100	3
BFTE2-210	Fashion and Apparel Design	3	0	0	40	60	100	3
BFTE2-211	Elements and Principles of Design	3	0	0	40	60	100	3
BFTE2-212	Textiles and Embroideries of India	3	0	0	40	60	100	3
BFTE2-213	Textile Studies – II	3	0	0	40	60	100	3
BFTE2-214	Pattern Making – Lab.	0	0	4	60	40	100	2
BFTE2-215	Garment Construction – Lab.	0	0	4	60	40	100	2
BFTE2-216	Computer Aided Designing – Lab.	0	0	4	60	40	100	2
BFTE2-217	Sketching – II Lab.	0	0	4	60	40	100	2
Total		15	0	16	440	460	900	23

MRSPTU B.Sc. FASHION TECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 30

Total Marks = 900

Total Credits = 24

SEMESTER 3 rd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2- 318	Apparel CAD & Grading	3	0	0	40	60	100	3
BFTE2-319	Garment Manufacturing Technology – I	3	0	0	40	60	100	3
BFTE2-320	Fabric Studies	3	0	0	40	60	100	3
BFTE2-321	Knitting and Knitted Garments	3	0	0	40	60	100	3
BFTE2-322	Fashion Studies	3	0	0	40	60	100	3
BFTE2-323	Garment Construction Lab –I	0	0	4	60	40	100	2
BFTE2-324	Pattern Making Lab. - I	0	0	4	60	40	100	2
BFTE2-325	Fabric Analysis Lab. - I	0	0	4	60	40	100	2
Department Electives - I		3	0	0	40	60	100	3
BFTE2-356	Home Textiles							
BFTE2-357	Surface Ornamentation Techniques							
BFTE2-358	Technical Textiles							
Total		18	0	12	420	480	900	24

Total Contact Hours = 30

Total Marks = 900

Total Credits = 24

SEMESTER 4 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2- 426	Apparel Marketing & Merchandising	3	0	0	40	60	100	3
BFTE2-427	Industrial Engineering	3	0	0	40	60	100	3
BFTE2-428	Testing & Quality Control in Apparel	3	0	0	40	60	100	3
BFTE2-429	Garment Manufacturing Technology - II	3	0	0	40	60	100	3
BFTE2-430	Textile and Garment Finishing - I	3	0	0	40	60	100	3
BFTE2-431	Garment Construction Lab. -II	0	0	4	60	40	100	2
BFTE2-432	Pattern Making Lab. - II	0	0	4	60	40	100	2
BFTE2-433	Textile Testing Lab.	0	0	4	60	40	100	2
Open Elective – I		3	0	0	60	40	100	3
Total		18	0	12	440	460	900	24

MRSPTU B.Sc. FASHION TECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 30

Total Marks = 900

Total Credits = 24

SEMESTER 5 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2- 534	Production Planning & Control	3	0	0	40	60	100	3
BFTE2-535	Costing and Retailing Management	3	0	0	40	60	100	3
BFTE2-536	Material Studies	3	0	0	40	60	100	3
BFTE2-537	Textile & Garment Finishing -II	3	0	0	40	60	100	3
BFTE2-538	Project & Seminar	3	0	0	40	60	100	3
BFTE2-539	Finishing Lab.	0	0	4	60	40	100	2
BFTE2-540	Pattern Making & Grading Lab.	0	0	4	60	40	100	2
BFTE2-541	Advance Apparel Construction Lab	0	0	4	60	40	100	2
Open Elective –II		3	0	0	40	60	100	3
Total		18	0	12	420	480	900	24

Total Contact Hours = 26

Total Marks = 300

Total Credits = 21

SEMESTER 6 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE2- 642	Plant Layout & Facility Design	3	0	0	40	60	100	3
BFTE2-643	Apparel Technology Management	3	0	0	40	60	100	3
BFTE2-644	Project	-	-	20	60	40	100	15
Total		6	0	20	140	160	300	21

ELEMENTS OF FASHION

Subject Code: BFTE2-101

**L T P C
3 0 0 3**

Duration: 29 Hrs.

UNIT-I (9 Hrs.)

General Definition of Fashion, Types of Fashion and Basic Terms, Fashion Cycle, Haute Couture, Street Fashion, Fashion Forecasting: Steps in Developing a Forecast, Concepts of season, Fairs and International Markets. Study of Great International Designers and Domestic Designers.

UNIT-II (9 Hrs.)

The awareness of the various aspects of colour will enhance the application of colour in design. Colour Theory: Colour Wheel, Monochromatic, Achromatic, Analogue, Complimentary, Split Complimentary and Tint, Tone, Shades. Textures –an introduction to the basic materials, creating textures using all, art media like pencils, crayons, pastels, paints etc.

UNIT-III (11 Hrs.)

Elements of Designs: Line, Shape, Texture, Colour, Value. Principles of Design: Unity, Emphasis, Proportion, Rhythm, Balance. Theme Board and Mood Board

Recommended Books

1. Marvin Bartel, 'Composition and Design'.
2. Richard Sager, 'Fundamentals of Fashion Design'.
3. Manmeet Sodhia, 'Fashion Studies'.
4. Manmeet Sodhia, 'Fashion Illustration'.

COMMUNICATION & SOFT SKILLS

Subject Code: BFTE2-102

**L T P C
3 0 0 3**

Duration: 29 Hrs.

UNIT-I (5 Hrs.)

Communication, Definition, Introduction and Process of Communication, Objective of Communication.

UNIT-II (12 Hrs.)

Parts of Speech: Noun, Pronoun, Verb, Adverb, Adjective, Preposition, Articles and Conjunction.

Tenses (in detail), Voice (Active, Passive), Narration (Direct, Indirect), Antonyms, Synonyms, Homonyms, Prefix, Suffix.

UNIT-III (12 Hrs.)

- Letters and
- Job Applications,
- Creative Writing,
- Comprehension.

Recommended Books

1. Abhishek Arora, 'Business Communication'.
2. T. Singh., 'Communication Skill Part-1'.

INTRODUCTION TO TEXTILES

Subject Code: BFTE2-103

**L T P C
3 0 0 3**

Duration: 29 Hrs.

UNIT-I (6 Hrs.)

Textile Industry: Introduction and History. Fiber Properties and its Classification. Different methods of fiber identification: Physical Examination, Burning Test, Chemical Test.

UNIT-II (15 Hrs.)

Flow Chart from fiber to fabric. Properties of natural fiber (Vegetable and Animal) i.e. Cotton, Flex, Wool, Silk, Jute. Properties of synthetic fiber i.e. Polyester, Nylon, Acrylic, Rayon, Spandex, Polyolefin. Yarn classification, Yarn spinning, Yarn numbering system.

UNIT-III (8 Hrs.)

1. Basics of weaving
2. Basic weaves
3. Introduction to Non-Woven fabrics
4. Common fabric names
5. Care Labelling

Industrial Visit in Spinning Mill.

Recommended Books

1. K.V.P. Singh, 'Introduction to Textiles', Kalyani Publishers.
2. Bernard P. Corbman, 'Textiles-Fiber to Fabric', McGraw Hill.
3. Jannet Wilson, 'Classic and Modern Fabrics'.
4. Bradley Quinn, 'Textile Future Fashion Design and Technology'.

ELEMENTS & PRINCIPLES OF DESIGN-1 LAB.

Subject Code: BFTE2-104

**L T P C
0 0 4 2**

1. Colour wheel: primary, secondary and tertiary colour scheme.
2. Principles of design and its importance in designing: Harmony, emphasis, proportion, balance, rhythm and contrast.
3. Elements of basic design: Line, Form, Composition, colour, texture etc.
4. Theory of Colour: warm, cool, hot, cold, light, dark pale and bright.
5. Basic colour schemes: analogues, complimentary, monochromatic, neutral etc.
6. Study of Positive and Negative- Grey scale.
7. Colour composition
8. 3D Forms
9. Sketch any five designs of garment use element and principles of design.

PATTERN MAKING-1 LAB.

Subject Code: BFTE2-105

**L T P C
0 0 4 2**

1. Method of taking measurements: - Tools and basic principles of taking measurements
2. Basic principles of flat pattern making: -Equipment and knowledge to use this equipment
3. Drafting of child bodies block and sleeve
4. Drafting of adult bodies block and sleeve
5. Developing patterns for the following: -

Basic Sleeve Block and Sleeve Variations:

- a) Puff sleeves - with gathers at the sleeve cap and round arm, gathers only at the sleeve cap and gathers at the round arm; Bishop sleeve
- b) Shirt sleeve
- c) Petal sleeve
- d) Flared sleeve sleeve
- e) Leg'O'mutton sleeve
- f) Tulip sleeve
- g) Lantern sleeve
- h) Cap sleeve

Collars and its Variations: - Flat and rolled collars, Peter Pan, Cape, Sailors, Puritan, Stand and fall, Mandarin, shawl collar.

FUNDAMENTALS OF COMPUTER LAB.

Subject Code: BFTE2-106

**L T P C
0 0 4 2**

1. **Definition of Computer:** Data, Instruction and information, Characteristics of Computer, Various Field of Application of Computer, Block Structure of computer, Advantages and Limitations of computer, Classification of Computer. Data Representation: Different number system (decimal, binary, octal and hexa decimal), Input and Output Devices.
2. **What is Software:** System software, Application Software (Corel Draw, Adobe Photoshop), Compiler and Interpreter. Computer Memory: Primary and Secondary Memory. Storage Media.
3. **Introduction to MS-Word:** Introduction to word processing and its features, formatting documents, paragraph formatting, indents, page formatting, header & footer, Bullets & Numbering, Tabs, Tables, Formatting the Tables, Finding and Replacing the Text etc.
4. **Introduction to MS-Power Point:** PowerPoint, Features of MS PowerPoint Clipping, Slide Animation, Slide Shows, Formatting etc.
5. **Introduction to MS-Excel:** Introduction to Electronic Spreadsheets, Feature of MS Excel, Entering Data, Entering Series, Editing Data, Cell Referencing, ranges, Formulae, Functions, Auto Sum, Copying Formula, Formatting Data, Creating Charts, Creating Database, Sorting Data, Filtering etc.
6. **Introduction of Internet:** Advantages and Limitations. E-Mail, WWW, Websites, Protocols, TCP/IP, FTP, TELNET.

GARMENT CONSTRUCTION-1 LAB.

Subject Code: BFTE2-107

**L T P C
0 0 4 2**

1. Tools and equipment used in garment clothing construction.
2. Sewing machine: parts, working and maintenance of sewing machine, its threading' bobbin winding.
3. Introduction to sewing thread, needles and their relationship with the fabric.
4. Common problems of sewing and its remedies.
5. Fabric preparation and basic rules for cutting of fabric. Definition and understanding of hand stitching techniques: Running Basting: uneven/even/diagonal
6. Hemming - Plain, blind, slip.
7. Backstitch, tailor's tack, button hole, overcasting.

8. Seams and seam finishes: Definition, their usage and b/pes: Plain, flat fell' lap' French, piped, corded, Eased, taped, bound (over locked).
9. Fullness techniques/shaping devices: dart, tucks, pleats, gathers, ruffles, shing, smocking
10. Application of buttons and buttonholes, hooks and eyes, snap fasteners.
11. Application of lace and binding.
12. Create a project to using these applications mentioned above.

BASIC SKETCHING-1 LAB.

Subject Code: BFTE2-108

**L T P C
0 0 4 2**

1. Introduction to Basic Sketching.
2. Introduction to Model Drawing.
3. Introduction to Prospective Drawing, Still life, Scribbling Drawing.
4. Textures in Pencil rendering and shading.
5. Silhouette/Shapes: - Basic types of Shapes.
6. Fashion Figures: - Difference between normal and fashion figures.
7. Drawing the Eight head (8")/Stick figure/Block figure/Slash figure: - (Male and Female)
8. Quick sketching: - create sketch without eraser in 3-5 minutes.
9. Using only Black and White Media.

FASHION STUDIES

Subject Code: BFTE2-209

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: The main objective of this course is to make the student understand the intricacy and importance of Fashion.

Discussion on the course structure.

UNIT-1

Definition of Fashion.

- a) Motives for consumer buying-practical and aesthetic.
- b) Clothes vs fashion.
- c) Inspirational sources of fashion (relating them to elements of fashion)

UNIT-II

- a) Color-color wheel, dimensions of color, color naming and psychological association of colors.
- b) Fabric, texture and line (relating them to principles of design) Interplan of elements of design (relating it to anthropometrics)

UNIT-III

Silhouettes-

- a) Necklines, collars and sleeves
- b) Variations of skirts, dresses and trousers.
- c) Variations of coats and jackets
- d) Detailing- pleats, tucks, darts, yokes and godets.
- e) Detailing – hemlines, edgings, pockets and fastenings.

UNIT-IV

Fashion cycle-

- a) Concept of haute couture, Ready to wear and street fashion.
- b) Indian designers

c) Trimmings and accessories.

FASHION AND APPAREL DESIGN

Subject Code: BFTE2-210

**L T P C
3 0 0 3**

Duration: 37 Hrs.

UNIT-I (8 Hrs.)

1. Fashion Forecasting – Concept of seasons, fairs and international markets.
2. International designers

UNIT-II (10 Hrs.)

1. Brand Analysis – Fashion & Textile Accessories.
2. Fashion Criticism

UNIT-III (11 Hrs.)

1. Psychology of colour and its application in apparel market.
2. Introduction of texture (prepare file too).
3. Texture: its types and application on clothing.

UNIT-IV (8 Hrs.)

1. Wardrobe planning
2. Process of Design development for formal, casual, executive, party and sportswear for male and female

Field visit to understand the available fabric and trims leading to class presentations.

ELEMENTS AND PRINCIPLES OF DESIGN

Subject Code: BFTE2-211

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objective: Students are provided with an understanding of mood boards and importance of presenting creative design for the fashion industry through good layouts. Integration of computer inputs into art is encouraged. Principles of line planning (developing a collection)

UNIT-I (9 Hrs.)

1. To develop Mood boards with special emphasis on relating the foreground to the background layout and composition cut and paste techniques and hand crafting techniques. (minimum 5)

UNIT-II (10 Hrs.)

1. Application of elements and principles of design to develop a range of garments on paper keeping in view the inspiration and mood /profile of the client.5 sets

UNIT-III (9 Hrs.)

1. Introduction to making of specification sheet of basic garments like blouses, shirts, T-shirts, Pants, Jacket.
2. Demographics and psychographics of customer profile.

UNIT-IV (10 Hrs.)

Exercise in visually assessing and relating fashion illustration to specs. For the above developed 5 sets.

TEXTILES AND EMBROIDERIES OF INDIA

Subject Code: BFTE2-212

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To Study Different traditional textiles originated in various regions of India keeping in view the Socio cultural background, Techniques / material, Colour / motifs / Evolution or changes over time/Present scenario/Contemporary usage

UNIT-I (9 Hrs.)

Woven Textiles

1. Carpets
2. Shawls
3. Sarees - Chanderi, Maheshwari, Kanjeevaram, Paithani, etc.
4. Brocades

UNIT-II (10 Hrs.)

Embroidered Textiles

1. Kantha
2. Phulkari
3. Chikankari
4. Kasuti
5. Kashida
6. Embroidery of Gujrat & Rajasthan.

UNIT-III (10 Hrs.)

Resist Dyed Textiles

1. Bandhani
2. Ikat
3. Patola

UNIT-IV (9 Hrs.)

Printed and Painted Textiles

1. Block printed textiles from Gujarat
2. Block printed textiles from Rajasthan
3. Ajrakh
4. Kalamkari

TEXTILE STUDIES-II

Subject Code: BFTE1-213

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To introduce the students to the basics of dyeing and printing

UNIT-I (9 Hrs.)

1. Fibers:
2. Introduction, classification, properties and end uses of natural and man-made fibers,
3. Yarns: Introduction. Types-ply yarns, novelty yarn, textured yarn.

UNIT- II (10 Hrs.)

1. Manufacturing process-
2. Spinning, weaving, knitting and non-woven
3. Properties-yarn twist, yarn numbering.
 - a) Introduction to fabric
 - b) Characteristics and classification of impurities
 - c) Introduction to the preparatory processes of dyeing for cotton – Singeing, desizing, scouring, bleaching, mercerization.

UNIT-III (9 Hrs.)

- a) Definition of color, dyes, pigment
- b) Classification of dyes
- c) Application of dyes on textiles
- d) Stages of dyeing – Fiber, yarn, fabric and garment

UNIT-IV (10 Hrs.)

- a) Methods of printing
- b) Environmental Concerns
- c) Field trip to a dyeing & printing unit will be taken.

Recommended Books

- 1. Joseph J. Puzzuto, 'Fabric Science'.
- 2. V.A. Shenai, 'Technology of Dyeing, Printing and Bleaching'.

PATTERN MAKING LAB.

Subject Code: BFTE1-214

**L T P C
0 0 4 2**

Duration: 39 Hrs.

Course Objectives: The main objective of this subject is to make the students understand the basic of pattern making involved in any exercise or assignment undertaken during the course. This is the very basis of the core specialization that they will ultimately learn through the semesters. To develop skill in the area pattern making with special emphasis on basics of garments design.

UNIT-I (10 Hrs.)

- a) Drafting and pattern making terminology.
- b) Principles of pattern cutting.
- c) Balanced line terms.
- d) Symbol key, notches and punches.

UNIT-II (10 Hrs.)

- a) Childs bodice block (5year in inches).
- b) Slash method: collar – Peter pan (one-two piece), Cape, fall collar, Chinese, rippled, cowl,
- c) Sleeves:- (puff, flared, Ruffle, shirred, bell, bishop, umbrella, lantern),
- d) Skirt (hip rider, cascade/partial circles, gored, pegged, wrap around, handkerchief, shirred, slashed, pleated).

UNIT-III (10 Hrs.)

Drafting and pattern making, layout of

- a) Trouser or Nicker
- b) Jump suit.

UNIT-IV (9 Hrs.)

Drafting and pattern making, layout of

- a) A-line frock, casual frock, Yolk, princess and empire lines.
- b) Drafting of apron

Recommended Books

- a) Manmeet Sodhia, 'Drafting and pattern making', Kalyani Publishers.
- b) Helen Joseph-Armstrong, 'Pattern making for Fashion Design,' 4th Edn.

GARMENT CONSTRUCTION- LAB.

Subject Code: BFTE1-215

**L T P C
0 0 4 2**

Duration: 38 Hrs.

Course Objectives: To understand and appreciate different hand and machine sewing techniques and obtain fabricating skills for the same.

UNIT-I (9 Hrs.)

Understanding of Basic Techniques Practically like

- a) Basting: uneven/even/diagonal running stitch.
- b) Hemming: plain, blind, slip.
- c) Marking.
- d) Padding.
- e) Button hole.

UNIT-II (9 Hrs.)

A) Definition and understanding of basic seams practically Plain/ Flat Fell/ Lap/ French and False French/ Bound/ Bias/ Corded/ Piped/ Eased/ Princess/ Taped.

UNIT-III (10 Hrs.)

POCKET MAKING AND APPLICATION

1. Patch pockets- different types
 - a) Unlined patch pockets
 - b) Lined patch pockets
 - c) Patch pockets with flap
2. Patch pocket with self-flap **INSIDE POCKETS**
 - a) Reinforcing in-seam pockets
 - b) Fabricating bound pockets
 - c) Welt pocket with flap

UNIT-IV (10 Hrs.)

FASTENERS

1. Inserting a zip fastener:
 - a) Centred standard
 - b) A lapped standard zip
 - c) Concealed zip
 - d) Open end zip
2. **BUTTONS-** Types attaching
 - a) Hook and eye
 - b) Press-studs
 - c) Touch and close

COMPUTER AIDED DESIGNING LAB.

Subject Code: BFTE1-216

**L T P C
0 0 4 2**

Duration: 38 Hrs.

Course Objectives: The main objective of this subject is to make the students understand the basic of Computer Application various tools of software. Photo shop & Corel draw to design collection.

UNIT-I (10 Hrs.)

Knowing and understanding the use of all the design tools of Corel Draw **to develop** Fashion Details

- a) Collars
- b) Sleeves

c) Cuff

UNIT-II (10 Hrs.)

Knowing and understanding the use of all the design tools of Corel Draw **to develop** Fashion Details

- a) Necklines
- b) Pockets
- c) Plackets

UNIT-III (8 Hrs.)

- a) Skirts
- b) Trouser
- c) Ties & Bows

UNIT-IV (10 Hrs.)

- a) Block Figure
- b) Flesh Figure

Recommended Books

Corel draw Users' guide/Manual accompanying the software.
Corel draw for dummies

SKETCHING-I LAB.

Subject Code: BFTE1-217

L T P C
0 0 4 2

Duration: 40 Hrs.

Course Objectives: The objective of the course is to increase the proficiency in drawing skills and to inculcate creative ability in the application of these acquired skills to translate as ideas for design. Also, to make the students understand the applications of different mediums to draw and colour and render such as pencils, colour pencils, water colours, crayons, etc.

UNIT-I (10 Hrs.)

Familiarity with the anatomy of the human body

Understanding of body proportion with special reference to:

- a) Anatomy b) Movement c) Posture d) Details of the Garments worn by the live model.

Understanding of the movement of the human body

UNIT-II (10 Hrs.)

a) Introduction to Female croqui for casual/formal wear both for the export as well as domestic market.

b) Development of children croqui for playwear/formalwear

UNIT-III (10 Hrs.)

a) Relative differences between normal and fashion figure

b) Rendering, shading & colouring the garments worn by the live model.

UNIT-IV (10 Hrs.)

1. Drawing the Garment:

- a) Understanding fabrics folds (flat sketching of tops, skirts, and trousers).
 - b) Laying down multiple washes.
 - c) Rendering texture of fabrics.
2. Costume anatomy (style lines)
3. Garment draping on fashion figure.

APPAREL CAD & GRADING

Subject Code: BFTE2-318

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To introduce CAD for Apparel and computer software related to pattern making, grading and marker planning.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT-I (9 Hrs.)

Fundamentals of CAD: Definition, History, Hardware and Software requirements of CAD, Design Process, Application, Use, Creating the manufacturing Data base and benefits of CAD. Hardware in CAD: Introduction, Design workstation, Graphics terminal, input and output devices, central processing unit and secondary storage.

UNIT-II (9 Hrs.)

Introduction to garment production software. Computerized Apparel Design: Introduction to “Basics of Computer Aided Design for Apparel. Usage of different drawing and measuring tools. Basic Block construction and digitization of patterns, Pattern making of different garments, e.g. skirts, jackets through assembly of lines, points, fold etc.

UNIT-III (11 Hrs.)

Introduction to Computer Graphics – What is Computer Graphics, Computer graphics applications, Computer Graphics Hardware and Software, two dimensional graphics primitives – Point and Lines, Line drawing algorithms, Introduction to Software Packages: Introduction to Auto-CAD: Features, Basic Drawing Techniques: Drawing Line, Circle, Rectangle, Arc, Polyline, Ellipse, Elliptical Arc, Polygons, Donuts, Corner rounding, Chamfering, Displacing, Duplicating, Removing Objects. Introduction to Corel Draw – Features and basic drawing techniques, Introduction to Photoshop – Features and basic drawing techniques.

UNIT-IV (9 Hrs.)

Introduction to Grading techniques, Application of grading system to basic blocks and adaptations, Computerized grading on Lectra and other software. Fundamentals & techniques for Grading with the use of size-charts etc., Grading of basic bodices by 2-track and 3-track method.

Recommended Books

1. Mikcle P. Groover, Emory W. Zimmers Jr., ‘Computer Aided Design & Manufacturing’.
2. James D. Foley, Andeies, ‘Computer Graphics Principles & Practices’.
3. Kitty G. Dickerson, ‘Inside the Fashion Business’, 7th Edn., Pearson Education, India.
4. G.S. Fringes, ‘Fashion from Concept to Consumer’, Pearson Education.
5. H.J. Armstrong, ‘Pattern-making for Fashion Design’, Pearson Publication.

GARMENT MANUFACTURING TECHNOLOGY-I

Subject Code: BFTE2-319

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To introduce various terms and techniques related to sewing of garment. Such as various sewing machine parts, sewing thread, seam and stitch formation, seam finishes, pucker, etc.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short

answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (10 Hrs.)

History of Sewing: stages and evolution of sewing and sewing machineries, requirement of stitches, contribution of stitch in fashion. Introduction to various Sewing machine parts, their functions and applications.

Needles: types of needles. Understanding the structure and specifications of sewing machine needles and their importance in sewing processes. Introduction to various parts of needle-shank, butt, shoulder, reinforced shoulder, blade, point (set, cut, ball), eye, groove, scarf.

Needle Sizing: needle numbers, singer and metric system. Needle size and its relation to fabric and sewing quality requirements

UNIT-II (10 Hrs.)

Seam Terminology: inside curved seam, outside curved seam, enclosed seam, exposed seam, extended seam allowances, intersecting seam.

Graphical description and representation of seams and its finishing, understanding of seam properties and their application in relation to different fabrics and apparels seams and the effect on performance, costs and quality in industrial sewing process.

UNIT-III (9 Hrs.)

Introduction: Classification and applications of different types of seams and stitches. Seam finishes: book seam finishes, net bound seam finish, self-bound seam finish, single ply bound seam finish, double stitched seam finish, pinked seam finish, etc.

Sewing threads: fibre types, and thread composition, thread finishes, thread sizing, thread package, thread cost, thread properties & seam performance.

UNIT-IV (9 Hrs.)

Machine stitches and their classification. Blind stitch, chain stitch, double needle machine stitch, hemistitch, lettuce edging, lock stitch zigzag machine stitch, over edge machine stitch, purl edging, picot edging, safety stitch, scallop over edge, shirring stitch, etc.

Sewing problems- problems of stitch formation, problem of pucker, problems of damaged to the fabric along stitch line, needle cutting index.

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 STUDIES

Subject Code: BFTE2-320

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To impart knowledge of fabric designing by understanding the concepts of fabric structure comprising basic weaves, their modification as well as decorative weaves, etc.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (10 Hrs.)

Woven Design Fundamentals: Classification of woven structures, Importance of fabric structure, Concept of fabric designing through fabric structure, methods of weave

representation, Basic elements of a woven design; Design, Drafting plan, Peg plan and Denting, Types of draft plans.

Plain Weaves: External characteristics, properties, uses, ornamentation, rib and cord effect. derivatives/modifications; warp rib, weft rib, hopsack, their classification, design, draft and peg-plan for all

UNIT-II (10 Hrs.)

Twill Weaves: External characteristics, properties, factors influencing prominence of twill weaves, influence of twist, classification; balanced and unbalanced: ordinary, zig-zag, herringbone, curved, broken, transposed, elongated, combination twills, design, draft and peg-plan for all weaves

UNIT-III (9 Hrs.)

Sateen and Satin Weaves: External characteristics, properties, uses, regular and irregular sateen, Cork screw weaves; warp faced, weft faced, uses, Diamond weave, Honey Comb weaves; ordinary and Brighton, characteristics and uses, Huck a back weaves; characteristics and uses, Crepe weaves; methods of constructions, characteristics and uses, Draft and Peg-plan for all decorative weave.

UNIT-IV (9 Hrs.)

Bed Ford Cords: Plain faced, twill faced, Mock Leno weaves; perforated fabrics, distorted thread effects, end uses, Welt and Pique Fabrics. Extra warp and weft figured fabrics, Introduction to Backed cloth, Terry pile fabrics and pile formation and velveteen.

Constructional particulars of various fabrics used for apparels.

Recommended Books

1. Navneet Kaur, 'Comdex Fashion Design; Fashion Concepts', Vol. I, Dreamtech Press, 2010.
2. N. Gokarneshan, 'Fabric Structure and Design', New Age Publishers.
3. Z.J. Groszicki, 'Watson Textile Design and Colour', Newnes Butterworth.
4. H. Nisbet, 'Grammar of Textile Design', D.B. Tarapore Wala Sons and Co.

KNITTING AND KNITTED GARMENT

Subject Code: BFTE2 – 321

L T P C

Duration: 37 Hrs.

3 0 0 3

Course Objectives: To impart knowledge of knitted fabrics, their properties, manufacturing techniques as well as ornamentation. To study Knitted garment technology, various types of methods of producing knitted garments, etc.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT-I (9 Hrs.)

Definition of knitting, comparison of knitting and weaving, Classification of knitting- warp and weft knitting. Classification of weft knitting machines. Difference between woven and knitted fabric properties., Characteristics of warp knit and weft knit structure. Fundamental Stitches: Knit, Tuck and float stitches and their uses. Ornamentation of knitted fabrics.

Concept of loop length, production calculation, fabric faults in knitting.

UNIT-II (10 Hrs.)

Weft knitting elements: knitting needles, sinkers, cam systems, etc. Knitting cycles of Latch, Beard and Compound Needles. Weft knitting elements: properties and uses of basic weft knitted structures- Plain, Rib, Interlock and Purl.

UNIT-III (9 Hrs.)

Warp Knitting: classification of warp knitting machine. Brief introduction of Raschal and Tricot machines. Characteristics of Raschal and Tricot structures and their uses. Calculations for Tightness factor, fabric cover, stitch density, areal density and knitting machine production. Characteristics of knitting yarns. Major Knitted fabric faults and their remedies.

UNIT-IV (9 Hrs.)

Introduction to Knitted Garments- types and flowchart including the steps of production. Fully Cut garments – Fully fashioned garments, Integral garments – hand and machine spreading, types of lays. Marking – manual and computerized marking Cutting devices as die-cutter. Hand shears, laser cutting, etc. Shaping of various garments, e.g., in body sleeve angles, etc., Cutting in case of cut stitch shaped garments.

Recommended Books

1. Azgaonkar. 'Knitting Technology', Universal Publishing Corporation, 1998.
2. Spencer, 'Knitting Technology', Pergamon Press.
3. H. Wignal, 'Hosiery Technology', Textile Book Service, 1968.
4. Irfan Ahmed Sheikh, 'Pocket Knitting Expert', Irfan Publisher.
5. Terry, 'Knitted Clothing Technology', Blackwell.
6. Brackenbury, 'Knitting Clothing Technology'.

FASHION STUDIES

Subject Code: BFTE2– 322

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To impart knowledge of fashion, dresses, sleeves, basic bodice, etc.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (9 Hrs.)

Definition of fashion, fashion terminology, fashion cycle, fad/classic, factors affecting fashion, Fashion adaptation theories, Major fashion centers of the world: Brief introduction to world fashion centers - American, European, Japanese. Consumer identification with fashion cycles- leaders, innovators, followers. Motives of consumer buying, fashion selection, brief introduction about roles/jobs in fashion / export houses.

UNIT-II (9 Hrs.)

Fashion information services, trend forecasting and auxiliary services. Forecasting trends: Purpose of forecasting trends, how to use forecasting service. Fashion promotion and communications- Trade fairs, Fashion shows.

Children's Wear: Size categories for children's wear. Selling seasons, Sources of inspiration for children's wear.

UNIT-II (11 Hrs.)

Women's Wear: Tops and Coats – different bodices, use of darts, ease gores and yokes to design tops, different types of sleeves and placket finishes, knit styling. Designing of some women's wear garments. Skirts – Basic skirt shapes and their variations, skirt lengths and waistband treatment. Dresses – Different dress categories like junior dresses, contemporary dresses, Missy dresses.

UNIT-IV (9 Hrs.)

Men's Wear: Historical development of menswear, menswear manufacturing plant, menswear designer. Sources of inspiration, constructional details in menswear. Designing of menswear.

Recommended Books

Sharon Lee Tate, 'Inside Fashion Design'.

Kitty G. Dickerson, 'Inside Fashion Business'.

GARMENT CONSTRUCTION LAB.-I

Subject Code: BFTE2 – 323

L T P C

0 0 4 2

Course Objectives: To familiarize students with basic tools, thread types, needle types and trims and components.

1. Introduction and application of different aids, tools & equipment for cutting.
2. Preparation of different types of pattern & pattern layout
3. Selection of different types of needles according to stitching components (Hand sewing & industrial Sewing)
4. Selection procedure of different types of sewing thread & embroidery thread.
5. Utility of different aids & tools for garment construction.
6. Basting operation.
7. Study of sewing machineries, Different tools & Work aids.
8. Application of different trims & components.
9. Study of fusing & pressing machine procedure.

NOTE: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

Recommended Books

1. H.C. Carr, 'The Clothing Factory', The Clothing Institute, London, 1972.
2. Jacob Solinger, 'Apparel Manufacturing Handbook', Van Nostrand Reinhold Company, 1980.
3. Irland, 'Encyclopedia of Fashion Details', Batsford

PATTERN MAKING LAB.-I

Subject Code: BFTE2-324

L T P C

0 0 4 2

Course Objectives: To familiarize students with basic tools, materials and drafting techniques.

1. Introduction to the tools and material used for drafting.
2. Drafting of child's basic and adults' bodice blocks.
3. Drafting of different commonly used sleeves as set-in, puff, raglan, flared, leg'o'mutton, etc.
4. Drafting of different collars as peter-pan, sailor, mandarin and shirt collars etc.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

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, M. Richard, 'Apparel Industry', 2nd Edn., Blackwell.
4. Chuter, 'Introduction to Clothing Production Management', Blackwell.
5. Armstrong, 'Pattern Making for Fashion Design', Dorling Kindersley Publication.

FABRIC ANALYSIS LAB.-I

Subject Code: BFTE2-325

L T P C

0 0 4 2

Course Objectives: To give hands on training to students in understanding the fabric formation on looms, the mechanism involved and as well as developing creativity in designing unique fabric structures along with fabric analysis.

1. To understand how woven fabric are manufactured on a loom
2. To understand process sequence for woven fabric manufacturing to study the objective and passage of material on cone winding machine
3. Line sketches of warping, sizing, drawing-in creating weave patterns by using colored pencil along with draft and peg plan
4. Description of important parts of a loom
5. General passage of material through loom
6. Basic loom mechanisms
7. Ways to distinguish warp & filling yarns
8. Weave analysis, count and weight calculations, cover factor
9. Use of strips of colored paper to produce different color and weave effects
10. Characterize a woven fabric with respect to its dimensional properties
 - a. Thread density
 - b. yarn count
 - c. Yarn crimp
 - d. thickness
 - e. cover factor
 - f. areal density
 - g. weave
 - h. skewness
11. Demonstration and practice of Weave software.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

Recommended Books

1. Navneet Kaur, 'Comdex Fashion Design; Fashion Concepts', Vol. I, Dreamtech Press, 2010.
2. N. Gokarneshan, 'Fabric Structure and Design', New Age Publishers.
3. Z.J. Groszicki, 'Watson Textile Design and Colour', Newnes Butterworth.
4. H. Nisbet, 'Grammar of Textile Design', D.B. Tarapore Wala Sons and Co.

HOME TEXTILES

Subject Code: BFTE1-356

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To impart knowledge on various Home textiles, their product range, properties, design aspects and applications, etc.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (10 Hrs.)

Introduction to Home textile and Home Fashion, Product Classifications; Widely used Home textile and Home fashion fabrics, Decorative fabrics; home textile fabrics, Soft floor coverings, designers,

Decorative weaves/Advanced fabric structures for Home Fashion; Jacquard weave, crepe weave, pile weave, Slack tension weave, Double weave fabrics,

UNIT-II (10 Hrs.)

Upholstery fabrics; their properties, standard performance specifications for woven upholstery fabrics, upholstery fabrics in use- application terms, upholstery fabric on furniture Flame resistance of upholstered fabrics, filling and padding of upholstered furniture, care and maintenance

UNIT-III (9 Hrs.)

Carpets; manufacturing methods, Woven Vs tufted carpet, types of carpet pile, carpet construction terms, fibres, yarns, dyeing, printing, and finishing for carpets, carpet underlay, carpet flammability, Traffic classification, carpet soiling, carpet maintenance, methods of cleaning, factor evaluating carpet quality,

UNIT-IV (9 Hrs.)

Window fabrics, how fibre properties, yarn and fabric construction, dyes and prints affect window fabrics, fabric finishing for window fabrics, Wall and Ceiling coverings, manufactured products, Bedding products; sheets, pillowcases, blankets, bedspread, quilts and comforters, mattresses, Textile Tabletop products and Hospitality Industry.

Recommended Books

1. Billie J. Collier, Martin Bide & Phyllis G. Tortora, 'Understanding Textiles', 7th Edn., Prentice Hall Publication Ltd, Cambridge, 2000.
2. Navneet Kaur, 'Comdex Fashion Design; Fashion Concepts', Vol. I, Dreamtech Press, 2010.
3. N. Gokarneshan, 'Fabric Structure and Design', New Age Publishers.
4. Z.J. Groszicki, 'Watson Textile Design and Colour', Newnes Butterworth.
5. Diamond Ellen and Diamond Jay, 'Fashion Apparel & Accessories and Home Furnishing', Pearsons Prentice Hall, NJ, 2007.

SURFACE ORNAMENTATION TECHNIQUES

Subject Code: BFTE1-357

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To familiarize students with traditional Indian embroideries. Illustration and application of various techniques and stitches in ornamentations of textiles or garments.

UNIT- 1

Surface ornamentation by beads, patch work, embroidery, etc. Introduction to embroidery. Various types of embroidery stitches such as stem stitch, chain stitch, herringbone stitch, cross stitch, etc.

UNIT- 2

Study of Indian traditional textiles and embroideries of different States with special reference to material, thread, colours, stitches, motifs and production processes used such as Chikankari and Brocades of UP. Phulkari of Punjab. Chamba Rumal of Himachal Pradesh.

UNIT- 3

Functional changes and value addition due to embroidery. Study of Indian traditional textiles and embroideries such as Kanthas, Baluchar and Jamdani of Bengal. Kashida, Shawls and Carpets of Kashmir, Ikat of Orissa. Patola, Bandhani, Sindh and Kutch of Gujrat.

UNIT- 4

Kalamkari and Pochampali of Andhra Pradesh. Kasuti of Karnataka.
Patch work, appliqué, quilting-introduction, tools material and techniques.
Advancements in embroidery techniques, new embroidery machines with advanced features.

Recommended Books:

1. Usha Shrikant, 'Ethnic Embroidery of India', Honesty Publications.
2. B.K. Behra, 'Traditional Textile Designs of India'.
3. Barnden Betty, 'Embroidery Basics', Barson's Educational Series Incorp.
4. Gillow, 'Traditional India Textile', Thames & Hudson, 1998.

TECHNICAL TEXTILES

Subject Code: BFTE1-358

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To give overview and brief knowledge on the advancement in technology and its tremendous impact in various spheres of life including electronics, sports, medical, defence by bringing functionality in apparels.

Unit 1

Functional garments; definition and different types, brief idea about properties and uses of speciality fibres like Nomex, Kevlar, Glass fibre and other fibres used in functional garments. Sportswear; Requirement, different fibres used, approaches for manufacture.

Breathable apparels; Introduction, principle, classification and use. Moisture management fabric.

Unit 2

Protective clothing; General requirement of protective clothing, chemical protective clothing (CPC) and their applications. Functional requirements of defence clothing.

Unit 3

Antimicrobial clothing, their importance and applications. Thermal protective clothing; combustion mechanism, fire governing parameters, requirements, construction, various parameters affecting flame retardency, performance evaluation.

Unit 4

Ballistic Protective clothing: Requirements, principle of mechanism, different fibres and fabrics, Medical Responsive Fabrics; Definition, requirements, fibres, classification, Smart Electronic clothing and requirements.

Recommended Books:

1. A.R. Horrocks and S.C. Anand, 'Handbook of Technical Textiles', Woodhead Publication Ltd, Cambridge, 2000.
2. Sarah. E. Braddock and Marie O "Mahony", 'Techno Textiles – Revolutionary Fabrics for Fashion & Design', Thames & Hudson.
3. Sabit Adanaur, 'Wellington Sears Handbook of Industrial Textiles', Technimic Publishing Company, Inc., Pennsylvania, U.S.A.
4. W. Fung, 'Coated and Laminated Textiles'.
5. W. Fung and J.M. Hardcastle, 'Textiles in Automotive Engineering'.
6. X.M. Tao, 'Smart Fibres, Fabrics and Clothing'.
7. R.A. Scott, 'Textiles for Protection'.
8. R. Shishoo, 'Textiles in Sport'.
9. X.M. Tao, 'Wearable Electronics and Photonics'.

APPAREL MARKETING & MERCHANDISING

Subject Code: BFTE2-426

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To impart knowledge about Apparel Marketing and Merchandising, domestic and export market and their procedures.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT-I (10 Hrs.)

Exploration of Fashion and Apparel Industry, Marketing and Careers within the industry, Core components, Primary markets, Producers of material, Secondary markets, Design and Production, Present scenario of Textile and Apparel industry in India. Fashion Marketing concept, Marketing environment.

UNIT-II (10 Hrs.)

Domestic Vs International Marketing, Challenges for International Marketing, International Marketing environment, Identifying foreign apparel markets, International marketing mix – PLC model, Pricing decision, Channels of distribution, Promotion mix in International context, Modes of entering foreign market for apparel exports, Merits and demerits of each method, Terms of payment

UNIT-III (9 Hrs.)

Exports- Export procedure and documentation, Export assistance – various schemes, sources of information, export promotion council etc., export finance,

UNIT-IV (9 Hrs.)

Export houses- working of export houses, categories- star trading export houses, etc. Outsourcing merchandising, visual merchandising, Business process off shoring/outsourcing. Concept of supply chain management, India's leading export houses, Trends in apparel industry, Foreign trade agreements related to the garment industry

Recommended Books

1. Varshney and Bhattacharya, 'International Marketing Management'.
2. Nabhi's Publication on Export Govt. Handbook
3. Onkvisit and Shaw, 'International Marketing'.
4. Cateora, 'International Marketing'.

INDUSTRIAL ENGINEERING

Subject Code: BFTE2-427

**L T P C
3 0 0 3**

Duration: 39 Hrs.

Course Objectives: To introduce various terms and techniques related to Industrial Engineering, work study, Method Study, etc.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (10 Hrs.)

Definition of Industrial Engineering. Various processes involved in Apparel Industry and the utility of Industrial Engineering. Machine productivity, Efficiency, SPM, SPI, etc.

UNIT-II (9 Hrs.)

Selection of proper work aids in garment machineries. Working of different work aids and their application in relation to different fabrics and apparels and the effect on the performance, costs and quality in industrial sewing process.

UNIT-III (10 Hrs.)

Classification and applications of different types of tools that are used in measuring work study, motion and method study. Machine lay out, material handling.

UNIT-IV (10 Hrs.)

Definition of Ergonomics. Problems of sewing workers, problems of damaged to the various parts of human being during working in Apparel Industry. Robotics and uses of robots in apparel industry.

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', Blackwell.
4. Chuter, 'Introduction to Clothing Production Management', Blackwell.

TESTING AND QUALITY CONTROL IN APPAREL

Subject Code: BFTE2-428

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To impart knowledge, importance and methods of Testing relevant to fibres, yarn, fabrics and apparel with brief description of relevant equipment, etc.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit

Objective: To impart knowledge, importance and methods of testing relevant to fibres, yarn and Fabrics with brief description of relevant equipment.

UNIT-I (9 Hrs.)

Introduction to testing and its importance, Standard atmospheric conditions for testing and its effect on test results. Testing of yarn strength, elongation, twist, evenness and hairiness. Fabric dimensions' measurement – length, width, thickness, weight/area, thread/length, and crimp.

UNIT-II (10 Hrs.)

Tensile strength and elongation: Definition of different units, tensile strength and elongation, work of rupture, tearing strength, bursting strength. Serviceability: Snagging test, Pilling test, Abrasion resistance.

UNIT-III (10 Hrs.)

Comfort: Water vapor repellency, Wicking properties, Air permeability, Thermal insulation and wettability. Fabric handle: Bending length, Crease recovery, Drape, Low stress mechanical properties. FAST, Kawabatta Evaluation System.

UNIT- IV (9 Hrs.)

Garment Testing: Dimensions, Seam strength, Seam slippage, Adhesion between interlining and fabric, shrinkage, zippers, buttons, snap fasteners and other general garment properties. Needle Cutting/Yarn severance.

Recommended Books

1. B.P. Saville, 'Physical Testing of Textiles', Woodhead Publishing Ltd, Cambridge, 2002.
2. V.K. Kothari, 'Testing and Quality Management', Ed. V.K. Kothari, IAFL Publications,
3. J.E. Booth, 'Principles of Textile Testing', CBS Publishers and Distributors, New Delhi.
4. Gopalakrishnan Angappan P. & R. Komarapalayam, 'Textile Testing', SSM Institute of Textile Technology, 2002.
5. Irfan Ahmed Sheikh, 'Pocket Textile Testing & Quality Expert', Irfan Publisher.
6. V.K. Mehta, 'Apparel Quality Control'.

GARMENT MANUFACTURING TECHNOLOGY - II

Subject Code: BFTE2-429

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To impart knowledge of garment manufacturing Technology, latest developments.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (9 Hrs.)

Overview of the Garment Manufacturing processes, Introduction to the latest advancements in the Garment manufacturing processes. Fabric cutting Process: Pre-requisites for the fabric cutting. Tools and equipment needed for the cutting process. Advancements in the fabric cutting technology.

UNIT-II (10 Hrs.)

Garment assembly processes: Basics of sewing, Functional parts of sewing machines (SNLS): Feed mechanisms, Run-in-ratio, Effect of sewing process on the sewing thread strength. Principle, mechanism and utility of following machines: Interlock machine, overlock machine, Double needle Lock stitch and chain stitch sewing machines, Bar- tacking machine, feed off the arm, Button attaching and buttonhole making machine and computerized embroidery machines.

UNIT-III (10 Hrs.)

Study of sewing needle temperature: Factors affecting and remedial measures, Methods for the needle temperature measurement. Study of the measurement of the sewing forces and pressure during sewing. Study of the measurement techniques of the sewing thread tension on the sewing machine:

SNLS and overlock machines. Applications of Programmable logic circuits (PLC) in the Garment manufacturing processes.

Robotics: Basic analogy, its applications, scope and limitations in the Garment Industry.

UNIT-IV (9 Hrs.)

Pressing and Fusing process and equipment. Handling of garments between different processes in the apparel industry.

Recommended Books

1. Brackenburry, 'Knitted Clothing Technology'.
2. Barbara Latham, 'The Technology of Clothing Manufacture Harold Carr'.
3. Gerry Cooklin, 'Introduction to Clothing Manufacture'.
4. Jacob Solinger, 'Apparel Production'.
5. M.G. Mahadevan, 'Robotics & Automation in the Textile Industry'.
6. Ann Giocello & Berle, 'Fashion Production Terms Debbie'.

TEXTILE AND GARMENT FINISHING-I

Subject Code: BFTE2-430

**L T P C
3 0 0 3**

Duration: 39 Hrs.

Course Objectives: To introduced fundamentals of printing, various methods and styles of printing and their applications. Emphasis is given on applications of printing procedure instead of detail chemistry of dyes and printing auxiliaries.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (10 Hrs.)

Introduction of printing. Evolution in textile printing. Different methods of printing such as block, roller and screen printing. Construction and working mechanism, drawback and advantage of each method. Design making and screen exposing - Table, Flat-bed, Rotary screen.

UNIT-II (9 Hrs.)

Transfer Printing: Types, mechanism of transfer in each type and machineries.

Print Paste: Constituent and characteristics of print paste, classification and mechanism and working of thickeners.

UNIT-III (10 Hrs.)

Printing Styles: Direct, discharge and resist styles of printing on textiles. Brief concept of printing of cellulose with direct, reactive and vat dyes; proteinous with acid dyes and synthetic textiles with disperse dye.

UNIT-IV (10 Hrs.)

Printing with Pigments: Fundamental concept, chemistry and procedure of pigment printing. Advantage and disadvantages of pigment printing.

Printing after Treatments: Importance of steaming, curing, ageing of prints. Mechanism of each process. Special effects like – Batik, Tie and dye, crimp style, etc.

Advancement in printing technology and applications ie. Ink Jet Printing.

Recommended Books

1. V.A. Shenai, 'Technology of Printing', Sevak Pub. Mumbai.
2. Clarke, 'An Introduction to Textile Printing', CBS Pub Delhi.
3. R.B. Chavan, 'Textile Printing', Second annual Symposium.
4. Leslie W.C. Mile, 'Textile Printing', Amer Assn of Textile, 2003.

GARMENT CONSTRUCTION LAB.-II

Subject Code: BFTE2-431

L T P C

0 0 4 2

Course Objectives: To give hand on training on apparel construction and their techniques. Illustration for the techniques of draping to get the fault free draped pattern. Practice of draping of basic bodice to the dress-form. Variations in bodices as per the designing details. Draping of basic skirt and hence skirt variations.

Fundamentals & techniques for Grading with the use of size-charts etc Grading of basic bodices by 2-track and 3-track method,

Different operational stitches of a garment. Line balancing system. Standard allowed minute calculation. Lay out setting procedure. Practice of pattern making and construction of ladies and kids wears. Analysis of different garments-beach wear, swim wear, leisure wear, night wear, etc. and construction few of them as per suitability.

Recommended Books

1. Armstrong, 'Pattern Making for Fashion Design', Dorling Kindersley Publication.
2. Aldrich, 'Metric Pattern Cutting Men's wear', 4th Edn., Blackwell Publication.
3. Aldrich, 'Metric Pattern Cutting for Children Wear & Baby Wear', Blackwell Publication.
4. Aldrich, 'Pattern Cutting for Women Tailored Jacket', Blackwell Publication.
5. Holman, 'Pattern Cutting Made Easy', Batsford Publication.
6. Cooklin, 'Pattern Grading Men's Cloth', Blackwell Publication.
7. Cooklin, 'Pattern Grading Women's Cloth', Blackwell Publication.

Note: Number of experiments or construction of garments may vary as per availability of resources.

PATTERN MAKING LAB.-II

Subject Code: BFTE2-432

L T P C

0 0 4 2

Course Objectives: To give hands on training to students on apparel construction techniques-basic block, dart manipulation- pleats, tucks, gathers, dart clusters, radiating darts, etc.

- Developing the basic blocks, marking information on blocks. Adaptations of the basic blocks, principle of dart manipulation by (i) slash and spread method (ii) pivotal transfer method.
- Style variations of dart manipulation – pleats, tucks, gathers, dart clusters, radiating darts, terminating darts.
- Fitting problems and their identification. Commercial paper pattern – symbols used in commercial patterns, envelopes for commercial paper patterns, guide sheet and other relevant information.
- Flat pattern technique – drafting, developing paper pattern, designing and construction of garments of children, men and women using different construction and decorative features.

Recommended Books

1. Armstrong, 'Pattern Making for Fashion Design', Dorling Kindersley Publication.
2. Aldrich, 'Metric Pattern Cutting Men's Wear', 4th Edn., Blackwell Publication.
3. Aldrich, 'Metric Pattern Cutting for Children Wear & Baby Wear', Blackwell Publication.
4. Aldrich, 'Pattern Cutting for Women Tailored Jacket', Blackwell Publication.
5. Holman, 'Pattern Cutting Made Easy', Batsford Publication.

6. Cooklin, 'Pattern Grading Men's Cloth', Blackwell Publication.

7. Cooklin, 'Pattern Grading Women's Cloth', Blackwell Publication.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

TEXTILE TESTING LAB.

Subject Code: BFTE2-433

L T P C

0 0 4 2

Course Objectives: To give hands on training to students on various testing equipment relevant to fibres, yarn and fabrics.

List of some of the experiments:

1. To find out tearing strength of a given fabric sample using the Elmendorf Tear Tester.
2. To find out the seam strength of a fabric.
3. To find out the abrasion resistance of various kinds of fabrics.
4. To find out the pilling resistance of given fabric samples
5. To test the air permeability of given fabric samples.
6. To find out the water permeability and water repellency of various kind of given fabric samples.
7. To check the dimensional stability of given fabric samples.
8. To check the rubbing fastness of different kind of fabrics.
9. To check the colour fastness of given fabric samples.
10. To determine the flammability resistance/Limited Oxygen Index of treated fabric samples
11. Determine the compression property of a fabric (thickness)

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.
3. J.E. Booth, 'Principles of Textile Testing', CBS Publishers and Distributors, New Delhi.
4. P. Angappan & R. Gopalakrishnan, Komarapalayam, Textile Testing, SSM Institute of Textile Technology, 2002.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

PRODUCTION PLANNING & CONTROL

Subject Code: BFTE2-534

L T P C

Duration: 37 Hrs.

3 0 0 3

Course Objectives: To familiarize students with production planning and control in apparel industry using work study, time study and advanced software for G.S.D.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (9 Hrs.)

Introduction to production, operation concept of production, production as the conversion process, productivity component of production. Production planning and Control, its objectives, function, organization of (PPC) department.

UNIT-II (9 Hrs.)

Production planning – order preparation, material planning process planning, loading and scheduling. Production control of dispatching, progressing and follow-up. Method study – basic procedure of method study. Work measurement – uses of work measurement, data, basic procedure of work measurement, definition and scope of motion and time study.

UNIT-III (10 Hrs.)

Time Study: Time study procedure, illustrative examples on computation of standard time. Motion and time study: data for sewing work study, improvement of production efficiency, improvement in thought pattern of an operator, evolution of PMTS.

UNIT-IV (9 Hrs.)

General sewing data system, method engineering, production analysis (qualitative and quantitative). Co-ordination of activities. Layering and marker planning, cutting room planning, planning of sewing room. Material management in clothing production. Quick response in apparel manufacturing, different production systems.

Recommended Books

1. A.J. Chuter, 'Introduction to Clothing Production Management', Blackwell.
2. Rajesh Bheda, 'Production Management in Apparel Industry'.
3. Rajesh Bheda, 'Managing Productivity in Apparel Industry', C.B.S. Pub.
4. V.P. Mehta, 'Managing Quality in Apparel Industry', New Age International.

COSTING AND RETAILING MANAGEMENT

Subject Code: BFTE2-535

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: To introduce fashion retailing and their related terms such as retail formats, key elements of retail mix, importance and objectives, etc.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT-I (10 Hrs.)

Retail, fashion retailing - types of retail formats, retail formats operating fashion in India-franchised retail, chain store retailing, specialty stores, factory outlets, discount retailing, non-store retailing like online retailing, level of service offered, franchising system-characteristics, retail marketing decisions.

UNIT-II (9 Hrs.)

Wholesalers-difference between retailers and wholesalers, types of wholesalers, major functions and services provided by wholesalers, product line of wholesalers, modes of physical distribution, marketing logistics, inventory management

UNIT-III (9 Hrs.)

Retail marketing –nature, concept and importance, objectives of retail marketing, retail marketing mix, mix planning and composition, key elements of retail mix, retail marketing planning and its types, retail buying sequence and communication. Various modes of fashion retail promotions. Influence of promotion on the business, limitations.

UNIT-IV (10 Hrs.)

Changing dimensions of fashion retailing - growth of private labels: retailers into manufacturing, concentration of retail power, globalization of retailing, relationship marketing, partnerships, logistics and distribution.

Recommended Books

1. Kitty G. Dickerson, 'Inside the Fashion Business', 7th Edn., Pearson Education, India.
2. Philip Kotler and Kevin Keller, 'Marketing Management', 13th Edn., Prentice Hall Higher Education, 2008.
3. Mike Easey, Fashion Marketing, Blackwell Publishers, 2008.

MATERIAL STUDIES

Subject Code: BFTE2-536

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To impart knowledge and importance of different types of raw materials relevant to fibres, yarn, fabrics and apparel with brief description of relevant leather, metal, narrow fabrics like laces, braids, ribbons, fancy yarns and fabrics for apparels.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

UNIT-I (9 Hrs.)

Introduction to important high performance fibres and their application in fashion design and speciality garments, fancy yarns, Types of fancy yarns and their application in fashion design.

UNIT-II (10 Hrs.)

Fabrics: Characteristics of Apparel fabrics; properties and end uses of fabrics like poplin, muslin, Madras Check, Seersucker, Georgettes, Crepe, Voile, denim, Drill, Chino, Satin, Brocade, Tussar, Organdie, Bedford cord, Pique, Velvet/Velveten, Gauze and Leno, Gaberdine, Organdie, Organza, Jean, etc.

UNIT-III (10 Hrs.)

Narrow fabrics: Types of Narrow fabrics, like Tapes, Ropes, Braids, Laces, Ribbons, Elastics, Belts and their applications in garments and fashion accessories, Lining & Interlining fabrics: Different types and their structure and end uses.

Nonwoven Fabrics: Manufacturing techniques and applications in the apparel and accessories.

UNIT-IV (9 Hrs.)

Introduction to nature of miscellaneous materials like metals, glass, shells, plastic and their applications in fashion design.

Leathers: Different types of leathers, their properties and end uses.

Furs: Different types, their properties and end uses.

Recommended Books

1. R. Chattopadhyay, 'Textile Ropes and Cordages'.
2. Watson, 'Textile Design'.
3. Preston & Lewin, 'High performance Fibres'
4. N.N. Banerjee, 'Nonwoven Fabrics'.
5. Carr & Latham, 'The Technology of Clothing'.

TEXTILE AND GARMENT FINISHING-II

Subject Code: BFTE2-537

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To introduce various mechanical and chemical finishes, their application in textile and garment industries. Emphasis is given on Conceptual knowledge, working principles of finishes applications instead of detail chemistry.

Note: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT-I (9 Hrs.)

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.

UNIT-II (10 Hrs.)

Mechanism of shrinking and pre-shrunk fabric. Sanforizing – method and mechanism. Brief concept of finishing of wool: Crabbing, decatizing, milling, shrink finishing, etc. General chemical finishes like softening, stiffening, delustering of rayon, polyester. organdy finish. Silky finish of polyester. Weighting of silk.

UNIT-III (9 Hrs.)

Introduction and preliminary concepts of specialty finishes such as durable press textile and garments, anti-crease finish. Water repellent and water proof finish, Flame-proof and flame-retardant finish.

UNIT-IV (10 Hrs.)

Introduction and preliminary concepts of specialty finishes such as Soil and oil repellent finish, anti-static finish, antimicrobial finish. Introduction of 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. Brief introduction to garment finishing machines.

Recommended Books

1. E.P.G. Gohl and L.D. Vilensky, 'Textile Science', CBS Publishers.
2. J.T. Marsh, 'An Introduction to Textile Finishing', 2nd Edn., Chapman and Hall, London, 1966.
3. V.A. Shenai, 'Textile Finishing', Sevak Pub., Mumbai.
4. J.N. Chakarverty, 'Fundamental and Practices in Colouration of Textiles', Wood Head Publications, 2008.

PROJECT & SEMINARS

Subject Code: BFTE2-538

L T P C

3 0 0 3

Course Objectives: To develop creative as well as technical skill to formulate or develop some product.

Students have to carry out extensive literature survey, compile text material and pursue project on any specific topic assigned to him. The minor project may be also an initial part or literature survey of major project coming in next semester. It is expected from the students

that they will utilize assigned hours in library, laboratory or industry as per the requirement of the project. Evaluation of minor project will be carried out by faculty members. Each student will have to deliver a talk on the topics, in the weekly period allotted to the subject pertaining to his project work or any topic assigned by Head of the Department. The performance of the speaker would be judged in the class.

FINISHING LAB.

Subject Code: BFTE2 – 539

L T P C

0 0 4 2

Course Objectives: To give practical exposure on various finishing chemicals and their applications in apparel industries.

Understanding of screen and block and stencil printing.

Printing of cotton, wool, silk, linen with direct resist and discharge printing. Pigment printing. Direct, discharge, resist and sublimation transfer printing of polyester fabrics. Printing of garments. Batik printing, different designs of tie-dye printing. Burn out printing, glittering printing, etc. Demonstration and practice on Lectra- Kaledo Print Software.

Applications of various finishes on textile materials such as - starch, antcrease finish, flame retardant finish, water repellent finish, softening agents, fragrance finishes, OBA, etc on basis of availability in the lab and their evaluation.

Recommended Books

1. E.P.G. Gohl and L.D. Vilensky, 'Textile Science', CBS Publishers, Delhi, 1983.
2. 'An Introduction to Textile Finishing', V.A. Shenai, Textile Finishing, Sevak Publication, Mumbai.
3. J.N. Chakarverty, 'Fundamental and practices in Colouration of Textiles', Woodhead Publishing India Pvt. Ltd., 2008.
4. V.A. Shenai, 'Technology of Printing', Sevak Pub. Mumbai.
5. Clarke, 'An introduction to Textile Printing', CBS Pub Delhi.
6. R.B. Chavan, 'Textile Printing', Second annual Symposium.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

PATTERN MAKING AND GRADING LAB.

Subject Code: BFTE2 – 540

L T P C

0 0 4 2

Course Objectives: To give hands on training to students on pattern making and grading, manipulation of darts, application of CAD software, etc.

Practice of pattern making and construction of shirts, pants/trousers and Jackets/Coats.

Introduction to "Basics of Computer Aided Design for Pattern making and grading". Usage of different drawing and measuring tools. Basic Block construction and digitization of patterns. Pattern making of different garments, e.g. skirts, jackets through assembly of lines, points, derived pieces, fold etc.

Introduction to Grading techniques. Application of grading system to basic blocks and adaptations.

Recommended Books

1. Armstrong, 'Pattern Making for Fashion Design', Dorling Kindersley Publication.

2. Aldrich, 'Metric Pattern Cutting Men's Wear', 4th Edn., Blackwell Publication.
3. Aldrich, 'Metric Pattern Cutting for Children Wear & Baby Wear', Blackwell Publication.
4. Aldrich, 'Pattern Cutting for Women Tailored Jacket', Blackwell Publication.
5. Holman, 'Pattern Cutting Made Easy', Batsford Publication.
6. Cooklin, 'Pattern Grading Men's Cloth', Blackwell Publication.
7. Cooklin, 'Pattern Grading Women's Cloth', Blackwell Publication.

Note: At least ten experiments have to be performed in the semester out of which seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by teacher as per the scope of the syllabus.

ADVANCE APPAREL CONSTRUCTION LAB.

Subject Code: BFTE2-541

L T P C

0 0 4 2

Course Objectives: To give hand on training on apparel construction and their techniques. Practice of pattern making and construction of shirts, pants/trousers, Jeans and Jackets/Coats. Development of Design of Men's tailored clothing. Presentation/exhibition of garments prepared in advance apparel construction lab I or II by the students on mannequins or in terms of fashion shows. Development of Design of Men's tailored clothing. Making of Flat sketches, Moodboard, Storyboard and Portfolio.

Recommended Books

1. Armstrong, 'Pattern Making for Fashion Design', Dorling Kindersley Publication.
2. Aldrich, 'Metric Pattern Cutting Men's Wear', 4th Edn., Blackwell Publication.
3. Aldrich, 'Metric Pattern Cutting for Children wear & baby wear', Blackwell Publication.
4. Aldrich, 'Pattern Cutting for Women tailored Jacket', Blackwell Publication.
5. Holman, 'Pattern Cutting Made Easy', Batsford Publication.
6. Cooklin, 'Pattern Grading Men's cloth', Blackwell Publication.
7. Cooklin, 'Pattern Grading Women's cloth', Blackwell Publication.

Note: Number of experiments or construction of garments may vary as per availability of resources.

PLANT LAYOUT & FACILITY DESIGN

Subject Code: BFTE2-642

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives: To impart knowledge about plant location, plant lay out, material handling and Facility design and their importance in Textile and Garment industries.

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit 1

Plant Location- Theories of plant location and location economics. Location of Textile & Garment Industries, its importance, factors influencing plant location, building, structure, lighting, ventilation, etc.

Unit 2

Plant layout-Objectives and importance of layout in Textile & Garment Industries, Principles of plant layout, types of plant layout, their merits and demerits, basic layout types various

approaches to plant layout, Modular design concept, Production Line balancing. Computer Aided Layout

Unit 3

Material handling: Definition, principles, system design and selection of equipment, unit load concepts, availability of labour, material management and transportation.

Space Determination and Area Allocation. Factors for consideration in space planning, receiving, storage, production, shipping, other auxiliary service actions. Establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column and area allocation procedure.

Unit 4

Facility Design: Its importance, factors influencing Facility design in Textile and Garment plants, categories of facility design, etc. Design of layout, Method of constructing the layout, evaluation of layout, presenting layout to management, implementing Quantitative Approaches to Facilities Planning

Warehouse layout models, plant location problems. Evaluation, Selection, implementation and maintenance of the facilities plan.

Recommended Books

1. Chandrashekhara Hiregoudar, 'Facility Planning and Layout Design'.
2. Ruddell Reed, 'Plant Layout: Factors, Principles and Techniques'.
3. James Mendon Moore, 'Plant Layout and Design'.

APPAREL TECHNOLOGY MANAGEMENT

Subject Code: BFTE2-643

L T P C
3 0 0 3

Duration: 38 Hrs.

Course Objectives: To introduce various terms and techniques related to Industrial Engineering, work study, Method Study, Plant Engineering, Production & productivity, etc

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (12 marks). Students have to attempt 5 questions in total at least one question from each unit.

Unit – 1

Human Resource Development: Introduction to Structure and Sectors of Apparel Industry - Job Analysis and Description – Job Specification – Recruitment and Selection – Kinds of Interview - Purpose Of Appraisal – Criteria Of Appraisal – Methods Of Appraisal Methods – Limitations - HRD Methods And Processes – Sewing Room Supervisor's Job And Training Needs - HRD In Indian Apparel Industry.

Unit - 2

Plant Engineering & Line Balancing Introduction to Garment Industry Plant Location – Location Economics – Plant Layout – Process Layout – Product Layout – Combination Layout – Introduction to Balancing Theory – Balance Control – Balancing Exercises for Garment Industry.

Unit – 3

Work Study Concept and Need – Method Study and Work Measurement – Techniques – Process Chart Symbol – Process Flow Chart – Flow Diagrams – String Diagrams – Multiple Activity Chart – Principles of Motion Economy – SIMO Chart – Time Study Methods – Standard Time Data – Ergonomics with Special Reference to Garment Industry.

Unit – 4

Production and Productivity: Methods of Production Systems – Job, Mass & Batch – Section Systems, Progressive Bundle System & „Synchro“ System – Conveyor Systems –

Unit Production System – Quick Response. Productivity Concepts – Measurement Of Productivity– “Man Machine Material” – Criteria For Increasing Productivity.

Production Planning and Control - Function, Qualitative And Quantitative Analysis Of Production - Coordinating Departmental Activities - Basic Production Systems - Evaluating And Choosing The System - Flow Process And Charts For Garment - Scheduling Calculations -Assigning Operators Optimally - Setting Up Complete Balanced Production Lines To Produce Given Amount Of Garments

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.

PROJECT

Subject Code: BFTE2-644

L T P C

- - - 18

Course Objective: To develop creative as well as technical skill to formulate or develop some product.

Students have to carry out literature survey, compile text material and pursue project on any specific topic assigned to him. It is expected from the students that they will utilise allotted hours/ week in library, laboratory or industry as per the requirement of the project. In case of industrial project, student may spend required time in industry in consultation with faculty/ supervisor. Students have to give their presentation in front of board of panel.

MRSPTU B.Sc. FASHION DESIGN SYLLABUS 2016 BATCH ONWARDS

B.Sc. FASHION DESIGN

Total Contact Hours = 27

Total Marks = 900

Total Credits = 21

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE1-101	Elements of Fashion	0	0	3	60	40	100	1.5
BETE1-102	Pattern Making	0	0	3	60	40	100	1.5
BFTE1-103	Sewing Technology	0	0	3	60	40	100	1.5
BFTE1-104	Computer Applications-1	3	0	0	40	60	100	3
BFTE1-105	Communication and Soft Skills	3	0	0	40	60	100	3
BFTE1-106	Textile Studies-1	3	0	0	40	60	100	3
BFTE1-107	Historic Costumes	3	0	0	40	60	100	3
BFTE1-108	Yarn Craft	3	0	0	40	60	100	3
BFTE1-109	Sketching	0	0	3	60	40	100	1.5
Total	Theory = 5 Lab = 4	15	0	12	440	460	900	21

Total Contact Hours = 35

Total Marks = 1200

Total Credits = 22

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFTE1-201	Fashion Model Drawing	0	0	3	60	40	100	1.5
BETE1-202	Fashion Art	0	0	3	60	40	100	1.5
BFTE1-203	Garment Construction	0	0	3	60	40	100	1.5
BFTE1-204	Pattern Making	0	0	3	60	40	100	1.5
BFTE1-205	Draping	0	0	3	60	40	100	1.5
BFTE1-206	Elements of Design	0	0	3	60	40	100	1.5
BFTE1-207	World Art Appreciation	0	0	3	60	40	100	1.5
BFTE1-208	Traditional Indian Textile & Embroideries	3	0	0	40	60	100	3
BFTE1-209	History of Western Costumes	3	0	0	40	60	100	3
BFTE1-210	Graphic Design & Applications	0	0	3	60	40	100	1.5
BFTE1-211	Dyeing & Printing	3	0	0	40	60	100	3
BFTE1-212	Photography Module	0	0	2	60	40	100	1
Total	Theory = 3 Lab = 8	9	0	26	660	540	1200	22

Overall

Semester	Marks	Credits
1 st	900	21
2 nd	1200	22
Total	2100	43

ELEMENTS OF FASHION

Subject Code – BFTE1-101

**L T P C
0 0 3 1.5**

Duration - 31 Hrs

UNIT-I (12 Hrs)

- Color wheel-primary color, secondary color, tertiary color.
- Draw design using Color Aspects in designs -warm, cool, hot, cold, dark, pale and bright.
- Make design of all color schemes.
- Different textures – thread pulling; thread crumple, thread rolling, blade effects, jute, thumb, comb, ink blow, sponge effect.
- Create designs using color schemes.
- Rendering techniques.

UNIT-II (7 Hrs)

- Elements of design (Line, shape, texture, color value)
- Principles of Design (unity, emphasis, proportion, rhythm, balance)

UNIT-III (5 Hrs)

- Face analysis.
- Figure analysis.
- Draw features eyes, nose, ear, lips, face, hands, arms, feet, legs and hairstyles.
- Sketching of Stick figures in different poses.

UNIT-IV (7 Hrs)

- Make geometric figures- - 8½, 10 and 12 heads, front, back and ¾ profile and Fleshing on geometric figures.
- Body line reading through different poses.
- Draw a fashion figure in poses-front, 3/4, side view.
- Design presentations sheets -mood board, theme board, client board, swatch board, Illustration sheet, Measurement sheet, Fabric and color sheet.
- Motif Background/foreground
- Negative/Positive

PATTERN MAKING

Subject Code – BFTE1-102

**L T P C
0 0 3 1.5**

Duration – 31 Hrs

UNIT-I (9 Hrs)

- Basic principles of flat pattern making
- Tools and Equipment used in drafting and pattern making.
- Anthropometric measurements, landmarks, taking body measurements.
- Selection of right size pattern, fitting problems, principles of a good fit, Alterations of paper pattern.
- Creation of a bodice block and a sleeve block for a child.

UNIT-II (10 Hrs)

- Sleeves – Plain, puff, cap, bell, umbrella, flared, leg-o-mutton, magyar and raglan.
- Basic skirt block & its adaptation.

- Collars, Peter pan, raised peter pan, cape, sailor, mandarin, wing, flat and roll.

UNIT-III (7 Hrs)

Garment Construction:

- Introduction to sewing, sewing tools, equipment and supplies.
- Introduction and handling of sewing machines, its parts, their working.
- Sewing problems and their solutions.
- All types of Basic Hand stitches

UNIT-IV (5 Hrs)

- Creation of Adult bodice block
- Mini and major Paper Pattern of bodice
- Pattern of kid's casual Wear-Slip, panty and romper
- Paper pattern of Trouser.

SEWING TECHNOLOGY

Subject Code – BFTE1-103

L T P C

Duration – 31 Hrs

0 0 3 1.5

UNIT-I (7 Hrs)

- Introduction to sewing, sewing equipment and supplies.
- Introduction and handling of sewing machines, its parts, their working and maintenance.
- Different types of sewing machines.
- Threading and bobbin winding.
- Sewing problems and their solutions.
- Introduction to threads and needles, their numbers and sizes in relation to different types of fabrics.

UNIT-II (6 Hrs)

Terminology and Classification used in:

- Collars
- Sleeves
- Pockets
- Yokes

UNIT-III (7 Hrs)

- Stitching samples:
- collars,
- sleeves and
- Necklines.

UNIT-IV (11 Hrs)

- Tucks – Plain, cross, shell, released, group.
- Pleats - knife, box, inverted box, cartridge and kick.
- Gathers.
- Necklines-Round, square, V shape etc.
- Patch pocket.
- Construction of a baby frock stitching of child slip, panty and romper.

COMPUTER APPLICATIONS-1

Subject Code – BFTE1-104

**L T P C
3 0 0 3**

Duration – 31 Hrs

UNIT-I (10 Hrs)

- Introduction to Computer:-Definition, Characteristics of computer, Generation of Computers, Capabilities and Limitations. Introduction to Operating System. Booting.
- Basic Components of a Computer System-Control Unit, ALU, Input/output functions and characteristics.

UNIT-II (7 Hrs)

- Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure, Computer.
- Programming Languages: Machine Language, Assembly Language, High Level Language, Object Oriented Language

UNIT-III (7 Hrs)

- Tools of PowerPoint, word, excel.
- Spreadsheet programs and their uses.
- Types of network-LAN, WAN, MAN

UNIT-IV (7 Hrs)

- What is internet. Internet concepts common software used on internet (browser, e-mail, web server, domain name server, browser plug-in). 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. E. Balagurusamy , ‘Fundamental of Computers’.
2. Peter Norton, ‘Introduction to Computers’.

COMMUNICATION AND SOFT SKILLS

Subject Code – BFTE1-105

**L T P C
3 0 0 3**

Duration – 31 Hrs

UNIT-I (10 Hrs)

- Communication its meaning and importance.
- One way and two-way communication.
- Essentials of Good communications.
- Methods of communication, Oral, Written and Non-verbal.
- Barriers of communication, Techniques of overcoming Barriers.
- Concept of effective communication.

UNIT-II (8 Hrs)

- Basic parts of speech – Noun, pronoun, verb, adjective, adverb, preposition, article and Conjunction.
- Active & passive voice, paragraph writing, précis, translation (from vernacular to English & English to vernacular).

UNIT-III (8 Hrs)

- Correct word usage – Homonyms, Antonyms and Synonyms.
- Importance of non-verbal communication – Positive gestures, symbols and signs.

UNIT-IV (5 Hrs)

- All forms of written communication including – Drafting reports, notices, agenda notes, business correspondence, preparation of summaries and précis, circulars, representations, press release and advertisements.
- Writing applications –For business (e.g. applying for a loan, salary advance, refund etc), Job application.

Recommended Books

1. Nitin Bhatnagar, 'Effective Communication and Soft Skills'.
2. P.K. Sinha, 'Computer Fundamentals'.

TEXTILE STUDIES-1

Subject Code – BFTE1-106

**L T P C
3 0 0 3**

Duration – 31 Hrs

UNIT-1 (10 Hrs)

Fabric Cover Factor and Its Significance, Engineering Approach for Fabric Formation, Pierce's Cloth Geometry, Practical Aspect of Cloth Geometry, Graphical Relationship in Cloth Geometry for Plain, Twill and Sateen Weaves

UNIT-II (8 Hrs)

Concept of Jammed Structure, Analysis of Racetrack Section of Yarn in Cloth Geometry, Theoretical Investigation of Weavability Limit of Yarns, Elastic Thread Model for Fabric

UNIT-III (7 Hrs)

Concept of Fabric Relaxation for Knitted Fabrics, Geometry and Properties of Weft Knitted Fabrics – Importance of Doyle's and Munden's Research, K-Values and Pierce's Geometry of Knitted Fabrics

UNIT-IV (6 Hrs)

Tensile and tearing Behaviour of Fabric, Bending Deformation of Fabric, Bending Hysteresis of Woven Fabric, Buckling, Shear and Drape Behaviour of Woven Fabric, Mechanical Properties of Nonwoven Needle Punch and Stitch Bonded Fabric, Brief Study of Formability, Tailorability and Hand of Apparel Fabric.

Recommended Books

- Bernard Corbman, 'Textiles-Fiber to Fabric', McGraw Hill.
- Sara Kadolph, 'Textiles,' Prentice Hall.

HISTORIC COSTUMES

Subject Code –BFTE1-107

**L T P C
3 0 0 3**

Duration – 31 Hrs

UNIT-I (7 Hrs)

- Traditional costumes of Indian states (Eastern, Western, Northern & Southern), Accessories & ornaments used in India.

- Costumes of folk dances of India.

UNIT-II (11 Hrs)

Study of Ancient Indian Dresses during the following periods:

- (a) Indus Valley
- (b) Mouran and Sunga Period
- (c) Aryans
- (d) Satvahana Period
- (e) Kushan Period
- (f) Gupta Period
- (g) Mughal Period
- (h) British Period.

UNIT-III (9 Hrs)

- Asian Costumes - Persian Costumes, Babylonian Costumes, Assyrian Costumes, Creton Costumes.
- Costumes of Europe - Greece, Italy, France, Byzantine.
- Costumes of Africa - Egyptian Costumes, Coptic.

UNIT-IV (5 Hrs)

- Influence of fashion in Indian dresses from ancient times to date.
- Influences of Italian and French fashion on global fashion.

Recommended Books

- Francois Boucher, '20,000 Years of Fashion- The History of Costume and Personal Adornment'.
- Manmeet Sodhia, 'History of Fashion '.

YARN CRAFT

Subject Code – BFTE1-108

**L T P C
3 0 0 3**

Duration – 31 Hrs

UNIT-I (8 Hrs)

- Macrame
- Knotting
- Braiding
- Twining
- Tasselling

UNIT-II (8 Hrs)

- Basic Knitting
- Crocheting
- Tatting.

UNIT-III (7 Hrs)

- Carpet-making
- Tufting
- Hook Weaving
- Ribbon Weaving
- Other explorations

Exploration, Improvisation and adaptation of the above techniques towards innovative surfaces and forms while using a variety of material of like different kinds of yarns, vegetable fibres, thread and ropes ribbons, braids, trimmings, paper, wires, fabric, acrylics, polythene, self-reflecting foils etc.

UNIT-IV (8 Hrs)

- Prepare project.
- This semester, the Yarn Craft course will be focused towards producing 2 or 3 products from bags, soft accessories or value addition to garments. Emphasis may be given to two or three techniques while other techniques may be demonstrated within the given time limitation.

SKETCHING

Subject Code – BFTE1-109

**L T P C
0 0 3 1.5**

Duration – 31 Hrs

UNIT-I (8 Hrs)

- Introduction to basics of Sketching & Drawing.
- Face analysis.
- Figure analysis.
- Draw features eyes, nose, ear, lips, face, hands, arms, feet, legs and hairstyles.
- Fashion figure - 8½, 10 and 12 heads, front, back and ¾ profiles.

UNIT-II (9 Hrs)

- Body line reading through different poses.
- Make stick figures in different poses.
- Make geometric figure.
- Fleshing on block figures.
- Illustrate a figure using texture in the garment.

UNIT-III (7 Hrs)

- Drawing and practice of sketching of outdoor surroundings comprising of flora and fauna. • Introduction to perspective. • Practicing perspective by drawing buildings etc along with trees etc. Practice perspective in colour.

UNIT-IV (7 Hrs)

- Students will design garments through a project using the inspirational objects as the theme for Line Development of the clients & for the fashion shows-
- Concept selection
- Market research
- Creating Mood boards
- Theme boards
- Client boards
- Swatch boards
- Design Development

FASHION MODEL DRAWING

Subject Code – BFTE1-201

**L T P C
0 0 3 1.5**

COURSE OBJECTIVES:

The focus of the course is on fashion communication and illustration of fashion design ideas.

Development of a personal illustration style, an ability to communicate visually a variety of fabrics, silhouettes and colours of garments draped on the body.

Familiarity with various colours media- oil pastels, colours pencils, water colors, poster colors, dried pastels and mixed media.

Effective use of these media introduced and applied in the various given exercises suitable for themes and different kind of given exercise

- Introduction to the human anatomy, bone structure and musculature with stylized interpretation of the live model.
- Rendering of different garments on the model with emphasis on the fabric texture, color and style details. Reference from life or magazine or good photographs could be used.
- Drapability of various garment styles in a variety of fabrics stitched and draped, are observed and illustrated.
- Express oneself through the theme of a given project. Inspiration is taken from art and the artists of any period.
- Eventual accomplishment in a particular medium suited to the designer's personal illustration style for the final project.

Recommended Books:

1. Anatomy & Drawing by Victor Perard.

FASHION ART

Subject Code – BFTE1-202

L T P C

0 0 3 1.5

COURSE OBJECTIVES:

The inputs refine the student's illustration skill with special emphasis on developing a signature style of sketching, learning to keep fabric texture and drapability in mind while doing colour rendering in different media. Inputs in clothing details and terminology as a universal vocabulary for communication about garments are also given.

- Introduction to garment details: Necklines, Collars, Sleeves, Cuffs, Silhouettes, Skirts, Pants, Coats, Pockets, Gathers, frills, pleats etc.
- Style-lines
- Principles of Draping of all kinds of garments on croquis.
- Stylisation of croqui (different kinds of paper and media used for different assignments) Each student is encourage to explore his/her own individual style of illustration.
- The aim of the following exercises is to explain the characteristics of the fabric for example drapability, weight, stretch, transparency/ opacity etc. Color rendering of the following are introduced.
 - Denim – Jeans
 - Ikat –Pants/Jump suit
 - Cotton – Solid and print
 - Lycra Spandex (Active sport-wear)
 - Chiffon and lace evening wear)

GARMENT CONSTRUCTION

Subject Code – BFTE1-203

L T P C

0 0 3 1.5

COURSE OBJECTIVES:

1. To understand and appreciate different types of necklines, collars, sleeves, cuffs and pockets.
2. To obtain fabricating skills for the same.

UNIT-1

AREAS OF STUDY

1. Types of Necklines:

- a) Round and jewel
- b) Square and glass
- c) V shaped, straight and curved
- d) Scalloped
- e) Sweet heart

2. Neckline finishing by using facings and interfacings:

- a) Shaped facing
- b) Bias facing
- c) Single layer binding
- d) Double layer binding

UNIT-2

TYPES OF COLLARS

Finishing collars using interfacing

1. Flat collar
2. One piece rolled collar
3. Two piece rolled collar
4. Shirt collar

TYPES OF SLEEVES AND ALEEVE FINISHES

1. Basic sleeve types
Half sleeve, full sleeve and 3/4 sleeve
2. Sleeves finish
3. Set in sleeves
 - a) Plain
 - b) Puff sleeve
 - c) Flare sleeve
 - d) Leg 'O' mutton
 - e) Shirt sleeve
 - f) Kurta sleeve

OTHER MODIFIED SLEEVES

1. Raglan
2. Kimono
3. Dolman

Note: Insertion of gusset to be explained sleeve finishes

- a) Self-hem

- b) Shaped facing
- c) Bias facing/double fold bias binding
- d) Casings

UNIT-3

POCKET MAKING AND APPLICATION

- 1. Patch pockets- different types
 - a) Unlined patch pockets
 - b) Lined patch pockets
 - c) Patch pockets with flap

PATCH POCKET WITH SELF FLAP INSIDE POCKETS

- 1. Reinforcing in-seam pockets
- 2. Extension in-seam-pocket-front hip pocket
- 3. Slashed pockets-bound pockets
- 4. Fabricating bound pockets
- 5. Flap and separate welt pocket
- 6. Welt pocket with flap

UNIT-4

FASTENERS

Inserting a zip fastener:

- 1. Centred standard
- 2. A lapped standard zip
- 3. Concealed zip
- 4. Open end zip
- 5. Finishing off in a slot

BUTTONS- TYPES ATTACHING

- 1. Positioning and buttons
- 2. Hook and eye
- 3. Press-studs
- 4. Touch and close

Recommended Books

- 1. Dorothy Wood, 'The Practical Encyclopedia of Sewing', Lorenz Books.
- 2. Dorling Kindersley, 'The Complete Book of Sewing'.
- 3. 'Sewing and Knitting: A Reader's Digest step –by-step Guide'.
- 4. Comparative Construction Techniques
- 5. Sherie Doonga, 'Clothing Construction'.
- 6. Sewing Manual: Singer
- 7. Stitch World
- 8. Apparel views

PATTERN MAKING

Subject Code – BFTE1-204

L T P C

0 0 3 1.5

This is an introductory course where the relationship between draping of a three-dimensional form and flat pattern making is introduced. Students draft basic slopers according to dress form requirements. The basic sloper is used to develop creative designs. The final project is the development of an original design through the flat pattern method.

Methodology:

The exercises are variations of basic slopers and their common variations. The students are given demonstrations for each and are required to make paper patterns along with muslin test fits. Design possibilities/variations of each should be explored and towards the end of the semester a complete term garment in suitable fabric is made.

COURSE OBJECTIVES:

This area of instruction should enable the students to:

1. Develop accurate slopers for Skirts.
2. Become familiar with tools of pattern making.
3. Understand the language of pattern making.
4. Develop the ability to create designs through the flat pattern method.

1. Introduction to PM.
2. How to take body measurements?
3. Developing the first bodice block (dartless).
4. Making a prototype for eg. A 'tank top' with the help of basic block.
5. Developing the 2nd bodice block (with darts).
6. Test fit the garment on the dress form.
7. Dart manipulation.
 - a) Single dart series.
 - b) Double dart series
 - c) Multiple dart series.
 - d) Darts away from bust point.
 - e) Darts in the form of gathers.
 - f) Stylised darts.

Recommended Books:

1. Helen Joseph Armstrong, 'Pattern making for Fashion Design', Harper Collins, LA.
2. Winfred Aldrich, 'Metric Pattern Cutting for Menswear', BSP Professional Book Oxford.
3. Marten Shoben and Janet P. Ward, 'Pattern making and making up-the professional approach', Butterworth Heinman, Oxford.
4. P. Kunick, 'Modern sizing for Womens and Children', Philip Kunik Publication, London.
5. Natalie Bray, 'Dress Fitting', Black Well Science Ltd., London.
6. Natalie Bray, 'Dress Patten Designing', Black Well Science Ltd. London.

DRAPING

Subject Code – BFTE1-205

**L T P C
0 0 3 1.5**

COURSE OBJECTIVES:

Students are expected to learn the basic principles of draping. Once the principles of draping have been mastered the designer is free to translate an endless variety of ideas.

Draping is a method of Pattern Making for Fashion Design that permits free and accurate expression of ideas as designer works. It is a three dimensional process of designing. The designer working from a sketch or a mental picture give the three dimensional form to an idea for a garment with a help of a dress form.

1. Introduction to Draping
2. Basic Bodice
3. Basic Sleeve
4. Basic skirt
5. Dart manipulation
6. Short sleeve
7. Flared skirt
8. Princess bodice
9. Dirndl skirt
10. Gored skirt
11. Collars
 - Mandarin
 - Convertible
 - Peter Pan
12. Yokes:
 - Shoulder
 - Midriff
 - Hip
13. Princess Bodice
14. Princess Bodice Variation
15. Term Garment

ELELMENTS OF DESIGN

Subject Code – BFTE1-206

**L T P C
0 0 3 1.5**

COURSE OBJECTIVES:

Introduction to Design Process/Material Exploration/Research Methodology/Presentation Techniques/Visual Communication/Visual Merchandising.

Project - A

Identify and select many visuals of any product except a garment (furniture or any other utility object, art forms or art effects, accessories, architecture or architectural details etc.).

1. The evolution and development of the product through time
2. Product manifestation as found in different environments/lifestyles

3. Product adaptation in different materials
4. The physiology of the product
5. Marketing and merchandising of the product
6. Any other

Project-B

Design the identified product utilising the above inputs (one to seven).

Methodology

Let the students:

- Visualize certain activities they enjoy (sleeping, eating and cycling...)
- Identify the effect of these activities (comfort, entertainment, inspiration etc.)
- Identify associated objects with the activity.
- Discuss with respect to the objectives given above. you may adopt your own methodology and invite related experts in various areas.

We are involving experts from the area of:

- a) Architecture for physiology and psychology of products
- b) Cultural studies and material exploration
- c) Marketing/advertising/communication

WORLD ART APPRECIATION

Subject Code – BFTE1-207

L T P C

0 0 3 1.5

COURSE OBJECTIVES:

The objective of the course is to give an insight and input about the various aspects of the History of World Art right from the origin. The students learn about the historic importance and relevance of the various aspects and phases of the World Art and take inspiration and influence for their own creations.

- Introduction to Pre Historic Art
- Egyptian Art
- Greek and Roman Art
- Medieval Europe: the birth of two major Religions-Christianity and Islam
- The Renaissance and its masters
- Mannerism and Baroque and Realism
- impressionism and Post Impressionism
- Cubism
- Fauvism
- Surrealism
- Discussions/presentations

Instruction to the Examiner:

- Pls add Fill in the blanks for at least 20 marks.
- Presentations on topics in groups should be given.

Recommended Books:

- Herbert Read, 'A Concise History of Modern Painting'.

- H.H. Arnason, 'A History of Modern Art'.
- H.W. Janson, 'History of Art'.
- Edith Tomory, 'A History of Fine Arts'.

TRADITIONAL INDIAN TEXTILES & EMBROIDERIES

Subject Code – BFTE1-208

**L T P C
3 0 0 3**

COURSE OBJECTIVES:

Study of different traditional textiles of various regions in terms of their origin

- Socio-cultural background
- Techniques/material
- Colour/motifs
- Evolution or changes over time
- Present scenario
- Contemporary usage

Woven Fabrics

- Carpets
- Shawls
- Sarees-Chanderi, Maheshwari, Kanjeevaram, Paithani etc.
- Brocades
- Textiles of North Eastern Region

Embroidered (Briefly as also covered under surface ornamentation)

- Kantha
- Phulkari
- Chikankari
- Kasuti
- Kashida
- Embroidery of Gujrat & Rajasthan.

Resist Dyed

- Bandhani
- Ikat
- Patola

Printed and Painted

- Block printed textiles from Gujarat
- Block printed textiles from Rajasthan
- Ajrakh
- Kalamkari

HISTORY OF WESTERN COSTUMES

Subject Code – BFTE1-209

L T P C

3 0 0 3

COURSE OBJECTIVES:

The objective of the course is give an insight and input about the various aspects of the History of the costumes of the western world right from the origin. The students learn about the historic importance and relevance of the costumes and take inspiration and influence for their own creations.

- Introduction
- Egyptian
- Assyrian
- Babylonian
- Greek
- Etruscan
- Roman
- Byzantine
- 13-14th century
- 15,16 and 17th centuries
- 18th -19th centuries
- 19th century onwards

Instruction to the Examiner:

Pls add Fill in the blanks for at least 20 marks.

Presentations on topics in groups should be given.

Recommended Books:

- Douglas Gorsline, 'A History of Fashion'.
- Phyliss G. Tortora & Keith Eubank, 'Survey of Historic Costume'.

GRAPHIC DESIGN AND APPLICATIONS

Subject Code – BFTE1-210

L T P C

0 0 3 1.5

COURSE OBJECTIVES:

This course is aimed at students and design professionals who are interested in learning how to design, print using Photoshop. To create, capture and enhance the images in accordance with the final objective. It is a bitmap based graphic designing program that designers use to create professional artwork or advertisements. In this course, students will explore the advanced features available with Photoshop including advanced text, color, layout and layers styles.

- Learn how to manipulate, edit, and adjust images by using, the different tools in Photoshop. Students will learn how to apply layer effects and filters to create special effects, including lighting and texture effects.
- To show advanced skills in using painting tools and blending modes to create special effects and quality artworks.

- Perform good skill in color correction and restoration of photographs and images.
- To learn how to optimize images for use on the Web, and the advantages of using image slicing techniques.
- Demonstrate basic skills in developing a time-based production

Duration-6 months

One class per week of 3 hrs.

Teaching Techniques

- Classroom lectures, demonstrations, & discussions.
- Individual and small group work.
- Hands-on lab classes/Assignments

Pre-requisite

Students should have basic knowledge in using Windows operating system and to access and work with the files and programs using Windows OS. It will be more preferable, if you have color sense and some photography or artistic skills.

Note: All topics are covered in extreme detail with practical examples for all.

Examination /Evaluation scheme

Practical Examination: One Practical examination of 3 hours' duration will be conducted on the modules described in the curriculum. The maximum marks will be 100.

Unit-I

Introduction To Adobe Photoshop, Opening new files, Opening existing files, exploring the Toolbox, Exploring Panels & Menus, Creating & Viewing a New Document, About Photoshop, Navigating Photoshop, Working with Images and Basic Selections, Working with Multiple Images, Rulers, Guides & Grids, Adjusting Color with the New Adjustments Panel, Getting Started With Layers And Painting Commands, Understanding the Background Layer, Creating, Selecting, Linking & Deleting Layers, Introduction to Blending Modes

Unit-II

Photo Draping In Adobe Photoshop, Photo Draping Basics, Using a Wrap tool to Photo, Photo Draping a garment/dress with Blending modes, Photo Draping a Bed, Painting In Photoshop Using the Brush Tool, Working with Colors & Swatches, Creating & Using Gradients, Creating & Working with Brushes.

Unit-III

Photo Retouching and Color Correction, The Red Eye Tool, The Clone Stamp Tool, The Patch Tool & the Healing Brush Tool, The Spot Healing Brush Tool, The Color Replacement Tool, Adjusting Levels, Adjust Curves, Non-Destructively, with Adjustment Layers

Unit-IV

Using Quick Mask Mode and the Pen Tool, working with Colors and Color Settings, working with the Color palette, Using the Color palette, Editing Foreground color and Background color, Using the Color ramp, Setting the CMYK Color gamut, Creating Special Effects, Getting Started with Photoshop Filters, Smart Filters, Creating Text Effects, Applying Gradients to Text

DYEING AND PRINTING

Subject Code – BFTE1-211

L T P C

3 0 0 3

COURSE OBJECTIVES:

To introduce the students to the basics of dyeing and printing.

Contents:

Unit-I

1. Introduction to the Grey fabric
2. Characteristics and classification of impurities
3. Introduction to the preparatory processes of dyeing for cotton – Singeing, desizing, scouring, bleaching, mercerization.

Unit-II

1. Definition of color, dyes, pigment
2. Classification of dyes
3. Application of dyes on textiles
4. Stages of dyeing – Fiber, yarn, fabric and garment
5. Introduction to dyeing of blends

Unit-III

1. Methods of printing
2. Styles of printing
3. Environmental Concerns

Instructions to the teacher: Field trip to a dyeing & printing unit will be taken.

Instructions to the examiner:

1. There will be one compulsory objective question (multiple choice questions or fill in the blanks or True/False questions) covering all units, carrying 30 marks.
2. There will be six questions of 10 marks each, out of which three questions are compulsory. The questions will be two from each unit.
3. It will be compulsory to attempt one question from each unit.

Recommended Books:

1. Joseph J. Puzuto, 'Fabric Science'.
2. V.A. Shenai, 'Technology of Dyeing, Printing and Bleaching'.

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

B. Sc. AGRICULTURE

Total Contact Hours = 37

Total Marks = 1500

Total Credits = 30

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BAGE1-101	Agricultural Meteorology	2	1	0	40	60	100	3
BHUM0 – 107	Communicative English	2	1	0	40	60	100	3
BAGE1- 102	Introductory Agriculture & Principles of Agronomy	2	1	0	40	60	100	3
BHUM0-111/ BHUM0-112	Punjabi*/ Basic Punjabi*	2	0	0	40	60	100	2
BAGE1-103	Introduction to Soil Science	2	1	0	40	60	100	3
BBIO0-101/ BMAT0-103	Basic Botany/Mathematics-I**	2	1	0	40	60	100	3
BAGE1-104	Water Management & Micro- Irrigation	2	1	0	40	60	100	3
BAGE1-105	Vegetable Production Technology	2	1	0	40	60	100	3
BAGE1-106	Agricultural Meteorology Lab	0	0	2	60	40	100	1
BHUM0- 108	Communicative English Lab.	0	0	2	60	40	100	1
BAGE1-107	Introductory Agriculture & Principles of Agronomy Lab	0	0	2	60	40	100	1
BAGE1-108	Introduction to Soil Science Lab.	0	0	2	60	40	100	1
BBIO0 -102	Basic Botany Lab	0	0	2	60	40	100	1
BAGE1-109	Water Management & Micro Irrigation Lab.	0	0	2	60	40	100	1
BAGE1-110	Vegetable Production Technology Lab.	0	0	2	60	40	100	1
Total	Theory = 8 Labs = 7	16	7	14	740	760	1500	30

*Those students who had studied Punjabi at matriculation level they will study Punjabi, whereas other students who had not studied Punjabi at matriculation level has to study Basic Punjabi.

** Those students who had studied Medical in 10+2 has to take Mathematics, whereas students who had studied Non-Medical in 10+2 has to take Basic Botany.

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

B. Sc. AGRICULTURE

Total Contact Hours = 37

Total Marks = 1500

Total Credits = 31

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BAGE1-211	Principles of Agricultural Economics	2	1	0	40	60	100	3
BAGE1-212	Plant Pathogens & Principles of Plant Pathology	2	1	0	40	60	100	3
BAGE1-213	Dimensions of Agriculture Extensions	2	1	0	40	60	100	3
BAGE1-214	Agriculture Micro Biology	2	1	0	40	60	100	3
BAGE1-215	Production Technology of Fruit Crops	2	1	0	40	60	100	3
BCAP0-193	Computer Application in Agriculture	2	0	0	40	60	100	2
BAGE1-216	Manures & Fertilizers	2	1	0	40	60	100	3
BMAT0-204	Basic Statistics	2	1	0	60	40	100	3
BBIO0-203 /BMAT0-203	Zoology / Mathematics –II**	2	0	0	60	40	100	2
BAGE1-217	Plant Pathogens & Principles of Plant Pathology Lab	0	0	2	60	40	100	1
BCAP0-194	Computer Application in Agriculture Lab	0	0	2	60	40	100	1
BAGE1-218	Agriculture Micro Biology Lab	0	0	2	60	40	100	1
BAGE1-219	Production Technology of Fruit Crops Practical	0	0	2	60	40	100	1
BAGE1-220	Manures & Fertilizers Practical	0	0	2	60	40	100	1
BBIO0-204	Zoology Lab	0	0	2	60	40	100	1
Total	Theory = 9 Labs = 6	18	7	12	720	780	1500	31

Overall

Semester	Marks	Credits
1 st	1500	30
2 nd	1500	31
Total	3000	61

AGRICULTURAL METEOROLOGY

Subject Code: BAGE1-101

**L T P C
2 1 0 3**

Duration: 45 Hrs.

UNIT – I (12 Hrs.)

Agricultural Meteorology: Definition, Practical Utility and Scope, General Climatology, Structure and Composition of Earth's atmosphere.

UNIT- II (13 Hrs.)

Elements and Factors of Weather and Climate: Temperature, Pressure, Wind, Solar Radiation and Moisture, Impact of Climate on Crops and Livestock Distribution and Production. Agroclimatic Indices: Definitions and Applications in Agriculture.

UNIT- III (10 Hrs.)

Effect of Environmental Factors on Crop Growth, Weather Hazards in Agriculture

UNIT-IV (10 Hrs.)

Climatic Classifications, Agroclimatic Regions of Punjab and India, Elementary Aspects of Weather forecasting, Effects of climate change on agriculture.

Recommended Books

1. D.R. Bates, 'The Earth and its Atmosphere'.
2. J. D. Yeade, 'General Climatology by Critbbfierd & Hewarda'.
3. H. S. Mavi, 'Agriculture Meteorology'.
4. G.S. Mahi, 'Fundamentals of Agro Meteorology'.
5. S.R. Reddy, 'Agro Meteorology'.

COMMUNICATIVE ENGLISH

Subject Code: BHUM0-107

**L T P C
2 1 0 3**

Duration: 45 Hrs.

UNIT-I (Reading) (23 Hrs.)

The prescribed reading textbook for students will be S. P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD), Orient Blackswan. They will go through the reading texts themselves with the help of a dictionary or word power as given at the end. As they progress from one reading to another they should learn to read fast with greater degree of understanding of both concrete and abstract topics. While taking up the textbook lessons in the classroom, the teacher shall ensure that students can do the following:

- 1) Identify the significant points and conclusions as given in the text.
- 2) Handle large texts (even outside the prescribed book) with overall comprehension of the links between arguments and the finer distinction between stated and implied meanings.
- 3) Generally, read the stance or the point of view of the writer and present it in the form of a summary
- 4) Use the vocabulary learnt in the lessons (especially given in „word power“) productively in various writing tasks as suggested at the end of each lesson.
- 5) Profitably use the grammatical items as discussed at the end of each lesson while producing language for communication.

Besides the textbook, the teacher must insist that students extend their reading by taking up additional texts of their own choice.

UNIT-II (Writing) (22 Hrs.)

In addition to the various exercises given at the end of each lesson of Dhanavel's book, the teacher shall use Anne Laws Writing Skills, Orient Blackswan to teach the language and conventions of writing. The students must learn the language that expresses various cognitive

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

functions that are frequently used in writing. With the help of the teacher who will give them adequate practice, the students should be able to:

- 1) Convey information on concrete or abstract topics with clarity and precision.
- 2) Write about objects or events with appropriate detail in both descriptive and narrative form.
- 3) Explain ideas and build up arguments with adequate support in a convincing manner.
- 4) Use language with some degree of flexibility in consideration to the reader.
- 5) Produce effectively such forms of professional writing as business letter, emails, notes, memos, reports summaries etc.

While teaching, the teacher must inculcate in students the habit of revising their writing. The teacher can also use and recommend the relevant sections of the following books for developing writing skills in students.

Recommended Books

1. Vandana R. Singh, 'The Written Word, Oxford University Press', New Delhi.
2. K.K. Ramchandran, et al, 'Business Communication', Macmillan, New Delhi.
3. Swati Samantaray, 'Business Communication and Communicative English', Sultan Chand, New Delhi.
4. S.P. Dhanavel, 'English and Communication Skills for Students of Science and Engineering (with audio CD)'.

INTRODUCTORY AGRICULTURE & PRINCIPLES OF AGRONOMY

Subject Code: BAGE1-102

L T P C

Duration: 48 Hrs.

2 1 0 3

UNIT-I (12 Hrs.)

Definition and Importance of Agriculture; Meaning and scope of Agronomy; Plant Growth and Development: Concept and Differences; General Growth Curves, Factors Affecting Crop production, Classification of Crops.

UNIT-II (13 Hrs.)

Meaning and Types of Tillage and Tilt, Soil Fertility and Productivity, Soil Erosion: Nature, Extent and Types; Soil Conservation- Meaning, Agronomic and Common Mechanical Practices; Agro-climatic Zones of Rajasthan and India.

UNIT-III (12 Hrs.)

National, International Agricultural Research Institutes in India and Abroad. Art, science and business of crop production; Agricultural heritage; Chronological agricultural Technology Development in India; Ancient Indian Agriculture in Civilization Era.

UNIT-IV (11 Hrs.)

Conversion of Man from Food Gatherer to Food Producer; Development of Agriculture Through Kautilya's Work; Tools to Predict Monsoon Rain; Plant Protection in Pncient and Medieval India; Forest Management and Products, History of Some Indigenous Trees.

Recommended Books

1. De, Gopal Chandra, 'Fundamentals of Agronomy', Oxford & IBH Publishing Co., New-Delhi, 1989.
2. 'ICAR Handbook of Agriculture', Indian Council of Agricultural Research, New-Delhi, 1989.
3. Y.B. Morachan, 'Crop Production and Management', Oxford & IBH Publishing Co., New-Delhi, 1986.
4. B.L. Porwal and D.D. Sharma, 'Sashya Vigyan Ke Adhunic Siddhant (Hindi)', Alka Publishers, Ajmer, 1991.

PUNJABI

Subject Code: BHUM0-111

LT P C
2 0 0 2

੧. ਲੇਖ: ਪਹੀਆ ਪ੍ਰਦੂਸ਼ਣ, ਭਰੂਣ ਹੱਤਿਆ ਦੇ ਦੋਸ਼ ਵਿਚ, ਨਾਰੀ ਸ਼ਕਤੀ, ਵਾਤਾਵਰਣੀ ਪ੍ਰਦੂਸ਼ਣ ਅਤੇ ਮਨੁੱਖ, ਏਡਜ਼: ਇਕ ਗੰਭੀਰ ਸੰਕਟ।
੨. ਲੇਖ: ਕੇ. ਐਲ. ਸਹਿਗਲ, ਬੜੇ ਗੁਲਾਮ ਅਲੀ ਖਾਂ, ਸੋਭਾ ਸਿੰਘ, ਪ੍ਰਿਥਵੀਰਾਜ ਕਪੂਰ, ਭਾਈ ਸਮੁੰਦ ਸਿੰਘ
੩. ਪੈਰਾ ਰਚਨਾ
੪. ਪੈਰਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ।
੫. (ੳ) ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ : ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਵਿਧੀਆਂ, ਸਵਰ, ਵਿਅੰਜਨ, ਸੁਰ।
(ਅ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ: ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੋ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ- ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪ ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।

ਏਚੋਮਸਟਨਦਦ ਭੋਕਸ

- ੧ ਗਿਆਨ ਮਾਲਾ (ਵਿਗਿਆਨਕ ਤੇ ਸਮਾਜ-ਵਿਗਿਆਨਕ ਲੇਖਾ ਦਾ ਸੰਗ੍ਰਹਿ), ਸੰਪਾ. ਡਾ. ਸਤਿੰਦਰ ਸਿੰਘ, ਪ੍ਰੋ. ਮਹਿੰਦਰ ਸਿੰਘ ਬਨਵੰਤ, ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
- ੨ ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਬਲਵੰਤ ਗਾਰਗੀ), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
- ੩ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ ਸੁਖਦਿੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ

BASIC PUNJABI

Subject Code: BHUM0-112

LT P C
2 0 0 2

੧. ਪੰਜਾਬੀ ਭਾਸ਼ਾ : ਨਾਮਕਰਣ ਅਤੇ ਸੰਖੇਪ ਜਾਣ ਪਛਾਣ, ਗੁਰਮੁਖੀ ਲਿਪੀ : ਨਾਮਕਰਣ, ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਪੈਂਤੀ ਅੱਖਰ, ਅੱਖਰ ਕ੍ਰਮ, ਸ_ਰ ਵਾਹਕ (ੳ ਅ ਏ), ਲਗਾਂ ਮਾਤਰਾ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ।
੨. ਗੁਰਮੁਖੀ ਆਰਥੋਗ੍ਰਾਫੀ ਅਤੇ ਉਚਾਰਨ : ਸ_ਰਾਂ ਦੀ ਵੰਡ ਅਤੇ ਉਚਾਰਨ (ਲਘੂ-ਦੀਰਘ ਸਰ) : ਸ_ਰ ਅਤੇ ਲਗਾਂ ਮਾਤਰਾ : ਵਿਅੰਜਨਾਂ ਦੀ ਵੰਡ ਅਤੇ ਉਚਾਰਨ : ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣਾਂ (ਹ, ਰ, ਵ) ਦਾ ਉਚਾਰਨ : ਲ ਅਤੇ ਲ ਦਾ ਉਚਾਰਨ : ਭ, ਧ, ਢ, ਝ, ਞ ਦਾ ਉਚਾਰਨ; ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣਾਂ ਦਾ ਉਚਾਰਨ।
੩. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਰਚਨਾ : ਸਾਧਾਰਨ ਸ਼ਬਦ; ਇਕੱਲਾ ਸ_ਰ (ਜਿਵੇਂ ਆ); ਸ_ਰ ਅਤੇ ਵਿਅੰਜਨ (ਜਿਵੇਂ ਆਰ) : ਵਿਅੰਜਨ ਅਤੇ ਸ_ਰ (ਜਿਵੇਂ ਪਾ); ਵਿਅੰਜਨ ਸ_ਰ ਵਿਅੰਜਨ (ਜਿਵੇਂ ਪਾਰ); ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ; ਲਿੰਗ-ਪੁਲਿੰਗ, ਇਕ ਵਚਨ-ਬਹੁ ਵਚਨ; ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ; ਖਾਣ-ਪੀਣ ਅਤੇ ਸਾਕਾਦਾਰੀ ਨਾਲ ਸੰਬੰਧਿਤ।

INTRODUCTION TO SOIL SCIENCE

Subject Code: BAGE1-103

L T P C
2 1 0 3

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Concept of land: Soil and Soil Science; Composition of Earth Crust and its Relationship with soils; Rocks and Minerals; Weathering. Soil Forming Factors and Processes; Soil Profile; Soil Colour; Elementary Knowledge of Taxonomic Classification of Soils; Soils of Punjab and India; Soil Physical Properties.

UNIT-II (11 Hrs.)

Soil Texture: Textural Classes; Soil Structure - Classification, Soil Aggregation and Significance, Soil Consistency, Soil Crusting, Bulk Density and Particle Density of Soils and Porosity, Their Significance and Manipulation.

UNIT-III (12 Hrs.)

Soil Water: Retention and Potentials, Soil Moisture Constants, Movement of Soil Water- Infiltration, Percolation, Permeability, Drainage and Methods of Determination of Soil Moisture, Thermal Properties of Soil, Soil Temperature, Soil Air Composition, Gaseous Exchange, Influence of Soil Temperature and air on Plant Growth.

UNIT-IV (10 Hrs.)

Soil Colloids: Properties, Nature, Types and Significance; Sources of Charges in Clay Minerals; Introduction to Salinity and alkalinity, Ion Exchange, CEC; AEC –Factors Affecting and Adsorption of Ions; Soil Organic Matter Decomposition, Mineralization, Humus; Carbon Cycle, C: N Ratio; Soil Organisms and Their Beneficial and Harmful Roles.

Recommended Books

1. J.L. Sehgal, 'Pedology'.
2. Nyle C. Brady & Ray R. Well, 'Nature and Properties of Soil'.
3. T.D. Biswas and S.K. Mukherjee, 'Text Book of Soil Science', Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2006.
4. D.K. Das, 'Introductory Soil Science', Kalyani Publishers, New Delhi, 2002.
5. M.M. Rai, 'Principles of Soil Science', Mac Millan India Ltd, New Delhi, 2002.
6. R.K. Mehra, 'Text Book of Soil Science', ICAR, New Delhi, 2004.

BASIC BOTANY

Subject Code: BBIO0-101

**L T P C
2 1 0 3**

Duration: 45 Hrs.

UNIT-I (10 Hrs.)

Classification and Introduction to Different Groups of the Plant Kingdom, A General Outline of the Studies of an Angiosperm, Life Cycle of a Flowering Plant; Annuals, Biennials and Perennials.

UNIT-II (15 Hrs.)

Morphology: Seed Structure of Seeds of: Gram, Castor, Maize, and Process of Germination.

Roots: External Characters and functions, types of root systems and their bearing on agriculture practices. Modifications of Roots and Their Significance.

Stem: External characters and functions, buds and their types, spines and ordinary branches, branching systems; stem as an organ of vegetative propagation, modification of stem.

Leaf: Parts of a typical leaf and their functions; simple and compound leaves and their functions, venation and modifications of leaves; uses of leaves.

Inflorescence: Elementary knowledge of simple and special types of inflorescences.

Flower: Structure and functions of floral parts, modifications, nectaries, floral diagram, floral formulae and vertical section of a flower, structure of the thalamus and insertion of the floral appendages on the thalamus, placentation.

Pollination: Pollination Mechanism, Agencies Responsible (Anemophily and Entomophily) for Pollination, Contrivances for Cross Pollination.

Fertilization: Fertilization and Seed Formation. Structure of Orthotropus, and Anatropous ovule, Embryo in Capsella only.

Reproduction in Plants: Vegetative, and sexual reproduction their merits and demerits. Natural and Artificial methods.

Fruits: Elementary knowledge of Fruits, Dispersal of Seeds and Fruits with Examples from

Punjab.

UNIT-III (10 Hrs.)

Anatomy: An Elementary Account of the Various Tissues and their Functions, Internal Structure of a Stem (Dicot and Monocot), Root and Leaf.

UNIT-IV (10 Hrs.)

Classification: Diagnostic Characters (floral), Economic Importance and General Characters of Solanaceae, Malvaceae, Cruciferae, Graminae, Compositae.

Recommended Books

1. L.D. Dutta, 'Text Book of Botany'.
2. I. R.D. Vidyarthi, 'Text Book of Botany Part'.
3. Widge & Bhatia, 'Introduction of Botany'.
4. C. Dutta, 'Text Book of Botany', Oxford University Press- India, 2000.
5. K.N. Bhatia and R. Widge, 'Introduction of Botany', Truman Publishers, Jalandhar, 2010.

MATHEMATICS-I

Subject Code: BMAT0-103

**L T P C
2 1 0 3**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Mensuration: Mensuration of Rectangles, Easy Examples of Garden Paths, Cost of Planting Trees and Fencing Gardens, Area of Right Angled Triangles Area and Height of Isosceles and Equilateral Triangles, Area of Triangles in Terms of Sides, Rent of Field. Area of Parallelograms, Rhombus, Quadrilateral and Trapezoid, Volumes of Cubes & Cylinders Regular Polygons with Emphasis on Hexagon and Octagon, Simple Cases of Similar Figures, Circumference and Area of Circles. Circular Rings. Cost of Fencing Circular Fields and Paths,

(N. B. Easy numerical examples bearing on Science of agriculture only to be set. Proofs of formulae not required.)

UNIT-II (12 Hrs.)

Algebra: Solution of Quadratic Equations and of Those Reducible to Quadratic Equation. (One Variable), Theory of Quadratic Equations, Relation between Roots and Co-Efficient, Algebra: Series: Nth Terms Sum to N Terms of an A. P. and G. P. Nth Term of an H. P. (Excluding Means And Problems On Numbers Etc.). Permutation and Combinations, Simple Problems Only. (Proofs Of Formulae Not Required). Binomial Theorem, Statement for any Index: Expansion Particular Term Coefficient of N, Summation of Simple Infinite Series Evaluation Cube Root Etc. Correct to a Certain Place of Decimal.

UNIT-III (11 Hrs.)

Co-ordinate Geometry:

- (1) The point-distance and section formulae area of a triangle.
- (2) The straight line equation in the following standard forms:

$$x = a, y = b, y = mx, y = mx + c, \frac{x}{a} + \frac{y}{b} = 1$$

$$x \cos \theta + y \sin \theta = p \quad y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$$

Reduction of Equation $ax+by+c=0$: to (a) Slope (b) Intercept Form (c) Perpendicular Form (only method of reduction and not proof); point of intersection and, Concurrence, Angle of Intersection of Lines $y = m_1x + c_1$, $y = m_2x + c_2$, and Equations of line (a) Parallel and (b) Perpendicular to a given line and Passing through a given point.

UNIT-IV (10 Hrs.)

The circle- equation when (i) Centre and Radius given. (ii) Passes through Three Points (iii) Extremities of a Diameter given; the equation $x^2+y^2+2gx+2fy+c=0$ represents circle, center and radius, equations of the tangents and normal at any point of circle (only use formula no proof).

Recommended Books

1. D.C. Kapoor & Gurbax Singh, 'Algebra'.
2. T.N. Nagpal & K. K. Gupta, 'Algebra'.
3. R.S. Dehiya, 'Comprehensive Calculus'.
4. R.K. Sondhi, 'New Style Co-ordinator Geometry'.
5. Jiwan, 'Trigonometry'.

WATER MANAGEMENT AND MICRO IRRIGATION

Subject Code: BAGE1-104

L T P C

Duration: 45 Hrs.

2 1 0 3

UNIT-I (10 Hrs.)

Irrigation- Definition and Objectives; Water Resources and Overtime Irrigation Development in India and Punjab

UNIT-II (13 hrs)

Plant Water Relationships; Water Requirement Major Crops and The Methods of Determination of Water Requirements; Effective Rainfall, Mulching and Criteria of Scheduling Irrigation

UNIT-III (12 Hrs.)

Methods of Irrigation- Surface, Sprinkler and Drip Irrigation; Irrigation Efficiency Measures; Conjunctive Use of Water; Agricultural Drainage

UNIT-IV (10 Hrs.)

Water Management in Rice, Wheat, Maize, Cotton, Groundnut, Moongbean, Sugarcane, Mustard, Kinnow, Mango and Main Vegetable Crops-Potato, Tomato and Okra

Recommended Books

1. A.M. Michael, 'Irrigation - Theory and Practice', Vikas Publishing House Pvt. Ltd., New-Delhi, 1987.
2. S.S. Parihar and B.S. Sandhu, 'Irrigation of Field Crops- Principles and Practices', ICAR, New-Delhi, 1978.
3. D. Lenka, 'Irrigation and Drainage', Kalyani Publishers, New-Delhi, 1999.
4. G.H. Sankara Reddy and T. Yellamanda Reddi, 'Efficient use of Irrigation Water', Kalyani Publishers, New-Delhi, 1995.
5. S.R. Reddy, 'Principles of Crop Production', Kalyani Publishers, New-Delhi, 2000.
6. D.K. Majumdar, 'Irrigation Water Management- Principles and Practice', Prentice Hall of India, New-Delhi, 2004.

VEGETABLE PRODUCTION TECHNOLOGY

Subject Code: BAGE1-105

L T P C

Duration: 45 Hrs.

2 1 0 3

UNIT-I (12 Hrs.)

Importance of Olericulture; Vegetable Gardens; Origin of Vegetables, Classification, area, yield and production and varieties of important vegetable gardens

UNIT-II (12 Hrs.)

Package of Practices of Tomato, Brinjal, Chillies, Okra, Cucurbitaceous Vegetables: Cucumber, Ridge Gourd, Ash Gourd, Snake Gourd, Bottle Gourd, Bitter Gourd and Melons

UNIT-III (11 Hrs.)

Package of practices of Cole crops - Cabbage, Cauliflower, Broccoli and Knol-khol; Bulb crops - Onion and Garlic; Beans and Peas - French beans, Cluster Beans, Dolichos Beans, Peas and Cowpea

UNIT-IV (10 Hrs.)

Package of Practices of Tuber crops - Potato, Sweet Potato, Tapioca, Colocasia; Root Crops - Carrot, Radish, Turnip and Beet root; Leafy vegetables - Palak, Methi, and Lettuce

Recommended Books

1. H.C. and W.C. Kelly, 'Vegetables Crops', Tata McGraw Hill.
2. D.V.S. Chauhan, 'Vegetable Production in India', Ram Prasad & Sons, Agra.
3. T.K. Bose, 'Vegetables', Naya Prokash, Calcutta.
4. S.P. Singh, 'Production Technology of Vegetables Crops', Agril. Res. Communication Centre, Karnal.
5. Centre, Karnal.
6. B. Choudhary, 'Vegetables', NBT, New Delhi.

AGRICULTURAL METEOROLOGY LAB.

Subject Code: BAGE1-106

L T P C

0 0 2 1

PRACTICALS

Site Selection for Agrometeorological Observatory, Project on Setting up, Recording and Maintenance of Instruments in a Meteorological Observatory. Measurement of Temperature, Rainfall, Evaporation, Atmospheric Pressure, Sunshine Duration, Solar Radiation, Wind Direction, Wind Speed and Relative Humidity, Study of Weather Forecasting and Synoptic Chart. Processing, Presentation and Interpretation of Climatic Data in relation to Crops.

COMMUNICATIVE ENGLISH LAB.

Subject Code: BHUM0 -108

L T P C

0 0 2 1

Listening Comprehension: Listening to Short Talks, Lectures, Speeches (Scientific, Commercial and General in Nature) Practical: Listening to at Least Two Tape, Recorded Conversations Aimed at Testing the Listening Comprehension of Students; Communication: Spoken English, Oral Communication, Importance Stress and Intonation. Practical: Spoken English Practice by Using Audio-visual Aids, The Essentials of Good Conversations, Oral Exercises in Conversation Practice; Oral Presentation of Reports: Seminars and Conferences, Features of Oral Presentation, Regulating Speech, Physical Appearance, Body Language Posture, Eye Contact, Voice, Audience, Preparation of Visual Aids. Practical: One Presentation by Individual on The Given Topic Related to Agriculture, Developing New Technologies in Agriculture Practice of Presentation by using Power Point and LCD Projector; Conducting Mock Interviews – Testing Initiative, Team Spirit, Leadership, Intellectual Ability – Potential for Development, Memory, Motivation, Objectives, Aptitude Etc., Group Discussions and Debates on Current Topics.

INTRODUCTORY AGRICULTURE & PRINCIPLES OF AGRONOMY LAB.

Subject Code: BAGE1-107

L T P C

0 0 2 1

Identification of Crop Seeds and Plants; Identification of Fertilizers and Manures; Acquaintance with Farm Tools and Implements; Methods of Ploughing and Sowing; Preparation of Seed Beds of Crops; Calculation on Plant Population; Calculation of Soil and Water Losses from Runoff Plots, Identification of Grasses, Legumes and Trees for Soil Conservation.

INTRODUCTION TO SOIL SCIENCE LAB.

Subject Code: BAGE1-108

L T P C

0 0 2 1

Determination of Bulk Density and Particle Density. Aggregate Size Analysis. Soil Moisture Determination. Soil Moisture Constant: Field Capacity, Infiltration Rate, Water Holding Capacity, Soil Mechanical Analysis. Analytical Chemistry - Basic Concepts, Techniques and Calculations, Collection and Processing of Soil Samples for Analysis of Organic Carbon, pH, EC, Available N, P, K and S. Study of a Soil Profile. Identification of Rocks and minerals.

BASIC BOTANY LAB.

Subject Code: BBIO0-102

L T P C

0 0 2 1

Form and Function of Root, Stem & Leaf and Modifications. Different Types of Inflorescence. Representative of Families Included in Theory

WATER MANAGEMENT AND MICRO IRRIGATION LAB.

Subject Code: BAGE1-109

L T P C

0 0 2 1

Determination of Bulk Density and Field Capacity by Field Methods; Determination of Permanent Wilting Point; Measurement of Irrigation Water Through Flumes and Weirs; Calculation of Irrigation Water Requirement; Demonstration of Furrow, Check Basin and Basin Methods of Irrigation; Cost Estimation of Drip Irrigation System; Demonstration of Filter Cleaning, Fertigation, Injection and Flushing of Laterals; Erection and Operation of Sprinkler Irrigation System. Measurement of Emitter Discharge Rate, Wetted Diameter and Calculation of Emitter Discharge Variability; Visit to Farmers' Fields for Demonstration of Conventional and Water Saving Irrigation Systems.

VEGETABLE PRODUCTION TECHNOLOGY LAB.

Subject Code: BAGE1-110

L T P C

0 0 2 1

Planning and Layout of Kitchen Garden. Identification of Important Vegetable Seeds and Plants. Raising of Vegetable Nurseries. Transplanting of Vegetable Seedlings in main field. Layout of Kitchen Garden and its Maintenance. Seed Extraction in Tomato and Brinjal. Visit to Commercial Vegetable Farms. Intercultural Operations in Vegetable Plots. Sowing of Potato, Solanaceous Fruit Crops, Root Crops and Cucurbitaceous Vegetables. Seed

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

Production in Vegetable Crops. Harvesting Indices of Different Vegetable Crops. Grading and Packing of Vegetables.

PRINCIPLES OF AGRICULTURE ECONOMICS

Subject Code: BAGE1-211

L T P C
2 1 0 3

Duration: 45 Hrs.

UNIT – I (12 Hrs.)

Economics: Meaning, Definition, Subject Matter, Basic Concepts: Want, Utility, Satisfaction, Income, Wealth, Welfare etc.; Theory of Consumption: Marginal Utility Analysis, Indifference Curves; Consumer's Surplus

UNIT – II (12 Hrs.)

Demand: Meaning, Definition, Kinds of Demand, Law of Demand, Change in Demand. Elasticity of Demand Types, Degrees, Methods of Measurement, Importance and Factors Influencing Elasticity of Demand; Supply, Elasticity of Supply, Factors Affecting Supply

UNIT – III (11 Hrs.)

Definition and Characteristics of Perfect Competition, Pure Competition, Monopolistic Competition, Oligopoly and Monopoly; Price Determination Under Different Market Situations; Marginal Productivity Theory of Distribution

UNIT – IV (10 Hrs.)

National Income: Concepts, Measurement, Meaning, Definition and Importance; Classical and Keynesian Approaches, Effective Demand, Multiplier, Accelerator. National Income - Concepts and Measurement; Inflation – Meaning, Definition, Kinds of Inflation

Recommended Books

1. K.K. Dewett and J.D. Verma, 'Elementary Economic Theory', S. Chand & Company, New Delhi, 1986.
2. P.A. Samuelson & W.D. Nordhaus, 'Economics', McGraw Hill, Singapore, 1987.
3. S.K. Mishra and V.K. Puri, 'Indian Economy', Himalaya Publishing House, New Delhi, 1996.
4. G.B. Jathar and S.G. Beri, 'Elementary Principles of Economics', 10th Edn., Oxford University Press Delhi, 1996.
5. Berkeley Hill, 'An Introduction to Economics for Students of Agriculture', Pergaman Press, Oxford, 1980.

PLANT PATHOGENS & PRINCIPLES OF PLANT PATHOLOGY

Subject Code: BAGE1-212

L T P C
2 1 0 3

Duration: 45 Hrs.

UNIT – I (13 Hrs.)

Introduction, Important Plant Pathogenic Organisms, Different Groups, Fungi, Bacteria, Fastidious Vesicular Bacteria, Phytoplasmas, Spiroplasmas, Viruses, Virioids, Algae, Protozoa and Phanerogamic Parasites with Examples of Diseases Caused by Them. General Characters of Fungi, Definition of Fungus, Somatic Structures, Types of Fungal Thalli, Fungal Tissues, Modifications of Thallus, Reproduction in Fungi (Asexual and Sexual). Nomenclature, Binomial System of Nomenclature, Rules of Nomenclature, Classification of Fungi. Key to Divisions and Sub-Divisions.

UNIT – II (11 Hrs.)

Introduction: Definition and Objectives of Plant Pathology. History of Plant Pathology. Terms and Concepts in Plant Pathology. Survival and Dispersal of Plant Pathogens. Phenomenon of Infection – Pre-Penetration, Penetration and Post Penetration. Pathogenesis –

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

Role of Enzymes, Toxins, Growth Regulators and Polysaccharides. Defense Mechanism in Plants – Structural and Bio-chemical (Pre and Post- Infection). Plant Disease Epidemiology. Plant Disease Forecasting.

UNIT – III (12 Hrs.)

General Principles of Plant Diseases Management – Importance, General Principles – Avoidance, Exclusion, Protection – Plant Quarantine and Inspection. Cultural Methods: Rouging, Eradication of Alternate and Collateral Hosts, Crop Rotation, Manure and Fertilizer Management, Mixed Cropping, Sanitation, Hot Weather Ploughing, Soil Amendments, Time of Sowing, Seed Rate and Plant Density, Irrigation and Drainage. Role and Mechanisms of Biological Control and PGPR.

UNIT - IV (10 Hrs.)

Physical Methods: Heat and Chemical Methods, Methods of Application of Fungicides, Host Plant Resistance – Application of Biotechnology in Plant Disease Management: Development of Disease Resistant Transgenic Plants Through Gene Cloning. Integrated Plant Disease Management (IDM): Concept, Advantages and Importance.

Recommended Books

1. R S. Singh, 'Plant Diseases', 8th Edn., Oxford and IBH Publishing Co. Pvt. Ltd. India, 2007.
2. A.A. Cook, 'Diseases of Tropical and Sub-Tropical Field Fiber and Oil Plants', Mac Millan Publishing Co. New York, 1981.
3. V.K. Gupta and Y.S. Paul, 'Diseases of Field Crops', Indus Publishing Co. India, 2002.
4. R.S. Mehrotra and A. Aggarwal, 'Plant Pathology', 2nd Edn., Tata McGraw-Hill Publishing Co Ltd. India, 2007.
5. A. Mishra, A. Bohra and A. Mishra, 'Plant Pathology', Agrobios. Jodhpur (India), 2005.
6. G. Rangaswamy and A. Mahadevan, 'Diseases of Crop Plants in India', Prentice Hall of India Pvt. Ltd., 2001.

DIMENSIONS OF AGRICULTURAL EXTENSION

Subject Code: BAGE1-213

L T P C
2 1 0 3

Duration: 45 Hrs.

UNIT – I (13 Hrs.)

Education: Meaning and Types. Extension Education and Agricultural Extension: Meaning, Objectives, Principles and Philosophy.

UNIT – II (11 Hrs.)

Importance and Problems of Rural Development. Agricultural and Rural Development Programmes of Pre and Post-Independence Era.

UNIT – III (10 Hrs.)

Powers, Functions and Organizational Set-Up of Three-Tier Panchayati Raj System.

UNIT – IV (11 Hrs.)

New Trends in Extension Education and Privatization of Extension. Women Development Programmes. Emergence of Broad Based Extension

Recommended Books

1. S. Mondal and G.L. Ray, 'A Text book of Rural Development', Kalyani Publishers, Chennai, 2007.
2. O.P. Dharma and O.P. Bhatnagar, 'Education and Communication for Development', Oxford, IBH, New Delhi, 2003.
3. A.R. Desai, 'Rural Sociology in India', Popular Prakashan, Bombay, 2003.
4. R.B. Samanta, 'Agricultural Extension in Changing World Perspective', UDH Publishing, New Delhi, 1991.

B.Sc. AGRICULTURE SYLLABUS 2016 BATCH ONWARDS

5. G.L. Ray, 'Extension Communication and Management', Kalyani Publishers, Chennai, 2007.

AGRICULTURAL MICROBIOLOGY

Subject Code: BAGE1-214

L T P C
2 1 0 2

Duration: 45 Hrs.

UNIT – I (12 Hrs.)

History of Microbiology – Its Applied Areas. Discovery of Microorganisms and Their role in Fermentation. Germ Theory of Disease and Mechanisms of Protection Against Them. Structure of Eukaryotic and Prokaryotic Cell. Major Groups of Eukaryotes: Fungi, Algae and Protozoa.

UNIT – II (12 Hrs.)

Major Groups of Prokaryotes: Actinomycetes, Cyanobacteria, Arhaebacteria, Rickettsias and Chlamydia. Bacterial Growth. Metabolism in Bacteria – ATP Generation. Chemoautotrophy, Photoautotrophy, Respiration, Fermentation. Bacteriophages: Structure and Properties, Lytic and Lysogenic Cycles, Virioids, Prions. Genetic Recombinations. Microbial Groups in Soil.

UNIT – III (11 Hrs.)

Microbial Transformation of Carbon, Nitrogen, Phosphorus and Sulphur. Biological Nitrogen Fixation. Microbes in Composting. Microbiology of Water and Food. Beneficial Microorganisms in Agriculture – Biofertilizers, Microbial Pesticides.

UNIT –IV (11 Hrs.)

Biodegradation. Biogas Production. Plant–Microbe Interactions. Introduction to Mushrooms and Mushroom Growing. Edible and Poisonous Mushrooms. Cultivation Technology of Mushrooms.

Recommended Books

1. N. Mukherjee and T. Ghosh, 'Agricultural Microbiology', Kalyani Publishers, New Delhi, 1998.
2. Jr. Pelczar, J. Michel, E.C.S. Chan and Noel R. Krieg, 'Microbiology', Tata McGraw - Hill Edition, India, 1993.
3. G. Rangaswami and D.J. Bagyaraj, 'Agricultural Microbiology', Prentice Hall of India Pvt. Limited, New Delhi, 1993.
4. N.S. Rao, 'Soil Microbiology', Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.
5. K. Vishnavat and S.J. Kolte, 'Essentials of Phytopathological Techniques', Kalyani Publishers, New Delhi, 2005.

PRODUCTION TECHNOLOGY OF FRUIT

Subject Code: BAGE1-215

L T P C
2 1 0 3

Duration: 45 Hrs.

UNIT – I (13 Hrs.)

Definition, Importance and Divisions of Horticulture. Climatic Zones, Area and Production of Different Fruit Crops Selection of Site, Fencing and Wind Break. Planting Systems, High Density Planting, Planning and Establishment

UNIT - II (12 Hrs.)

Propagation Methods: Conventional and Non-Conventional Methods of Training and Pruning. Use of Growth Regulators in Fruit Production.

UNIT –III (10 Hrs.)

Fundamentals for Cultivation of Horticultural Crops, Package of Practices for the Cultivation of Major Fruits: Mango, Citrus, Grapes, Guava, Apple, Litchi and Papaya.

UNIT –IV (10 Hrs.)

Package of Practices for the Cultivation of Minor fruits: Pineapple, Pomegranate, Ber, Fig, Loquat, Banana, Phalsa, Pear, Plum, Peaches.

Recommended Books

1. T.K. Bose., J. Kabir, P. Das and P.P. Joy, 'Tropical Horticulture', Naya Prokash, Calcutta, 2000.
2. Amar Singh, 'Fruit Physiology and Production', Kalyani Publishers, New Delhi, 1986.
3. S.P. Singh, 'Commercial Fruits', Kalyani Publishers, New Delhi, 1997.
4. S.K. Mitra, T.K. Bose and D.S. Rathore, 'Temperate Fruits', Horticulture & Allied Publishers, Calcutta, 1991.
5. V.A. Parthasvathy, P.K. Chattopadhyay and T.K. Bose, 'Plantation Crpos', Naya Prokash, Kolkatta, 2006.
6. J.S. Bal, Fruit Growing', Kalyani Publishers, New Delhi, 1997.
7. Atul Chandra and Anju Chandra, 'Production and Post-Harvest Technology of Fruits', NBS Publisher & Distributers, Bikaner.

COMPUTER APPLICATIONS IN AGRICULTURE

Subject Code: BCAP0-193

**L T P C
2 0 0 2**

Duration: 45 Hrs.

UNIT – I (13 Hrs.)

Introduction: Characteristics of a Computers; Evolution and Classification of Computer; Limitations of Computer; Application of Computer in Agriculture and Related Fields; Computer Hardware and Software; Input and Output Devices; Memory and Storage Devices, Typical Specifications of a Computer.

UNIT – II (12 Hrs.)

Operating System: Types and Functions; Classification of Programming Languages; Language Translators; Computer Viruses.

UNIT – III (10 Hrs.)

Microsoft Windows: Microsoft World, Power Point, Spreadsheet Applications in Agriculture, Database Application in Agriculture, Expert Systems in Agriculture, Analysis and Forecasting with Examples.

UNIT – IV (10 Hrs.)

Internet: World Wide Web (WWW), Web Browsing, Electronic mail and Bluetooth.

Recommended Books

1. P.K. Sinha, 'Fundamentals of Computers'.
2. V. Rajaraman, 'Fundamentals of Computers'.
3. Satish Jain, 'Information Technology'.

MANURES AND FERTILIZERS

Subject Code: BAGE1-216

**L T P C
2 1 0 3**

Duration: 45 Hrs.

UNIT – I (13 Hrs.)

Fertilizers: Classification, Manufacturing Processes and Properties of Major Nitrogenous (Ammonium Sulphate, Urea, Calcium Ammonium Nitrate, Ammonium Nitrate, Ammonium Sulphate Nitrate), Phosphatic (Single Super Phosphate, Enriched Super Phosphate, Diammonium Phosphate, Ammonium Poly Phosphate), Potassic and Complex Fertilizers

UNIT – II (10 Hrs.)

Fate and Reactions of Various Types of Fertilizers in the Soil

UNIT –III (10 Hrs.)

Secondary and Micronutrient Fertilizers and Amendments; Adulteration in Fertilizers; Fertilizer Control Order; Fertilizer Storage

UNIT – IV (11 Hrs.)

Bio-Fertilizers and Their Advantages; Manures: Bulky and Concentrated, Farm Yard and Poultry Manures; Composting: Different Methods, Mechanical Compost Plants, Vermicomposting, Green Manuring, Oil Cakes. Sewage and Sludge: Biogas Plant Slurry, Plant and Animal Refuges.

Recommended Books

1. K.S. Yawalkar and J.P. Agarwal, 'Manure and fertilizers', Agriculture- Horticulture Publishing House, Nagpur, 1992.
2. S.L. Tisdale and W.L. Nelson, 'Soil Fertility and fertilizers', McMillan Pub. Co. N.Y. 1990.
3. V.K. Sanchalli, 'Chemistry and Technology of Fertilizers', Reinhebl Publishing Corporation, New York, USA, 1960.
4. S.L. Chopra and J.S. Kanwar, 'Analytical Agriculture, Chemistry', Kalyani Publishers, New Delhi, 1991.
5. H.L.S. Tandon, 'Soil Water and Fertilizers Analysis', Fertilizer Development and Consultant Organization, New Delhi.

BASIC STATISTICS

Subject Code: BMAT0-204

L T P C

Duration: 45 Hrs.

2 1 0 3

UNIT – I (14 Hrs.)

Statistics: Definition, Applications and Limitations, Frequency Distribution and Frequency Curves; Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean; Measures of Dispersion: Mean Deviation, Standard Deviation, Coefficient of Variation; Basic Applications of Probability Theory; Normal Distribution and its Properties

UNIT – II (11 Hrs.)

Introduction to Sampling, Tests of Significance, Standard Normal Deviate Test for Means, Student's T-test for Single Sample, Two Samples and Paired T-test, F-test, Chi-square test in 2*2 Contingency Tables; Yates Correction for Continuity

UNIT – III (10 Hrs.)

Correlation; Computation of Correlation Coefficient and its Testing; Linear Regression of Y upon X and X upon Y; Interrelation between Correlation and Regression Coefficients

UNIT – IV (10 Hrs.)

Experimental Designs, Layout and Analysis of Completely Randomized Design; Randomized Block Design, Latin Square Design and Factorial Design

Recommended Books

1. V.G. Panse, F.J. Shaw and P.V. Sukhatme, 'Statistical Methods for Agricultural Workers', Indian Council of Agricultural Research.
2. S.P. Gupta, 'Statistical Methods', Sultan Chand & Sons, New Delhi, 2002.
3. S. Singh, T.P. Singh, M.L. Babsal and R. Kumar, 'Statistical Method for Research Workers', Kalyani Publishers, Ludhiana, 2004.

ZOOLOGY

Subject Code: BBIO0 - 203

**L T P C
2 0 0 2**

Duration: 45 Hrs.

UNIT – I (11 Hrs.)

Introduction to Zoology, Description of Typical Animal Cell, Difference Between Plant and Animal Cell. Zoological Nomenclature and Principles of Classification. General Survey of Animal Kingdom up to Phylum in In-Vertebrates and up to Class in Vertebrates.

UNIT –II (12 Hrs.)

Economic Significance and Importance of Amoeba, Entamoeba, Sycon, Plasmodium, Fasciola, Tapeworm, Ascaris, Hirudo, Pharitema, Grasshopper, Locust, Silkworm, Beetle, Red Cotton, Honey Bee, Bug, Mosquito, Rohu, Frog, Snake, Owl, Woodpecker, Hoopoe, Parrot, Horse, Sheep, Rat, Mongoose and Monkey.

UNIT – III (10 Hrs.)

Animals of Economic Importance in Agriculture. Comparison of Digestive and Reproductive System of Horse, Ox and Sheep.

UNIT – IV (10 Hrs.)

Physiology of Respiration Composition of Blood and its function Reproduction, Locomotion in Animals Structure of skin and Heat Regulation General account of Aves.

MATHEMATICS-II

Subject Code: BMAT0 - 203

**L T P C
2 0 0 2**

Duration: 44 Hrs.

UNIT – I (11 Hrs.)

Definition of function; Limit and continuity; The Limit of a Function, Calculating Limits Using the Limit Laws, Limits at Infinity; Horizontal Asymptotes' Derivatives and Rates of Change; The Derivative of a Function

UNIT – II (11 Hrs.)

Differentiation, successive differentiation, geometrical interpretation of derivative, applications of differentiation

UNIT –III (10 Hrs.)

Indefinite integration, integration by substitution

UNIT – IV (10 Hrs.)

Partial fractions and their use in integration; Integration by parts

Recommended Books

1. N. Piskunov, 'Differential and Integral Calculus', Vol. II.
2. G.K.P., 'Differential and Integral Calculus' - Vol. 1.

PLANT PATHOGENS & PRINCIPLES OF PLANT PATHOLOGY LAB.

Subject Code: BAGE1 - 217

**L T P C
0 0 2 1**

Acquaintance to Plant Pathology Laboratory Equipment, Preparation of Culture Media for Fungi and Bacteria, Isolation Techniques and Preservation of Plant Disease Samples, Study of Important Plant Pathogenic Genera, Demonstration of Koch's Postulates. Study of Different Groups of Fungicides and Antibiotics, Bio-Control of Plant Pathogens; Visit to Remote Sensing Laboratory and Experimental Area.

COMPUTER APPLICATIONS IN AGRICULTURE LAB.

Subject Code - BCAP0 - 194

L T P C

0 0 2 1

Applications- MS WORD- Word Processing and Units of Document, Features of Word Processing Packages; Creating, Editing, Formatting and Saving a Document in MS WORD; Prepare Own Bio Data, Writing Mathematical Equations involving Sub/Super Scripts, Splitting a Paragraph in Columns

MS EXCEL: Electronic Spreadsheets; Concept; Packages; Creating, Editing and Saving a Spreadsheet; Diagrammatic Presentations and Use of Data Analysis Tools- Correlation and Regression, T-Test for Two-Samples with One-Way Classification. Creating Diagrams and other Statistical Functions

MS ACCESS: Concept of Database; Units of Database; Creating Database: Illustration through Examples

MS POWER POINT: Prepare Agriculture based Presentation with Special Features (with Photographs, Charts, Bullet Points etc.) of Power Point Package

AGRICULTURE MICROBIOLOGY LAB.

Subject Code - BAGE1 - 218

L T P C

0 0 2 1

Familiarization with Instruments and other Materials used in a Microbiology Laboratory, Preparation of Aseptic Methods on Nutrient Broth, Slants and Agar Plate, Methods of Sterilization and Preparation of Media and Glassware, Sterilization of Nutrient Broth by Filtration, Plating Methods for Isolation and Purification of Bacteria; Identification of Bacteria by Staining Methods; Enumeration of Bacteria by Staining, Pour Plate and Spread Plate Methods; Cultivation Technology of Mushrooms; Tissue Culture Preparation and Maintenance of Edible Fungi, Spawn Production

PRODUCTION TECHNOLOGY OF FRUIT CROPS LAB.

Subject Code - BAGE1 - 219

L T P C

0 0 2 1

Horticultural Tools and Their Uses, Containers and Potting Mixtures, Plant and Seed Propagation, Scarification and Stratification, Layout and Planting Systems, Methods of Pruning and Training, Training of Ber, Grape and Pomegranate, Pruning of Ber, Grape, Phalsa, Fig, Apple, Pear, Peach. Identification of Important Species and Varieties of Fruits, Irrigation Methods Including Drip and Micro Irrigation, Methods of Fertilizer Application, Preparation of Growth Regulators, Powder, Solution and Lanolin Paste for Propagation. Application of Growth Regulators for Improving Fruit Set, Fruit Size, Quality, Delaying and Hastening Ripening. Visit to Local Commercial Orchards.

MANURES & FERTILIZERS LAB.

Subject Code: BCAP0 - 220

L T P C

0 0 2 1

Total Nitrogen and Phosphorus in Manures / Composts – Ammonical and Nitrate Nitrogen – Water Soluble P₂O₅, Potassium, Calcium, Sulphur and Zinc Contents of Fertilizers Chemical

Oxygen Demand in Organic Wastes – Adulteration in Fertilizer – Compatibility of Fertilizers with Pesticides.

ZOOLOGY LAB.

Subject Code: BBIO0 - 204

L T P C

0 0 2 1

Study of Cell Structure and Cell Division; Microscopic Study of Histological Preparations of Simple and Compound Tissues; Anatomy of a Mammal; Slides of Frog Development; General Survey of Animal Kingdom up to Classes.

MRSPTU

**MRSPTU UNDER GRADUATE OPEN ELECTIVES-I 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

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	

PLANT UTILITIES & CONTROL

Subject Code: BFOT0-F91

L T P C
3 0 0 3

Contact Hrs.

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.

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FUNDAMENTALS OF MANAGEMENT

Subject Code: BBAD0-F91

**L T P C
3 0 0 3**

Duration: 40 Hrs

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 Wehrich, Cannice & Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Wehrich, '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.

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PERSONNEL & INDUSTRIAL MANAGEMENT

Subject Code: BBAD0-F92

**L T P C
3 0 0 3**

Duration: 45 Hrs

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. Chhabra, '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
3 0 0 3**

Duration: 40 Hrs.

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.

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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.

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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. Bishnu P. 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
3 0 0 3**

Duration: 37 Hrs.

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.

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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 Learning , 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

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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.

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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	EEE
BEEE0-F95	High Voltage Engineering	
BEEE0-F96	Nano Science and Nano Technology	
BECE0-F94	Communication Systems	ECE
BECE0-F95	Robotics and Automation	
BECE0-F96	Electronic System Design	

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DATA PROCESS ANALYSIS

Subject Code: BFOT0-F92

**L T P C
3 0 0 3**

Contact Hrs.

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 Hotelling 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 2^k factorial design, Fractional replication of the 2^k 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
3 0 0 3**

Duration: 40 Hrs.

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

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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.

ENTREPRENEURSHIP

Subject Code: BBAD0-F95

**L T P C
3 0 0 3**

Duration: 40 Hrs.

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

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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
3 0 0 3**

Duration – 40 Hrs

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.

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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
3 0 0 3**

Duration: 37 Hrs.

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
3 0 0 3**

Duration: 36 Hrs.

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 Course, 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.

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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
3 0 0 3**

Duration: 38 Hrs.

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.

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(UPDATED ON 23.4.2017)**

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	

**MRSPTU UNDER GRADUATE OPEN ELECTIVES-III 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

ADVANCE PROCESS CONTROL

Subject Code: BECE0-F97

**L T P C
3 0 0 3**

Duration: 36 Hrs.

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 Iptak, 'Instrument Engineers Handbook', CRC Press.

DIGITAL SIGNAL PROCESSING

Subject Code: BECE0-F98

**L T P C
3 0 0 3**

Duration: 37 Hrs.

Learning Objectives

1. To study the concept of digital signal processing and its characteristics.
2. To learn discrete Fourier transform and its properties

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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. Oppenheim & 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 Wesley.

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.

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(UPDATED ON 23.4.2017)**

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', Wiley.
3. K.D. Prasad, 'Antenna & Wave Propagation', Satya Parkashan, New Delhi.
4. E.C. Jordan & B.C. Balmain, 'Electromagnetic waves & radiating System', P.H.I.
5. R.E. Collins, 'Antennas and Radio Propagation', McGraw Hill.

**MRSPTU BACHELOR OF SCIENCE (INFORMATIONTECHNOLOGY)
SYLLABUS 2016 BATCH ONWARDS**

Total Contact Hours = 29

Total Marks = 800

Total Credits = 24

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BITE1-101	Trends in Information Technology	3	1	0	40	60	100	4
BITE1-102	Developing Programming Logic and Techniques	3	1	0	40	60	100	4
BHUM0-101	Communicative Skills-I	3	0	0	40	60	100	3
BMAT0-105	Mathematics – I	3	1	0	40	60	100	4
BHUM0-103	Human Values and Professional Ethics	3	1	0	40	60	100	4
BITE1-103	Information Technology Lab	0	0	4	60	40	100	2
BITE1-104	Programming Logic Lab	0	0	4	60	40	100	2
BHUM0-102	Communication Skills Lab-I	0	0	2	60	40	100	1
Total	Theory = 5 Labs = 3	15	4	10	380	420	800	24

Total Contact Hours = 30

Total Marks = 800

Total Credits = 25

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BHUM0-213	Communication Skill – II	3	1	0	40	60	100	4
BMAT0-206	Mathematics – II	3	1	0	40	60	100	4
BITE1-205	Object Oriented Programming	3	1	0	40	60	100	4
BITE1-206	Fundamental of Digital Electronics	3	1	0	40	60	100	4
BESE0-101	Environmental Science	3	1	0	40	60	100	4
BITE1-207	Object Oriented Programming Lab	0	0	4	60	40	100	2
BITE1-208	Digital Electronics Lab.	0	0	4	60	40	100	2
BHUM0-214	Communication Skill Lab.-II	0	0	2	60	40	100	1
Total	Theory = 5 Lab = 3	15	5	10	380	420	800	25

**MRSPTU BACHELOR OF SCIENCE (INFORMATIONTECHNOLOGY)
SYLLABUS 2016 BATCH ONWARDS**

Total Contact Hours = 26

Total Marks = 800

Total Credits = 24

SEMESTER 3 rd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BITE1-309	Data structure	3	1	0	40	60	100	4
BITE1-310	Computer system architecture	3	1	0	40	60	100	4
BITE1-311	Operating system	3	1	0	40	60	100	4
BITE1-312	System Programming	3	1	0	40	60	100	4
BITE1-313	Data structure Lab.	0	0	2	60	40	100	1
BITE1-314	Operating system Lab.	0	0	2	60	40	100	1
Departmental Elective – I (Select any one)		3	0	0	40	60	100	3
BITE1-356	Management information systems							
BITE1-357	E-Commerce							
BITE1-358	Multimedia and Applications							
Open Elective-1		3	0	0	40	60	100	3
Total		18	4	4	360	440	800	24

Total Contact Hours = 26

Total Marks = 800

Total Credits = 24

SEMESTER 4 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BITE1-415	Computer Networks	3	1	0	40	60	100	4
BITE1-416	Embedded Systems	3	1	0	40	60	100	4
BITE1-417	Data Base Management Systems	3	1	0	40	60	100	4
BITE1-418	System Analysis & Design	3	1	0	40	60	100	4
BITE1-419	Computer Networks lab	0	0	2	60	40	100	1
BITE1-420	Database management system lab	0	0	2	60	40	100	1
Departmental Elective – II (Select any one)		3	0	0	40	60	100	3
BITE1-459	Design & Analysis of Algorithms							
BITE1-460	Computer Peripherals and Interfaces							
BITE1-461	Enterprise Resource Planning							
Open Elective-II		3	0	0	40	60	100	3
Total		18	4	4	360	440	800	24

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Total Contact Hours = 23

Total Marks = 600

Total Credits = 19

SEMESTER 5 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BITE1-521	Programming in Java	3	1	0	40	60	100	4
BITE1-522	Web Technologies	3	1	0	40	60	100	4
BITE1-523	Software Engineering	3	1	0	40	60	100	4
Departmental Elective – III (Select any one)		3	0	0	40	60	100	3
BITE1-562	Artificial Intelligence							
BITE1-563	Expert Systems							
BITE1-564	Data Warehousing & Mining							
BITE1-524	Programming in Java Lab.	0	0	2	60	40	100	1
BITE1-525	Minor Project	0	0	6	60	40	100	3
Total		12	3	8	280	320	600	19

Total Contact Hours = 24

Total Marks = 600

Total Credits = 19

SEMESTER 6 th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BITE1-626	Mobile Application Development	3	1	0	40	60	100	4
BITE1-627	Linux Administration	3	1	0	40	60	100	4
Departmental Elective – IV (Select any one)		3	0	0	40	60	100	3
BITE1-665	Cloud Computing							
BITE1-666	Network Security							
BITE1-667	Software Testing and Quality Assurance	3	0	0	40	60	100	3
Departmental Elective – V (Select any one)								
BITE1-668	Modelling and Simulation							
BITE1-669	Cyber Laws and IPR							
BITE1-670	Software Project Management	0	0	8	60	40	100	4
BITE1-628	Major Project							
BITE1-629	Mobile Application Development Lab.							
Total		12	2	10	280	320	600	19

Semester	Marks	Credits
1 st	800	24
2 nd	800	25
3 rd	800	24
4 th	800	24
5 TH	600	19
6 TH	600	19
Total	3200	135

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TRENDS IN INFORMATION TECHNOLOGY

Subject Code – BITE1-101

L T P C

Duration – 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Introduction to Computer: Computer System Characteristics, Hardware - CPU, Memory, Input, Output & Storage Devices, Organization of Secondary Storage Media, Software - System & Application, Types of processing Batch and On-line

UNIT-II (10 Hrs.)

Operating System Concepts: Role of an Operating System, Types of operating systems, Booting Procedure and Its Types, Fundamentals and Typical Instructions of Windows & Non-Windows based Operating Systems.

UNIT-III (12 Hrs.)

Computer Software: What is Software? Relationship between Hardware and Software, Logical System Architecture showing relationship between hardware, Types of Software: System Software, Application Software, Firmware, Functions of System Software, Type of **System Software:** Operating Systems, Language Translators, Utility Programs, Communications Software. Application Software, Commonly Used Application Software: Word Processing, Spreadsheet, Database, Graphics Personal Assistance, Education, Entertainment Software. Open Source Terminologies: Open Source Software, Freeware, Shareware, Proprietary Software, FLOSS, GNU, FSF, OSI.

UNIT-IV (11 Hrs.)

Advanced Trends in IT Wireless: Mobile Internet, GPS, 3G, 4G, Wi-Fi, Bluetooth, Social Networking, Cloud Technology, Virtual LAN Technology, Firewall, M-Commerce, Nanotechnology, Virtual Reality, BPO and KPO, Social and Ethical Issue YouTube, FaceBook, LinkedIn, Orkut.

Recommended Books

1. Peter Nortorn's, 'Introduction to Computer', Tata McGraw Hill, 2004.
2. R.K. Taxali, 'Introduction to Software Package', Galgotia Publications.
3. P.K. Sinha, 'Introduction to Computer'.

DEVELOPING PROGRAMMING LOGIC AND TECHNIQUES

Subject Code – BITE1-102

L T P C

Duration – 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Language Evolution Machine Language, Assembly Language, High Level Language. Translators: Compiler, Interpreter and Assembler. The Compilation Process, Linker, Loader, Study of HLL, Characteristics of Good Language, Generation of Languages, Study of Programming Languages (Function Oriented, Object Oriented, Event-Based).

UNIT-II (11 Hrs.)

Programming Construction Tools Problem Analysis, Process Analysis, Conceptual Development of Solution. Development Tools: Algorithm: Types of Algorithm, Algorithm of Analysis, Advantage and Disadvantage of Algorithm, Complexity of Algorithm, Big-O Notation Flowcharts: Types of Flowcharts, Advantage and Disadvantage of Flowchart. Pseudo Code: Definition and Its Characteristics.

UNIT-III (12 Hrs.)

Control Statements Basics of Programming Language: Usage of Character Set, Meaning

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of Keywords and Identifiers, Role of Data Types, Constants and Variables. Importance of Casting, Different Types of Operators and their Precedence, Expressions, Conditional Statements (One-Way, Two-Way and Multi-Way Conditional), Looping Statements (For, While, do-while), Usage of Exit, Continue, Break and Goto Statement.

UNIT-IV (10 Hrs.)

Arrays Arrays: Arrays, one dimensional array, Various Operation on Array (Inserting of Element, Deleting of Element, Rotating List, Sorting, Searching, Merging Etc.) and Two dimensional arrays (Matrix Addition, Transpose of Matrix, Matrix Multiplication), Modular programming and its features.

Recommended Books

1. Behrouz Forouzan, 'Basic of Computer Science', Cengage Learning.
2. Horowitz, Sahani, 'Fundamental of Computer Algorithm', Orient Longman.
3. Maureen Sprankle, 'Problem Solving Programming Concepts', 7th Edn., Pearson, 2009.

MATHEMATICS-I

Subject Code: BMAT0-105

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Set Theory: Sets, Type of sets, Set operations, Principle of Inclusion-Exclusion, Cartesian product of sets, Partitions.

Logic: Propositions, Implications, Precedence of logical operators, Truth table, Arguments and validity of arguments, equivalence and implication laws of logic, Principle of Mathematical induction.

UNIT-II (11 Hrs.)

Relations: Relations and diagraph, n-ary relations and their applications, properties of relations, representing relations, closure of relation, equivalence relation, operation on relations, partial ordering.

Functions: Functions, One-to-one Functions, Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.

UNIT-III (11 Hrs.)

Matrix Algebra

Matrices, types of matrices, operations on matrices, determinants, inverse of a matrix, Elementary transformations, Rank of a matrix, solution of simultaneous linear equations using Cramer's rule and matrix inversion method. Consistency of linear equations by Rank Method.

UNIT-IV (12 Hrs.)

Graph Theory.

Graphs: Introduction to Graph, Graph terminology, Representing graphs and Graph Isomorphism, Connectivity, Euler Paths and Circuits, Hamiltonian paths and circuits, Shortest Path Problems, Planar Graphs.

Trees: Trees, labelled trees, Tree Traversal, Undirected trees, Spanning Trees, Minimum spanning trees.

Recommended Books

1. Richard Johnsonbaugh, 'Discrete Mathematics', 5th Edn., Pearson Education, Asia.
2. M.N.S. Swami. & E. Thisiraman, 'Graphics Networks and Algorithms', 2nd Edn., John Wiley and Sons.
3. Seymour Lipschutz & Max Lans Lipson, 'Discrete Mathematics', Tata McGraw Hill.

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COMMUNICATION SKILLS-I

Subject Code: BHUM0-101

L T P C
3 0 0 3

Duration: 45 Hrs.

Course Objectives

1. To expose the students to effective communication strategies and different modes of communication.
2. To enable the students to analyze his/her communication Behaviour and that of others.
3. To enable a student to apply effective communication skills professionally and socially.

UNIT-I (12 Hrs.)

Communication: Meaning, its types, Significance, Process, Channels, Barriers to Communication, Making Communication Effective, Role in Society.

Business Correspondence: Elements of Business Writing, Business Letters: Components and Kinds, Memorandum, Purchase Order, Quotation and Tenders, Job Application Letters, Resume Writing etc.

UNIT-II (10 Hrs.)

Discussion Meeting and Telephonic Skills: Group Discussion, Conducting a Meeting, Telephone Etiquettes, Oral Presentation: Role of Body Language and Audio Visual Aids.

Grammar: Transformation of Sentences, Words used as Different Parts of Speech One Word Substitution, Abbreviations, Technical Terms etc.

UNIT-III (11 Hrs.)

Reading Skills: Process of reading, Reading Purposes, Models, Strategies, Methodologies, Reading Activities.

Writing Skills: Elements of Effective Writing, Writing Style, Technical Writing: Report Writing.

UNIT-IV (12 Hrs.)

Listening Skills: The process of Listening, Barriers to Listening, Effective Listening Skills and Feedback Skills.

Speaking Skills: Speech Mechanism, Organs of Speech, Production and Classification of Speech Sound, Phonetic Transcription, Skills of Effective Speaking, Components of Effective Talk.

Course Outcomes

The students after undertaking this course will be able to:

1. Understand and appreciate the need of communication training.
2. Use different strategies of effective communication and select the most appropriate mode of communication for a given situation.
3. Speak effectively and assertively
4. Correspond effectively through different modes of written communication.
5. Present himself/herself professionally through effective resumes and interviews.

Recommended Books

1. M.V. Rodrigues, 'Effective Business Communication', Concept Publishing Company New Delhi, 1992, reprint 2000.
2. Adhikari Sethi, 'Business Communication', McGraw Hill.
3. Indrajit Bhattacharya, 'An Approach to Communication Skills', Dhanpat Rai Co., Pvt. Ltd., New Delhi.
4. Chrissie Wright, 'Handbook of Practical Communication Skills', Jaico Publishing House, Mumbai.
5. L. Gartside, 'Modern Business Correspondence', Pitman Publishing, London.

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6. Rizvi M. Ashraf, 'Effective Technical Communication', McGraw Hill.

HUMAN VALUES & PROFESSIONAL ETHICS

Subject Code: BHUM0-103

**L T P C
2 0 0 2**

Duration: 24 Hrs.

Course Objectives and Course 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 (Course 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 fulfil 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 IITM, 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 fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil 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" - *Sukhand 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: *Sanyamand Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyamand 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

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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-astitvaas comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*) - 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 fulfilment 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:

1. Ability to utilize the professional competence for augmenting universal human order,
2. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
3. Ability to identify and develop appropriate technologies and management patterns for above
4. production systems;
5. Case studies of typical holistic technologies, management models and production systems; Strategy for transition from the present state to Universal Human Order:
6. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
7. 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 Harper Collins, USA, 1974.
3. E.F. Schumacher, 'Small is Beautiful: A Study of Economics as if People mattered', Blond & Briggs, Britain, 1973.
4. A. Nagraj, 'JeevanVidyaekParichay', Divya Path Sansthan, Amarkantak, 1998.
5. Sussan George, 'How the Other Half Die's', Penguin Press, 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 Edition, 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.

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INFORMATION TECHNOLOGY LAB

Subject Code: BITE1-103

L T P C

0 0 4 2

1. Familiarizing with PC and WINDOWS
2. Hardware: Input / Output devices installation and configuration.
3. Software: Application and System Software installation and usage
4. DOS internal & external commands.
5. MS Office: MS WORD, MS EXCEL & MS PowerPoint.
6. Internetworking: WWW, Email, Blogs, Social Networking, Search Engines etc.

PROGRAMMING LOGIC LAB.

Subject Code – BITE1-104

L T P C

0 0 4 2

Programming Fundamentals

1. Describe Procedural and Object-Oriented Programming Languages.
2. Identify How a Computer Processes and Stores Data.

Problem Solving and Algorithm Development

1. Describe The Process and Methods for Problem Recognition.
2. Define The Process of Algorithm Development.
3. Describe The Importance of Using a Structured Modular Approach to Program Development.
4. Analyse the Development of Procedural and Object-Oriented Problem Solutions.

Programming Logic

1. Demonstrate The Sequential and Selection Processing Control Structure.
2. Examine The Iteration Control Structure.
3. Apply Flowcharts to Represent Logic.

Structures, Verification, and Validation

1. Explain Array Structures.
2. Define Objects and Object-Oriented Classes.
3. Apply Arrays to Program Logic and Data Manipulation.
4. Verify Algorithms using Requirements and Desk Review Design.

File Processing

1. Differentiate Between Sequential and Direct Access.
2. Demonstrate Reading and Writing Sequential Files in Pseudocode.
3. Compare and Contrast Procedural and Object-Oriented Programming.

COMMUNICATION SKILLS-I LAB.

Subject Code: BHUM0-102

L T P C

0 0 2 1

The Communicative English Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objectives

1. To expose the students to a variety of self-instructional, learner-friendly modes of language Course.

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2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams.
3. To enable them to learn pronunciation through stress on word accent, intonation, and rhythm.
4. To train them to use communication skills effectively for interviews, group discussions, public speaking etc.

Syllabus

The following course content is prescribed for Communicative English Laboratory sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. G.D. and Debate

The teacher may use following different classroom techniques to give practice and monitor the progress of the students:

1. Role Play
2. Question-Answer
3. Discussion
4. Presentation of Papers
5. Seminars etc.

Minimum Requirement

The Communicative English Language Lab shall have two parts:

1. The Computer aided Language Lab for 30 students with 30 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System & a LCD projector/ T.V.

System Requirement (Hardware Component)

Computer network with LAN with minimum 30 multimedia systems

Suggested Software

1. Cambridge Advanced Learners' English Dictionary with CD.
2. The Rosetta stone English Library
3. Clarity Pronunciation Power – Part I
4. Mastering English in Vocabulary, Grammar, Spellings, Composition
5. Dorling Kindersley series of Grammar, Punctuation, Composition etc.
6. Language in Use, Foundation Books Pvt. Ltd with CD.
7. Oxford Advanced Learner's Compass, 7th Edition
8. Course to Speak English - 4 CDs
9. Microsoft Encarta with CD
10. Murphy's English Grammar, Cambridge with CD.
11. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Recommended Books

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
2. English Pronouncing Dictionary, Daniel Jones Current Edition with CD.
3. R.K. Bansal and J.B. Harrison, 'Spoken English', Orient Longman, 2006.

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4. A. Ramakrishna Rao, G. Natanam & S.A. Sankaranarayanan, 'English Language Communication: A Reader cum Lab Manual', Anuradha Publications, Chennai.
5. Krishna Mohan & N.P. Singh, 'Speaking English Effectively', Macmillan.
6. J. Sethi, Kamlesh Sadanand & D.V. Jindal, 'A Practical Course in English Pronunciation, (with two Audio cassettes)', Prentice-Hall of India Pvt. Ltd., New Delhi.
7. T. Balasubramanian, 'A Text Book of English Phonetics for Indian Students', Macmillan.
8. 'English Skills for Technical Students, WBSCTE' with British Council, OL.

Course Outcomes:

The students after undertaking this course will be able to:

1. Understand and Appreciate the Need of Communication Skills in Personal and Professional Life.
2. Use Different Medias/Channels of Communication and Select the Most Appropriate for a Given Situation.
3. Speak and Present himself/herself Professionally and Socially Effectively Through Effective Talks, Resumes, Interviews etc.

COMMUNICATION SKILLS- II

Subject Code: BHUM0-213

L T P C
3 1 0 4

Duration: 40 Hrs.

UNIT-I (10 Hrs.)

Introduction to Business Communication Meaning and Definition; process and classification of communication; elements & characteristics of communication; barriers to effective communication in business organization; Formal and Informal communication; grapevine, importance of effective communication in business house; Principles of effective communication

UNIT-II (10 Hrs.)

Writing Skills Inter-office memorandums; faxes; E-mails; writing effective sales letters - to agents; suppliers; customers; report writing; project writing.

UNIT-III (10 Hrs.)

Curriculum Vitae (CV) Drafting a CV; writing job application and other applications; do's and don'ts while appearing for an Interview; types of interview.

UNIT-IV (10 Hrs.)

Presentation Skills, Introduction; need of good presentation skills in professional life; preparing a good presentation; group discussion; extempore speaking.

Recommended Books

1. M.V. Rodriguez, 'Effective Business Communication'.
2. Meenakshi Raman, Parkash Singh, 'Business Communication', Oxford University Press.

MATHEMATICS-II

Subject Code – BMAT0-206

L T P C
3 1 0 4

Duration - 42 Hrs.

UNIT-I (10 Hrs.)

Probability: Definition, Addition law of Probability, Multiplication law, Binomial Distribution, Poisson Distribution, Normal Distribution.

UNIT-II (11 Hrs.)

Statistics and Applications of Logarithms: Introduction to Statistics, Measures of Central Tendency- Mean, Median and Mode, Measures of Dispersion, Mean Deviation, Standard

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Deviation and Coefficient of Variation.

Problems related to Compound Interest, Depreciation and Annuities.

UNIT-III (10 Hrs.)

Differential Calculus: Introduction to Differentiation, Derivative of a Function of one variable, Power Functions, Sum and Product of two functions, Function of a Function, Differentiation by Method of Substitution, Maxima and Minima.

UNIT-IV (11Hrs.)

Integral Calculus: Indefinite Integral, Integration by Substitution, Integration by parts, Integration by Partial Fractions, Definite Integral, Rectification of Standard curves, Area bounded by standard curves.

RECOMMENDED BOOKS:

1. B.S. Grewal, 'Engineering Mathematics', 7th Edn., Khanna Publishers.
2. S.C. Gupta and V.K. Kapoor, 'Fundamentals of Mathematical Statistics,' 11th Edn., Sultan Chand & Sons.
3. H.K. Dass, 'Advanced Engineering Mathematics,' S. Chand & Company, Ltd.

OBJECT ORIENTED PROGRAMMING

Subject Code: BITE1-205

L T P C

Duration: 39 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

Introduction: Object oriented programming approach, characteristics of object orientated languages, Bridging C & C++ (Overview of C Concepts). Structures and Unions: Declaration of structures, Accessing structure members, Structure Initialization, Arrays of structure, nested structures, structure with pointers, functions & structures, Unions, Structure/Union Versus Class in C++. Class Declaration: Data Members, Member Functions, Private and Public Members, Data Hiding and Encapsulation, Array within a class.

UNIT-II (10 Hrs.)

Class Function Definition: Member Function definition inside the class and outside the class, Friend Function, Inline Function, Static Members & Functions, Scope Resolution Operator, Private and Public Member Functions, Nesting of Member Functions. Creating Objects, accessing class data members, accessing member functions, Arrays of Objects, Objects as function arguments: Pass by value, Pass by reference, Pointers to Objects. Constructors and Destructors: Declaration and Definition, Default Constructors, Parameterized Constructors, Constructor Overloading, Copy Constructors. Destructors: Definition and use.

UNIT-III (10 Hrs.)

Inheritance - Extending Classes Concept of inheritance, Base class, Derived class, defining derived classes, Visibility modes: Private, public, protected; Single inheritance: Privately derived, publicly derived; Making a protected member inheritable, Access Control to private and protected members by member functions of a derived class, Multilevel inheritance, Nesting of classes. Function Overloading & Operator Overloading: Binary & Unary.

UNIT-IV (9 Hrs.)

Polymorphism: Definition, early Binding, Polymorphism with pointers, Virtual Functions, late binding, pure virtual functions. Input/output files: Streams, buffers & iostreams, header files, redirection, file input and output.

Recommended Books

1. E. Balagurusami, 'Object Oriented Programming with C++', 4th Edn., Tata McGraw Hill.

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2. Robert Lafore, 'Object Oriented Programming in Turbo C++', 4th Edn., Galgotia Publications.
3. Bjarnan Stroustrup, 'The C++ Programming Language', 3rd Edn., Addison-Wesley Publishing Company.
4. R.S. Salaria, 'Object Oriented Programming Using C++', 4th Edn., Khanna Book Publishing.

FUNDAMENTAL OF DIGITAL ELECTRONICS

Subject Code: BITE1-206

**L T P C
3 1 0 4**

Duration: 38 Hrs.

UNIT-I (10 Hrs.)

Number System: Decimal Number System, Binary Number System, Octal Number System, Hexa-decimal Number System, Conversion from One Number System to another, Arithmetic Operation without Changing the Base, 1's Complement and 2's Complement. Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, NAND & NOR as Universal Gates, Logic Gates Applications.

UNIT-II (9 Hrs.)

Boolean Algebra: Introduction, Theorems, Simplification of Boolean Expression using Boolean Algebra, SOP & POS Forms, Realization of Boolean Expression using Gates, KMaps, Simplification of Boolean Expression using K-Maps. Combinational Logic Circuits: Half Adder & Half Subtractor, Full Adder & Full Subtractor, Parallel Binary Adder, Binary Adder/Subtractor.

UNIT-III (10 Hrs.)

Combinational Logic Circuits: Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer, Encoders & Decoders. Sequential Logic Circuits: Latch, Flip Flops- R-S Flip-Flop, J-K Flip-Flop, Master-Slave J-K Flip-Flop, Race Condition, Removing Race Condition, D Flip-Flop, T Flip-Flop, Applications of Flip-Flops.

UNIT-IV (9 Hrs.)

Counters: Clock Pulse Generator using 555 Timer as Monostable and Multivibrator, Design of Asynchronous Counters, Design of Synchronous Counters, Up-Down Counters, MOD-N Counters.

Recommended Books

1. Malvino, 'Digital Computer Electronics', 2nd Edn., McGraw Hill.
2. R.P. Jain, 'Modern Digital Electronics', 4th Edn., Tata McGraw Hill.
3. D. Morris Mano, 'Digital Logic & Computer Design', 2nd Edn., Prentice Hall India.
4. T.C. Bartee, 'Digital and Electronic Circuits', McGraw Hill.

ENVIRONMENTAL SCIENCE

Subject Code: BESE0-101

**L T P C
2 0 0 2**

Duration: 48 Hrs.

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.

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SYLLABUS 2016 BATCH ONWARDS

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 (2 Hrs.)

Definition, scope and importance. Need for public awareness.

2. Natural Resources (Hrs.)

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-II

3. Ecosystems (8 Hrs.)

- (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 (6 Hrs.)

- (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 option values.
- (d) Biodiversity at global, national and local levels.
- (e) India as a mega-diversity nation.
- (f) Hot-spots of biodiversity.
- (g) Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.
- (i) Endangered and endemic species of India.

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- (j) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III

5. Environmental Pollution (8Hrs.)

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 (8 Hrs.)

- (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-IV

7. Human Population and the Environment (7 Hrs.)

- (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 (6 Hrs.)

- (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

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- (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. ErachBharucha, 'Textbook for Environmental Studies', UGC, New Delhi.

OBJECT ORIENTED PROGRAMMING LAB.

Subject Code: BITE1-207

L T P C

0 0 4 2

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.
15. [Inheritance] Write a program to demonstrate the multiple inheritance.
16. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
17. [Polymorphism] Write a program to demonstrate the runtime polymorphism.
18. [Exception Handling] Write a program to demonstrate the exception handling.
19. [Templates and Generic Programming] Write a program to demonstrate the use of function template.
20. [Templates and Generic Programming] Write a program to demonstrate the use of class template.
21. [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,
22. [File Handling] Write a program to demonstrate the reading and writing of mixed type of data.

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23. [File Handling] Write a program to demonstrate the reading and writing of objects.

DIGITAL ELECTRONIC LAB.

Subject Code: BITE1-208

L T P C
0 0 4 2

To study the function of basic logic gates and verify the truth table of AND, OR, NOT, X OR, NAND, NOR.

1. To study applications of AND, OR, NAND, X-OR gates for gating digital signals.
2. To develop the different Arithmetic Circuits:
 - a. Half-Adder and Subtractor. b. Full-Adder and Subtractor.
3. To study the BCD to binary and binary to BCD Code converter.
4. Study of Decoder Circuits: a. BCD-to-Decimal Decoder b. BCD-to-7-Segment Decoder
5. Study of Encoder Circuits: a. BCD-to-Decimal Encoder b. Octal-to-Binary Encoder
6. To study the flip flop circuit using Gates:
 - a. R-S Flip Flop b. J-K Flip Flop c. Master Slave J-K Flip Flop d. D-Flip Flop
7. To study R-S, J-K and D Flip Flop Using IC's.
8. Study of Ring Counter.
9. Study of Asynchronous and Synchronous Counters.

DATA STRUCTURE

Subject Code: BITE1-309

L T P C
3 1 0 4

Duration: 40 Hrs.

UNIT-I (12 Hrs.)

Introduction to Data Structures: Basic concept of data, Problem analysis, algorithm complexity, Big O notation and time space trade off, Types of data structures: arrays records, pointers, stack, queue, trees, linked list packet, blocks, tracks, sector (in storage devices). Searching and Sorting: Use of various data structures for searching and sorting, linear and binary search, bubble sort, insertion sort, selection sort.

UNIT-II (10 Hrs.)

Stacks & Queues: Basics of stacks and queues, Recursion, Polish notation, circular Queues, priority Queues.

UNIT-III (9 Hrs.)

Linked Lists: Single linked list, Circular linked list, doubly linked list and Dynamic storage management, generalized list, Garbage Collection.

UNIT-IV (9 Hrs.)

Trees: Definition & Concepts, Basic trees, Binary tree representations, Binary tree traversals and application of trees

Recommended Books

- 1 Lipschutz Seymour, 'Data Structures,' 2nd Edn., TMH.
- 2 Tanenbaum, 'Data Structures,' Paperback Edition.
- 3 Trembley & Soreson, 'An Introduction to Data Structures Applications,' 2nd Edn.

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COMPUTER SYSTEM ARCHITECTURE

Subject Code: BITE1-310

L T P C
3 1 0 4

Duration: 44 Hrs.

UNIT-I (12 Hrs.)

Introduction to Computer Organization: Introduction to Computer and CPU (Computer Organization, Computer Design and Computer Architecture), Stored Program Concept- Von Neumann Architecture. Introduction to Flynn's Classification- SISD, SIMD, MIMD, Register Transfer and Micro operations- Introduction to Registers, Register Transfer Language, Data movement among Registers and Memory.

Micro Operations: Introduction to micro operations, Types of micro operations—Logic Operations, Shift operations, Arithmetic and Shift operations. Common Bus System: Introduction to Common Bus System, Types of Buses (Data Bus, Control Bus, Address Bus), 16-bit Common Bus System--Data Movement among registers using Bus.

UNIT-II (12 Hrs.)

Basic Computer Instructions- Introduction to Instruction, Types of Instructions (Memory Reference, I/O Reference and Register Reference), Instruction Cycle, Instruction Formats (Direct and Indirect Address Instructions, Zero Address, One Address, Two Address and Three Address Instructions)

Interrupt: Introduction to Interrupt and Interrupt Cycle. Design of Control Unit: Introduction to Control Unit, Types of Control Unit (Hardwired & Micro programmed Control Unit). Addressing Modes-Introduction & different types of Addressing Modes.

UNIT-III (10 Hrs.)

I/O Organization: I/O Interface Unit, types of ports (I/O port, Network Port, USB port, Serial and Parallel Port), Concept of I/O bus, Isolated I/O versus Memory Mapped I/O. I/O Data Transfer Techniques: Programmed I/O, Interrupt Initiated I/O, DMA Controller and IOP. Synchronous and Asynchronous Data Transfer: Concept of strobe and handshaking, source and destination initiated data transfer.

UNIT-IV (10 Hrs.)

Stack Organization: Memory Stack and Register Stack Memory organization: Memory Hierarchy, Main Memory (RAM and ROM chips, Logical and Physical Addresses, Memory Address Map, Memory Connection to CPU), Associative Memory Cache Memory: Cache Memory (Initialization of Cache Memory, writing data into Cache, Locality of Reference, Hit Ratio), Replacement Algorithms (LRU and FIFO).

Cache Memory Mapping Techniques: Direct Mapping, Associative Mapping and Set-Associative Mapping. Harvard Architecture, Mobile Devices Architecture (Android, Symbian and Windows Lite), Layered Approach Architecture.

Recommended Books

1. M.M. Mano, 'Computer System Architecture,' Third Edition, PHI
2. J.P. Hayes, 'Computer Organization and Architecture,' Third Edition, TMH
3. Stallings, 'Computer Organization and Architecture,' Eighth Edition, PHI.

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OPERATING SYSTEM

Subject Code: BITE1-311

**L T P C
3 1 0 4**

Duration: 38 Hrs.

UNIT-I (10 Hrs.)

Introduction: Application programs and system programs; functions of an operating system; classification of operating Systems-Multi-user, multiprogramming, multiprocessing, time sharing, multi-threaded. Subsystems – Top Layer, Middle Layer, Bottom Layer, Bootstrap, Protection and security. Processes and Threads: Program vs. Process; Process context, address space, identification, transition, state & management. Thread management-benefits, synchronization issues; applications of threads.

UNIT-II (9 Hrs.)

CPU Management: Objectives, Pre-emptive vs. Non-pre-emptive, context switching, scheduling schemes; multi-processor scheduling, thread scheduling. Inter-process Communications: Introduction, message passing model, shared memory model. Pipe, FIFO and Socket.

UNIT-III (10 Hrs.)

Memory Management: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, performance, page replacement. Thrashing. I/O Device Management: I/O devices and controllers, device drivers; disk storage, scheduling and management.

UNIT-IV (9 Hrs.)

Memory Management: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, performance, page replacement. Thrashing. I/O Device Management: I/O devices and controllers, device drivers; disk storage, scheduling and management.

Recommended Books

1. Abraham Silberschatz and Peter Baer Galvin, 'Operating System Principles ,7th Edn., Wiley-India
2. Sibsankar Haldar and Alex A. Aravind, 'Operating Systems,' Pearson Education.
3. W. Stalling, 'Operating System,' 6th Edn., Prentice Hall.

SYSTEM PROGRAMMING

Subject Code: BITE1-312

**L T P C
0 0 4 2**

Course Objectives: This course provides knowledge to design various system programs.

1. Introduction: Introduction to system programming and different types of system programs – editors, assemblers, macro-processors, compilers, linkers, loader, debuggers.
2. Assemblers: Description of single pass and two pass assemblers, use of data structures like
3. OPTAB and SYMTAB, etc.
4. Macro processors: Description macro expansion of macros, macro expansion, conditional
5. and recursive
6. Compilers: Various phases of compiler – lexical, syntax and semantic analysis,
7. intermediate code generation, code optimization techniques, code generation, Case study
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8. LEX and YACC. [9]
9. Linkers and Loaders: Concept of linking, different linking schemes, concept of loading and various loading schemes.
10. Editors: Line editor, full screen editor and multi window editor, Case study MS-Word,
11. DOS Editor and vi editor.
12. Debuggers: Description of various debugging techniques.

Recommended Books

1. J.J. Donovan., 'Systems Programming', New York, McGraw Hill, **1972**.
2. D.M. Dhamdhare, 'Introduction to Systems Software,' Tata McGraw Hill, **1996**.
3. Aho A.V. and J.D. Ullman, 'Principles of compiler Design', Addison Wesley/ Narosa. **1985**.
4. Kenneth C. Louden, 'Compiler Construction,' Cengage Course.

DATA STRUCTURE LAB.

Subject Code: BITE1-313

L T P C
0 0 4 2

Note: Program should be fully documented with sample I/O. Data Flow charts should be developed wherever necessary.

Write an Algorithm and Program using functions for:

1. Program using Recursion.
2. Traversing the elements of an Array
3. Inserting an element in an Array
4. Deleting an element from an Array
5. Merging of two Arrays
6. Linear Search
7. Binary Search
8. Insertion Sort
9. Bubble Sort
10. Selection Sort
11. Implementing PUSH & POP operations of a Stack
12. Array Implementation of a Queue and Circular Queue
13. Converting infix notation into post fix notation
14. Insertion in single and double Linked List
15. Deletion from single and double Linked List

OPERATING SYSTEM LAB.

Subject Code: BITE1-314

L T P C
0 0 4 2

1. Installation Process of various operating systems.
2. Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine.
3. Commands for files & directories in Linux: cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in linux, connecting processes with pipes, background processing managing multiple processes. Manual help. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep.
4. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file. File related commands

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ws, sat, cut, grep.

5. Shell Programming: Basic of shell programming, various types of shell, Shell programming in bash, conditional & looping statement, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.

MANAGEMENT INFORMATION SYSTEMS

Subject Code: BITE1-356

**L T P C
3 1 0 4**

Duration: 38 Hrs.

Course Objectives: The course aims at providing fundamental knowledge and exposure to the concepts, theories and practices in the field of MIS. The course will explain the relationship among and between information systems and management, analyse how technology can be used to synthesize complex data to make sound business decisions.

UNIT-I (10 Hrs.)

Introduction: Definition, characteristics & significance of MIS. Introduction to business systems: Operations Support Systems, Management Support Systems, Expert Systems, and Knowledge Management Systems. Information Concepts: Data Vs Information, types of information, quality of information.

UNIT-II (9 Hrs.)

Decision Making: Simon's model of decision making, structured & unstructured decisions. **Database Management:** Objectives, role, advantages & disadvantages of DBMS, SQL, use of databases for integration across functional areas. Introduction to Decision Support System.

UNIT-III (10 Hrs.)

Design Methodology & Techniques: System development life cycle, software development models. System Analysis – SRS, DFD, DD & Decision tables. System Design – design methods, detailed system design, design documentation. System Implementation & testing.

UNIT-IV (9 Hrs.)

Implementation & Evaluation: Planning, organizing, testing & changeover. Evaluation approaches. Brief introduction of emerging concepts and issues in Information Systems: Supply Chain Management, Customer Relationship Management, ERP, Data Warehousing, Data Mining.

Recommended Books

1. D.P. Goyal, 'Management Information Systems,' MacMillan.
2. Davis & Olson, 'Management Information Systems'.
3. Murdick, Ross & Clagett, 'Information Systems for Management'.
4. Kenneth, Laudon and Jane Laudon MIS, 'Managing the Digital Firm', Pearson Education.

E-COMMERCE

Subject Code: BITE1-357

**L T P C
3 0 0 3**

Duration: 38 Hrs.

Course Objectives: The objective of the course is to acquaint the students with E-Business in competing International markets.

UNIT-I (10 Hrs.)

Introduction to E-Commerce and E- Business: Definition and competing in the digital economy – Forces Fueling E-commerce and E- Business Models - Environment of E-Business, Economics and social impact of E- Business, opportunities and Challenges.

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UNIT-II (9 Hrs.)

Industry framework and types, Structure and organization of E-Business, Communications – Internet Service Providers, Internet access provider, Internet Vs. Online Services, WWW: Concepts, Technology, Applications and services offered in the Internet. EDI, EFT, Electronic Payment Systems, Industry applications like online banking and other business applications. Electronic Payment Technology, Digital Cash, Electronic check, On-line Credit Card; Electronic Commerce and Banking; Changing dynamics in the banking Industry, Home banking Implementation approaches, Open Vs. Closed models, Management issues in online banking.

UNIT-III (10 Hrs.)

Supply chain Management: Supply chain Integration and coordination, importance of supply chain management, objective and methodology of supply chain management, CRM - online sales force, online customer service and support, Technology and Marketing Strategy: Intranets and manufacturing Integrated logistics, agile manufacturing, Internet Marketing. Manufacturing Information Systems, Intranet based manufacturing logistics Management

UNIT-IV (9 Hrs.)

Security Issues in e-business: Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Securing E-commerce Networks: Security Protocols such as HTTP, SSL, Firewalls, Personal Firewalls, IDS, VPNs, Public Key Infrastructure(PKI) for Security.

Recommended Books

1. Cady, G H and Part McGreger, 'The Internet', BPB Pub.
2. Keen, Peter and Mark McDonald, 'The e-Process Edge,' Tata McGraw Hill.
3. Mann, Catherine, L. Global, 'Electronic Commerce', Institute for International Economics.
4. Oberoi, Sundeep, 'E-Security and You,' Tata McGraw Hill.
5. Rich, R. Jason, 'Starting an E-Commerce Business,' IDG Books, Delhi,

MULTIMEDIA AND APPLICATION

Subject Code: BITE1-358

L T P C
3 0 0 3

Duration: 38 Hrs.

Course Objectives: This Course introduces the multimedia systems and their applications to students. This course covers the different compression standards used in multimedia, some current technology and related issues.

UNIT-I (10 Hrs.)

Introduction: Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia.

Multimedia Technology: Multimedia Systems Technology, Multimedia Hardware devices, Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, SGML, ODA, Multimedia Standards for Document interchange, MHEG, Multimedia Software for different media.

UNIT-II (9 Hrs.)

Storage Media: Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers.

Audio: Basics of Digital Audio, Application of Digital Audio, Digitization of Sound, Sample Rates and Bit Size, Nyquist's Sampling Theorem Typical Audio Formats Delivering Audio over a Network, Introduction to MIDI (Musical Instrument Digital Interface), Components of a MIDI System Hardware Aspects of MIDI, MIDI Messages. Audio Compression, Simple Audio Compression Methods, Psychoacoustics, MPEG Audio Compression.

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UNIT-III (10 Hrs.)

Basics of Compression: Classifying Compression Algorithms, Lossless Compression Algorithms, Entropy Encoding, Run-length Encoding, Pattern Substitution, Basics of Information theory, Huffman Coding, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques: Transform Coding, Frequency Domain Methods, Differential Encoding.

Image and Graphics Compression: Colour in Images, Types of Colour Models, Graphic/Image File Formats: TIFF, RIFF, BMP, PNG, PDF, Graphic/Image Data, and JPEG Compression, GIF Compression.

UNIT-IV (9 Hrs.)

Video Compression: Basics of Video, Video Signals, Analog Video, Digital Video, TV standards, H. 261 Compression, Intra Frame Coding, Inter-frame (P-frame) Coding, MPEG Compression, MPEG Video, The MPEG Video Bitstream, Decoding MPEG Video in Software.

Multimedia Communication: Building Communication network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia Systems.

Recommended Books

1. Ralf Steinmetz and Klara NaHrs.tedt, 'Multimedia Computing Communications and Applications', Pearson Educations.
2. Parag Havaldar, Gerard Medioni, 'Multimedia Systems Design', PHI.

COMPUTER NETWORKS

Subject Code: BITE1-415

L T P C
3 1 0 4

Duration: 38 Hrs.

Course Objectives: This course provides knowledge about computer network related hardware and software using a layered architecture.

UNIT-I (10 Hrs.)

Introduction to Computer Networks: Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO OSI reference model, TCP/IP reference model.

Physical Layer: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits: Nyquist formula, Shannon Formula, Multiplexing: Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching, Packet Switching & their comparisons

UNIT-II (9 Hrs.)

Data Link Layer: Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP.

4. Medium Access Sub-Layer: Wait ARQ, Go-back-N Static and dynamic channel allocation, **Random Access:** ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm.

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UNIT-III (10 Hrs.)

Network Layer: Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms

Transport Layer: Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison.

UNIT-IV (9 Hrs.)

Application Layer: World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), Introduction to Network security.

Recommended Books

1. Andrew S. Tanenbaum, 'Computer Networks,' 4th Edn., Pearson Education.
2. Behrouz A. Forouzan, 'Data Communication & Networking,' 4th Edn., Tata McGraw Hill.
3. James F. Kurose and Keith W. Ross, 'Computer Networking,' 3rd Edn., Pearson Education.
4. Douglas E. Comer, 'Internetworking with TCP/IP, Volume-I,' Prentice Hall, India.
5. Greg Tomsho, 'Guide to Networking Essentials', 5th Edn., Cengage Course.
6. Michael W. Graves., 'Handbook of Networking,' Cengage Course.

EMBEDDED SYSTEM

Subject Code: BITE1-416

L T P C
3 1 0 4

Duration: 38 Hrs.

UNIT-I (10 Hrs.)

Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT-II (9 Hrs.)

Characteristics and Quality attributes of Embedded Systems: characteristics, operational and non-operational quality attributes, application specific embedded system – washing machine, domain specific – automotive

UNIT-III (10 Hrs.)

Programming Embedded Systems: structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

UNIT-IV (9 Hrs.)

Peripherals: Control and Status Registers, Device Driver, Timer Driver- Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process Unit-VI Design and Development: embedded system development environment – IDE, types of file generated on cross compilation, disassembler/ decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

Recommended Books

1. Michael Barr, O'Reilly, 'Programming Embedded Systems in C and C++', 1st Edn.,
2. K.V. Shibu, 'Introduction to Embedded Systems', Tata McGraw Hill.
3. Rajkama, 'Embedded Systems', Tata McGraw Hill.

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DATA BASE MANAGEMENT SYSTEMS

Subject Code: BITE1-417

L T P C

Duration: 38 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

An Overview of DBMS: Concept of File Processing Systems and database systems, Database Administrator and his responsibilities. Physical and Logical data independence. Three level Architecture of Database System: the external level, conceptual level and the internal level.

UNIT-II (9 Hrs.)

Introduction to Data Models: Entity Relationship Model, Hierarchical, Network and Relational Model. Comparison of Network, Hierarchical and Relational Model.

UNIT-III (10 Hrs.)

Relational Data Model: Relational database, relational algebra and calculus, SQL dependencies, functional dependency, multi-valued dependency and join, normalization

UNIT-IV (9 Hrs.)

Database Protection: Recovery, Concurrency Management, Database Security, Integrity and Control, Disaster Management Distributed databases: Structure of a distributed database, design of distributed databases.

Recommended Books

1. Bipin C. Desai, 'An Introduction to Database System', Galgotia Publications.
2. C.J. Date, 'An Introduction to Data Base Systems', 8th Edn., Narosa Publications.
3. Henry F. Korth, 'Database System Concepts', 5th Edn., McGraw Hill.
4. Naveen Prakash, 'Introduction to Database Management', TMH.
5. Ullman, 'Principles of Database Systems', 2nd Edn., Galgotia Publications.
6. Rob Coronel, 'Database Systems: Design, Implementation, and Management', 9th Edn.

SYSTEM ANALYSIS AND DESIGN

Subject Code: BITE1-418

L T P C

Duration: 38 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

System Development Life Cycle: System Definition, characteristics, elements & types of system, Phases of SDLC, Information gathering tools, Structured Analysis tools, Role of System Analyst.

UNIT-II (9 Hrs.)

System Design: Process and stages of systems design, Input / Output and file design, Documentation (User Manual, Design Documentation, Training Manual), Case Study techniques in system design.

UNIT-III (10 Hrs.)

System Testing: Unit Testing, System Testing, Integration Testing, Alpha & Beta Testing, Acceptance Testing, Regression Testing.

UNIT-IV (9 Hrs.)

System Implementation: System implementation Process, Implementation methods, System maintenance, Post implementation maintenance.

Recommended Books

1. Awad Elias N., 'System Analysis and Design', 2nd Edn., Galgotia Publications.
2. A Sen James, 'Analysis and Design of Information System', 2nd Edn., Tata McGraw Hill.

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SYLLABUS 2016 BATCH ONWARDS**

COMPUTER NETWORKS LAB.

Subject Code: BITE1-419 **L T P C**
 0 0 2 1

1. Write specifications of latest desktops and laptops.
2. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
3. Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
4. Preparing straight and cross cables.
5. Study of various LAN topologies and their creation using network devices, cables and computers.
6. Configuration of TCP/IP Protocols in Windows and Linux.
7. Implementation of file and printer sharing.
8. Designing and implementing Class A, B, C Networks
9. Subnet planning and its implementation
10. Installation of ftp server and client.

DATABASE MANAGEMENT SYSTEM LAB.

Subject Code: BITE1-420 **L T P C**
 0 0 2 1

1. Familiarization with MS Access: Features, Elements, Parts of MS Access Window,
2. Creating and Saving Database, and Tables.
3. Using Queries: Running various DDL and DML commands using SQL,
4. Creating Views.
5. Using Forms and Reports in MS Access.
6. Introductory Practicals on using Crystal Reports.

DESIGN & ANALYSIS OF ALGORITHMS

Subject Code: BITE1-459 **L T P C** **Duration: 38 Hrs.**
 3 0 0 3

Course Objectives: To learn the ability to distinguish between the tractability and intractability of a given computational problem. To be able to devise fast and practical algorithms for real-life problems using the algorithm design techniques and principles learned in this course.

UNIT-I (10 Hrs.)

Introduction: What is an algorithm? Time and space complexity of an algorithm. Comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs. Exponential running time.

Basic Algorithm Design Techniques: Divide-and-conquer, greedy, randomization, and dynamic programming. Example problems and algorithms illustrating the use of these techniques.

UNIT-II (9 Hrs.)

Graph Algorithms: Graph traversal: breadth-first search (BFS) and depth-first search (DFS). Applications of BFS and DFS. Topological sort. Shortest paths in graphs: Dijkstra and Bellman-Ford. Minimum spanning trees.

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Sorting and Searching: Binary search in an ordered array. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting. Median and order statistics.

UNIT-III (10 Hrs.)

Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

NP-completeness: Definition of class NP. NP-hard and NP-complete problems. 3SAT is NP-complete. Proving a problem to be NP-complete using polynomial-time reductions. Examples of NP-complete problems.

Coping with NP-completeness: Approximation algorithms for various NP-complete problems.

UNIT-IV (9 Hrs.)

Advanced Topics: Pattern matching algorithms: Knuth-Morris-Pratt algorithm. Algorithms in Computational Geometry: Convex hulls. Fast Fourier Transform (FFT) and its applications. Integer and polynomial arithmetic. Matrix multiplication: Strassen's algorithm.

Recommended Books

1. J. Kleinberg and E. Tardos, 'Algorithm Design'.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 'Introduction to Algorithms'.
3. S. Dasgupta, C.H. Papadimitriou and U.V. Vazirani, 'Algorithms'.
4. Michael T. Goodrich and Roberto Tamassi, 'Algorithm Design: Foundations, Analysis, and Internet Examples'.
5. A.V. Aho, J.E. Hopcroft and J.D. Ullman, 'The Design and Analysis of Computer Algorithms'.
6. Donald Knuth, 'The Art of Computer Programming', Vol. 1, 2, and 3.

COMPUTER PERIPHERALS AND INTERFACES

Subject Code: BITE1-460

L T P C
3 0 0 3

Duration: 38 Hrs.

UNIT-I (10 Hrs.)

System Resources: Interrupt, DMA Channel, I/O Port Addresses and resolving and resolving the conflict of resources. I/O buses- ISA, EISA, Local bus, VESA Local bus, PCI bus, PCI Express, Accelerated graphics port bus.

IDE & SCSI Interfaces: IDE origin, IDE Interface ATA standards ATA1 to ATA7. ATA feature, ATA RAID and SCSI RAID, SCSI Cable and pin Connector pin outs SCSI V/s IDE Advantages and limitation.

UNIT-II (9 Hrs.)

Video Hardware: Video display technologies, DVI Digital signals for CRT Monitor, LCD Panels, Video adapter types, Integrated Video/ Motherboard chipset, Video RAM, Video driver and multiple Monitor, Graphic accelerators. Advanced 3D Technologies, TV Tuner and Video Capture upgrades troubleshooting Video Cards and Drivers.

I/O Interfaces: I/O Interfaces from USB and IEEE1394, I/O Interface from serial and Parallel to IEEE1394 and USB 961, Parallel to SCSI converter. Testing of serial and parallel port, USB Mouse/ Keyboard Interfaces.

UNIT-III (10 Hrs.)

Input/Output Driver software aspects: Role of device driver DOS and UNIX/ LINUX device drivers.

Design & Integration of Peripheral devices to a computer system as a Case Study

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UNIT-IV (9 Hrs.)

Future Trends: Detailed Analysis of recent Progress in the Peripheral and Bus systems. Some aspects of cost Performance analysis while designing the system

Recommended Books

1. Douglas V. Hall, 'Microprocessors and Interfacing', Tata McGraw Hill, 2006.
2. Barry B. Brey & C.R. Sarma, 'The intel Microprocessors', Pearson, 2003.
3. P. Pal Chandhari, 'Computer Organization and Design', Prentice Hall of India Pvt. Ltd., 1994.
4. Del Corso, H. Kirrman, J.D. Nicond, 'Microcomputer Buses & Links', Academic Press 1986.

ENTERPRISE RESOURCE PLANNING

Subject Code: BITE1-461

L T P C
3 1 0 4

Duration: 38 Hrs.

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 (9 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 (10 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 (9 Hrs.)

ERP MARKET: Marketplace – Dynamics – SAP AG – Oracle – PeopleSoft – JD Edwards – QAD Inc – SSA Global – Lawson Software – Epicor – Intutive.

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, Second Edition, 2008.
2. Mary Sumner, 'Enterprise Resource Planning', Pearson Education, 2007.
3. Jim Mazzullo, 'SAP R/3 for Everyone', Pearson, 2007.
4. Jose Antonio Fernandez, 'The SAP R /3 Handbook,' Tata McGraw Hill, 1998.
5. Biao Fu, 'SAP BW: A Step-by-Step Guide', First Edition, Pearson Education, 2003.

PROGRAMMING IN JAVA

Subject Code: BITE1-521

L T P C
3 1 0 4

Duration: 42 Hrs.

Unit-I

FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING: Introduction; Object-Oriented Paradigm; Basic Concepts of Object-Oriented Programming Benefits of OOP; Applications of OOP. **JAVA EVOLUTION:** - Java History; Java Features; How Java Differs

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from C and C++; Java and Internet, Java and World Wide Web, Web Browsers; Hardware and Software Requirements; Java Support Systems, Java Environment. **OVERVIEW OF JAVA LANGUAGE:** - Introduction; Simple Java Program; Comments in java; An application with Two Classes; Java Program Structure; Java Tokens; Java Statements; Implementing a Java Program; Java Virtual Machine; Command Line Arguments; Programming Style. **CONSTANTS, VARIABLES AND DATA TYPES:** - Introduction; Constants; Variables; Data Types; Variables, Constants, Standard Default Values. **OPERATORS AND EXPRESSIONS:** - Introduction to Operators, Expressions; Operator Precedence; Mathematical Functions. **DECISION MAKING, BRANCHING AND LOOPING:** - Decision making and Branching Statements, Looping Statements, Labeled loops, Jumping Statements

Unit-II

CLASSES, OBJECTS AND METHODS: Introduction; Defining a Class; Adding Variables; Adding Methods; Adding Methods; Creating Objects; Accessing Class Members; Constructors; Methods Overloading; Static Members; Nesting of Methods; Inheritance: Extending a Class; Overriding Methods; Final Variables and Methods; Final Classes; Finalizer Methods; Abstract Methods and Classes; Visibility Control. **ARRAYS, STRINGS AND VECTORS:** - Arrays; Jagged Arrays; Strings; String functions; Vectors; Wrapper Classes. **INTERFACES:** Introduction; Defining Interfaces; Extending Interfaces; Implementing Interfaces; Accessing Interface Variables, Implementing Multiple Inheritance using Interfaces. **PACKAGES:** Introduction; System Packages; Using System Packages; Naming Conventions; Creating Packages; Accessing a Package; Using a Package; Adding a Class to a Package; Hiding Classes.

Unit-III

MANAGING ERRORS AND EXCEPTIONS: Introduction; Types of Errors; Exceptions; Exception Handling using Try, Catch and Finally block; Throwing Our Own Exceptions; Using Exceptions for Debugging. **APPLET PROGRAMMING:** - Introduction; How Applets Differ from Applications; Applet Life Cycle; Creating an Executable Applet; Passing Parameters to Applets; Aligning the Display; More about HTML Tags; Displaying Numerical Values; Getting Input from the User. **GRAPHICS PROGRAMMING:** - Introduction; The Graphics Class; Lines and Rectangles; Circles and Ellipses; Drawing Arcs; Drawing Polygons; Line Graphs; Using Control Loops in Applets; Drawing Bar Charts.

UNIT-IV

JAVA AWT: Java AWT package Containers; Basic User Interface components; Layouts. **EVENT HANDLING:** Event delegation Approach; ActionListener; AdjustmentListener, MouseListener; MouseMotionListener; WindowListener; KeyListener; ItemListener **JAVA I/O HANDLING:** I/O File Handling (Input Stream & Output Streams, File Input Stream & FileOutputStream, Data I/P and O/P Streams, File Class, Reader and Writer Streams, Random Access File).

Recommended Books:

1. E. Balagurusami, 'Programming in Java', 4th Edn., Tata McGraw Hill.
2. Mastering Java, 2nd Edn., BPB Publications.
3. Ivan Bayross, 'Advance Java', BPB Publications.

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WEB TECHNOLOGIES

Subject Code: BITE1-522

L T P C
3 1 0 4

Duration: 42 Hrs.

Course Outcomes: This course will enable the student to build web pages using HTML, DHTML, CSS and JavaScript.

Unit-I

Introduction to HTML: Information Files Creation; Web Server; Web Client/Browser (Understanding how a Browser communicates with a Web Server); Hyper Text Markup Language (HTML) (HTML Tags, Paired Tags); Commonly used HTML Commands (The structure of an HTML program, Document Head, Document Body); Titles and Footers; Text Formatting (Paragraph Breaks, Line Breaks); Emphasizing Material in a Web Page (Heading Styles, Drawing Lines); Text Styles (Bold, Italics, Underline); Other Text Effects (Centering (Text, Images etc.); Spacing (Indenting Text)). Lists: Types of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition. Adding Graphics to HTML Documents: Using the Border attribute; using the Width and Height Attribute; Using the Align Attribute; Using the ALT Attribute.

Unit-II

Tables: Introduction (Header, Data rows, The Caption Tag); Using the Width and Border Attribute; Using the Cell Padding Attribute; Using the Cell Spacing Attribute; Using the BGCOLOR Attribute; Using the COLSPAN and ROWSPAN Attributes. Linking Documents: Links (External Document References, Internal Document References); Images as Hyperlinks (Image Maps). Frames: Introduction to Frames: The <FRAMESET> tag, the <FRAME> tag, Targeting Named Frames. DHTML: Cascading style sheets, Style tag.

Unit-III

Introduction to JavaScript: JavaScript in Web Pages (Netscape and JavaScript, Database Connectivity, Client side JavaScript, Capturing User Input); The Advantages of JavaScript (An Interpreted Language, embedded within HTML, Minimal Syntax - Easy to Learn, Quick Development, designed for Simple, Small Programs, Performance, Procedural Capabilities, designed for Programming User Events, Easy Debugging and Testing, Platform Independence/Architecture Neutral); Writing JavaScript into HTML.

Unit-IV

Forms Used by a Web Site: The Form Object; The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The Reset (Button) Element, The Checkbox Element, The Radio Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element); Other Built-In Objects in JavaScript (The String Object, The Math Object, The Date Object); User Defined Objects (Creating a User Defined Object, Instances, Objects within Objects).

Recommended Books:

1. Alexis Leon, 'Internet for Every One', 1st Edn., Leon Techworld Publication, 2009.
2. R. Greenlaw, E. Hepp, 'Fundamentals of Internet and WWW', 2nd Edn., Tata McGraw Hill, 2007.
3. Raj Kamal, 'Internet & Web Technologies', Tata McGraw Hill Education, 2009.
4. Bayross Ivan, 'HTML, DHTML, Javascript, PERL, CGI', 3rd Edn., BPB Publication, 2009.
5. Chris Payne, 'Asp in 21 Days', 2nd Edn., Sams Publishing, PDCA, 2003.

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SOFTWARE ENGINEERING

Subject Code: BITE1-523

L T P C
3 1 0 4

Duration: 42 Hrs.

Unit-I

Software: Characteristics, Components Applications, Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques, Concepts of Project Management, Role of Metrics and Measurement.

Unit-II

S/W Project Planning: Objectives, Decomposition Techniques: S/W Sizing, Problem Based Estimation, Process Based Estimation, Cost Estimation Models: COCOMO Model, The S/W Equation, System Analysis: Principles of Structured Analysis, Requirement Analysis, DFD, Entity Relationship Diagram, Data Dictionary. S/W Design: Objectives, Principles, Concepts, Design Methodologies: Data Design, Architecture Design, Procedural Design, Object – Oriented Concepts.

Unit-III

Testing Fundamentals: Objectives, Principles, Testability, Test Case Design: White Box & Black Box testing, Testing Strategies: Verification & Validation, Unit Testing, Integration Testing, Validation Testing, System Testing.

Unit-IV

Advanced Topics in Software Engineering: Reengineering: Reverse Engineering, Restructuring, Forward Engineering. Computer Aided Software Engineering (CASE): Taxonomy of CASE tools.

Recommended Books:

1. Roger S. Pressman, 'Software Engineering – A Practitioner's Approach', 6th Edn., McGraw Hill.
2. R.E. Fairley, 'Software Engineering Concepts', Paperback Edition, McGraw Hill.
3. Jalota, 'An Integrated Approach to Software Engineering', 3rd Edn., Narosa Publishing House.

ARTIFICIAL INTELLIGENCE

Subject Code: BITE1-562

L T P C
3 0 0 3

Duration: 42 Hrs.

Unit-I

Module1: Introduction- What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.

Module2: Informed Search Strategies- Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning.

Unit-II

Module3: Reasoning-Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS

Module4: Planning- Basic representation of plans, partial order planning, planning in the blocks world, heirarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints

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Unit-III

Module5: Uncertainty - Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems.

Unit-IV

Module 6: Inductive Course - decision trees, rule based Course, current-best-hypothesis search, least commitment search, neural networks, reinforcement Course, genetic algorithms; Other Course methods - neural networks, reinforcement Course, genetic algorithms.

Module7: Communication - Communication among agents, natural language processing, formal grammar, parsing, grammar

Recommended Books

1. Stuart Russell and Peter Norvig, 'Artificial Intelligence – A Modern Approach', Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, 'Artificial Intelligence', McGraw Hill, 2008.
3. George F. Luger, 'Artificial Intelligence', Pearson Education, 2001.
4. Nils J. Nilsson, 'Artificial Intelligence: A New Synthesis', Morgan Kauffman, 2002.

EXPERT SYSTEMS

Subject Code: BITE1-563

L T P C
3 0 0 3

Duration: 42 Hrs.

PREREQUISITIES: Data Structure and Programming, Design & Analysed Algorithm, Symbolic Logic and Logic Programming.

OBJECTIVES: The major objectives of this course is to provide students with a view of various models of expert systems, its design, Implementation methods for Knowledge extraction and representation, Fuzzy and connectionist systems.

COURSE CONTENTS:

Expert Systems, Definitions types, components, Expert System Development Process [15 %]
Knowledge Representation Techniques-Logic Frames, Semantic Nets, etc. [15 %]
Domain Exploration Knowledge elicitation. Conceptualization, bathering Formlizations
Methods of Knowledge Acquisition; Interviewing Sensor Data Capturing. [20 %]
Course, Planning and Explanation in Expert System: Neural Expert System, Fuzzy Expert System, Real Time Expert Systems. [30 %]
Implementation Tools: Prolog, Expert System Shell Expersys, etc. Study of existing expert systems- TIERES, As Mycin & AM. [20 %]

RECOMMENDED BOOKS

1. Patterson, 'Introduction to AI Expert System', PHI, 1993.
2. Jackson, 'Building Expert System', John Wiley, 1991.

DATA WAREHOUSING & MINING

Subject Code: BITE1-564

L T P C
3 0 0 3

Duration: 42 Hrs.

Unit-I

Introduction to Data Warehousing, The need for data warehousing, Operational & Informational Data Stores, Data Ware House Characteristics, Data Warehouse role & Structure, The cost of warehousing data. Introduction to OLAP & OLTP, Difference between OLAP & OLTP. OLAP Operations

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Unit-II

Building a Data Warehouse, Design/Technical/Implementation Considerations, Data Preprocessing Overview. Data Summarization, Data Cleaning, Data Transformation, Concept Hierarchy, Structure. Patterns & Models, Artificial Intelligence (Overview). Multidimensional Data Model, Schemas for Multidimensional Data (Star Schema, Snowflake Schema, Fact Constellation), Data Warehouse Architecture, Data Warehouse Design, OLAP Three-tier Architecture, Indexing & Querying in OLAP, OLAM, Efficient Methods of Cube Computation, Discovery Driven Exploration of Data Cubes, Attributed-Oriented Induction. SECTION -C Association Rule Mining, Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, From Association Mining to Correlation Analysis, Constraint Based Association Mining, Introduction to Classification, Classification by decision Tree, Attribute Selection Measure.

Unit-III

Introduction to Prediction techniques, Accuracy of a Classifier, Cross-Validation, Bootstrap, Boosting, Bagging, Introduction to Clustering, Classification of Various Clustering Algorithms, Selecting and Using Right DM Technique, Selecting and Using Right DM Technique, Data Visualization.

Recommended Books:

1. Alex Berson, 'Data Warehousing, Data Mining, and OLAP', 1st Edn., Tata McGraw Hill.
2. Jiawei Han & Micheline Kamber, 'Data Mining Concepts & Techniques', 2nd Edn., Morgan Kaufmann Publishers.
3. George M. Marakas, 'Modern Data Warehousing, Mining & Visualization Core Concepts', 1st Edn., Pearson Education.
4. Hawkin, 'Data Warehousing, Architecture & Implementation', Prentice Hall.
5. Rud,Olivia, 'Data Mining: Modelling Data for Marketing, Risk and Customer Relationship Management', Paperback Edition.
6. Berry, Michael, 'Data Mining Techniques', 3rd Edn.
7. Sharma, Gajendra, 'Data Mining, Data Warehousing and OLAP', 2nd Edn.
8. G.K. Gupta, 'Data Mining with Case Studies', 2nd Edn.
9. Hand, David, 'Principles of Data Mining'.

PROGRAMMING IN JAVA LAB.

Subject Code: BITE1-524

L T P C
0 0 2 1

Implementation of all the programs related to theory concepts studied in Programming in Java Paper.

1. Operators and Mathematical Functions.
2. Decision making, Branching and Looping Statements.
3. Classes, Objects and Methods.
4. Arrays, Strings and Vectors.
5. Interfaces.
6. Packages.
7. Exception handling.
8. Applet Programming.
9. AWT.
10. Event Handling.
11. I/O Handling.

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MOBILE APPLICATION DEVELOPMENT

Subject Code: BITE1-626

**L T P C
3 1 0 4**

Duration: 42 Hrs.

Unit-I

Introduction: Overview of Java, Basics of Android & its applications, Smartphone's future, Comparison of Android with other environments. Android Architecture: Android Stack, Android applications structure. UI Architecture: Application context, Intents, Activity life cycle, supporting multiple screen sizes.

Unit-II

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. Working with data storage: Shared preferences, Preferences activity, Files access, SQLite database. Animation: View animation, Draw table animation.

Unit-III

Network Communications: Web Services, HTTP Client, XML and JSON. Services: Service lifecycle, Foreground service. Publishing Your App: Preparing for publishing, Signing and preparing the graphics, publishing to the Android Market.

Unit-IV

Introducing SQLite: SQLiteOpenHelper 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. Onur Cinar, 'Beginning Android 4', Apress Publication.
2. Reto Meier, 'Professional Android 4 Application Development', Wrox Publication.
3. 'Beginning iOS 6 Development: Exploring the iOS SDK', David Mark, Apress Publication.

Web Resources

1. Safari Textbooks Online: <http://library.ohio-state.edu/search/y?SEARCH=Safari>
2. Android Developer Site: <http://developer.android.com/index.html>
3. Stack Overflow: <http://www.stackoverflow.com>

LINUX ADMINISTRATION

Subject Code: BITE1-627

**L T P C
3 1 0 4**

Duration: 42 Hrs.

Unit-I

Introduction: Introduction to UNIX, Linux, GNU and Linux distributions Duties of the System Administrator, The Linux System Administrator, Installing and Configuring Servers, Installing and Configuring Application Software, Creating and Maintaining User Accounts, Backing Up and Restoring Files, Monitoring and Tuning Performance, Configuring a Secure System, Using Tools to Monitor Security Booting and shutting down: Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services, The File System: Understanding the File System Structure, Working with Linux Supported File

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Systems, Memory and Virtual File Systems, Linux Disk Management Network Configuration Files.

Unit-II

System Configuration Files: System wide Shell Configuration Scripts, System Environmental Settings, Network Configuration Files, Managing the init Scripts, Configuration Tool, Editing Your Network Configuration TCP/IP Networking: Understanding Network Classes, Setting Up a Network Interface Card (NIC), Understanding Subnetting, Working with Gateways and Routers, Configuring Dynamic Host Configuration Protocol, Configuring the Network Using the Network, The Network File System: NFS Overview, Planning an NFS Installation, Configuring an NFS Server, Configuring an NFS Client, Using Automount Services, Examining NFS Security

Unit-III

Connecting to Microsoft Networks: Installing Samba, Configuring the Samba Server, Creating Samba Users 3, Starting the Samba Server, Connecting to a Samba Client, Connecting from a Windows PC to the Samba Server Additional Network Services: Configuring a Time Server, Providing a Caching Proxy Server, Optimizing Network Services Internet Services: Secure Services, SSH, scp, sftp Less Secure Services (Telnet ,FTP, sync,rsh ,rlogin,finger,talk and ntalk, Linux Machine as a Server, Configuring the xinetd Server, Comparing xinetd and Standalone, Configuring Linux Firewall Packages, Domain Name System: Understanding DNS, Understanding Types of Domain Servers, Examining Server Configuration Files, Configuring a Caching DNS Server, Configuring a Secondary Master DNS Server, Configuring a Primary Master Server, Checking Configuration Configuring Mail Services: Tracing the Email Delivery Process, Mail User Agent (MUA), Introducing SMTP, Configuring Sendmail, Using the Postfix Mail Server, Serving Email with POP3 and IMAP, Maintaining Email Security Configuring FTP Services: Introducing vsftpd, Configuring vsftpd, Advanced FTP Server Configuration, Using SFTP.

Unit-IV

Configuring a Web Server: Introducing Apache, Configuring Apache, Implementing SSI, Enabling CGI, Enabling PHP, creating a Secure Server with SSL Providing Web Services: Creating Mailing Lists, Setting Up Web-Based Email, configuring an RSS Feed, Adding Search Functionality.

Optimizing Internet Services: Optimizing LDAP Services, Optimizing DNS Services, Optimizing Mail Services, Optimizing FTP Services, Optimizing Web Services System Administration: updating system, upgrading and customizing kernel, Administering Users and Groups Installing and Upgrading Software Packages.

Recommended Books

1. Neil Mathew, 'Beginning Linux', 4th Edn.
2. Terry Collings, 'Red Hat Linux Networking and System Administration'.
3. S. Das, 'UNIX: Concepts and Techniques', Tata McGraw Hill.
4. Linux Administration: A Beginner's Guide, Fifth Edition, Wale Soyinka, Tata McGraw-Hill
5. Richard Petersen, 'Linux: Complete Reference', 6th Edn., Tata McGraw Hill.

CLOUD COMPUTING

Subject Code: BITE1-665

L T P C
3 0 0 3

Duration: 40 Hrs.

Overview of Cloud Computing: What is a cloud, Definition of cloud, Definition of cloud, characteristics of cloud, why use clouds, how clouds are changing, how clouds are changing,

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driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud, “Big Data”, IT as a service.

Cloud Computing Concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services, Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.

Cloud Service Delivery: Cloud service, Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS), Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus, Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

Cloud Deployment Scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

Security in Cloud Computing: Cloud security reference model, How security gets integrated, Cloud security, Understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques, Encryption & Encrypting data, Symmetric key encryption, Asymmetric key encryption, Digital signature, What is SSL?

IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

Recommended Books

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, ‘Cloud Computing: Principles and Paradigms’, **2011**.
2. Michael Miller, ‘Cloud Computing’, **2008**.
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, ‘Cloud Computing for Dummies’, **2009**.
4. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, ‘Cloud Computing: A Practical Approach’, McGraw Hill, **2010**.
5. Barrie Sosinsky, ‘Cloud Computing Bible’, Wiley, **2011**.
6. Borko Furht, Armando Escalante (Editors), ‘Handbook of Cloud Computing’, Springer, **2010**.

NETWORK SECURITY

Subject Code: BITE1-666

L T P C

Duration: 40 Hrs.

3 0 0 3

Introduction: Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc. MAC protocols for high-speed LANS, MANS and wireless LANs. (For Example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)

Fast access technologies (For Example, ADSL, Cable Modem, etc. Ipv6: Basic Protocol, extensions and options, support for QoS, security, etc., neighbour discovery,

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autoconfiguration, routing. Changes to other protocols. Application Programming Interface for IPV6.

Mobility in networks. Mobile IP, Security related issues.

IP Multicasting, Multicast routing protocols, address assignments, session discovery, etc.

TCP extension for high-speed networks, transaction-oriented applications. Other new options in TCP.

Network security at various layers. Secure- HTTP, SSL, ESP, Authentication header, key distribution protocols. Digital signatures, digital certificates.

Recommended Books

1. W.R. Stevens, 'TCP/IP Illustrated: The Protocols', Vol. 1, Addison Wesley, 1994.
2. R. Wright, 'TCP/IP Illustrated: The Implementation', Vol. 2, Addison Wesley, 1995.
3. W.R. Stevens, 'TCP/IP Illustrated: TCP for Transactions, HTTP, NNTP and the unix domain protocols', Vol. 3, Addison Wesley, 1996.

SOFTWARE TESTING AND QUALITY ASSURANCE

Subject Code: BITE1-667

L T P C
3 0 0 3

Duration: 40 Hrs.

Course Objectives: This course offers a good understanding of the concepts, methods and techniques of software testing and quality assurance and prepares students to be in a position to develop error free and quality software.

Introduction: Overview of Software Engineering, Software Process, Process Models, Overview of Project Management Process and its Phases.

Software Quality Assurance Concepts and Standards: Quality Concepts, Quality Control, Quality Assurance, SQA Activities, Software Reviews, Formal Technical Reviews, Review Guidelines, Software Reliability, Software Safety, Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126 Quality Factors, CMM, TQM, Six Sigma, SPICE, Software Quality Assurance Metrics.

Risk Management and Change Management: Software Risks, Risk Identification, Risk Projection, Risk Refinement, The RMMM Plan, Software Configuration Management, Baselines, Software Configuration Items, SCM Process: Version Control, Change Control, Configuration Audit, Configuration Management for Web Engineering.

Software Testing: Testing, Verification and Validation, Test Strategies for Conventional and Object Oriented Software, Unit Testing, Integration Testing, Validation Testing, Alpha and Beta Testing, System Testing, Recovery Testing, Security Testing, Stress Testing, Performance Testing, Metrics for Source Code, Metrics for Testing, Debugging Process, Debugging Strategies.

Testing Techniques: Software Testing Fundamentals, Black Box and White Box Testing, Basis Path Testing, Flow Graph Notation, Independent Program Paths, Graph Matrices, Control Structure Testing, Condition Testing, Data Flow Testing, Loop Testing, Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis.

Object Oriented Testing Methods: Applicability of Conventional Test Case Design Methods, Issues in Object Oriented Testing, Fault-Based Testing, Scenario-Based Testing, Random Testing and Partition Testing for Classes, InterClass Test Case Design.

Testing Process and Specialized Systems Testing: Test Plan Development, Requirement Phase, Design Phase and Program Phase Testing, Testing Client/Server Systems, Testing Web based Systems, Testing Off-the-Shelf Software, testing in Multiplatform Environment, testing for Real Time Systems, Testing Security.

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Case Studies: Design test cases for: ERP, Traffic controller, University Management system etc.

Recommended Books

1. Ian Sommerville, 'Software Engineering', 7th Edn., Pearson Education.
2. R.S. Pressman, 'Software Engineering: A Practitioner's Approach', 6th Edn., Tata McGraw Hill.
3. William E. Perry, 'Effective Methods for Software Testing', 2nd Edn., John Wiley & Sons.
4. Paul C. Jorgensen, 'Software Testing: A Craftsman's Approach', 3rd Edn., Auerbach Publications, Taylor and Francis Group, 2010.
5. Yogesh Singh, 'Software Testing', Cambridge University Press.

MODELLING AND SIMULATION

Subject Code: BITE1-668

L T P C
3 0 0 3

Duration: 40 Hrs.

Course Objectives: This course should provide the students with good understanding of various techniques of Simulation.

Introduction: What is modelling and simulation? Application areas, definition and types of system, model and simulation, introduction to discrete-event and continuous simulation.

Simulation Methods: Discrete-event Simulation, Time advance Mechanisms, Components and organization of Discrete-event simulation, Flowchart of next-event time advance approach, Continuous Simulation, Monte Carlo Simulation.

Queueing Models: Single server queueing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queueing model. Determining the events and variables, Event graphs for inventory model.

Random Numbers: Introduction to Random Numbers, Importance of Random Numbers in Simulation, Mid-Square random number generator, Residue method, Arithmetic Congruential generator, Testing Numbers for Randomness, Chi-Square Test.

Distribution Functions: Stochastic activities, Discrete probability functions, Cumulative distribution function, Continuous probability functions. Generation of random numbers following binomial distribution, poisson distribution, continuous distribution, normal distribution, exponential distribution, uniform distribution.

Simulation Languages: Basic Introduction to Special Simulation Languages: GPSS/MATLAB/ Network Simulators.

Recommended Books:

1. Averil M. Law and W. David Kelton, 'Simulation Modeling and Analysis', Tata McGraw Hill.
2. Jeffery Gordan, 'System Simulation', Prentice Hall of India.
3. D.S. Hira, 'System Simulation', S. Chand Publication.
4. Stephen J. Chapman, 'MATLAB Programming for Engineers', Thomson Course Inc.
5. Jerry Banks, John S. Carson, Barry L. Nelson and David M. Nicol, 'Discrete-Event System Simulation', Prentice Hall of India.
6. Rudra Pratap, 'Getting Started with MATLAB 7', Oxford University Press.

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SYLLABUS 2016 BATCH ONWARDS

CYBER LAWS AND IPR

Subject Code: BITE1-669

L T P C
3 0 0 3

Duration: 40 Hrs.

Basics of Computer & Internet Technology

Internet, ISP & domain name; Network Security; Encryption Techniques and Algorithms; Digital Signatures

Introduction to Cyber World

Introduction to Cyberspace and Cyber Law; Different Components of cyber Laws; Cyber Law and Netizens.

E-Commerce

Introduction to E-Commerce; Different E-Commerce Models; E-Commerce Trends and Prospects; E-Commerce and Taxation; Legal Aspects of E-Commerce.

Intellectual Property Rights

IPR Regime in the Digital Society; Copyright and Patents; International Treaties and Conventions; Business Software Patents; Domain Name Disputes and Resolution.

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 Act.

Suggested Readings/Books

1. Nandan Kamath, 'A Guide to Cyber Laws & IT Act 2000 with Rules & Notification'.
2. Keith Merrill & Deepti Chopra (IK Inter.), 'Cyber Cops, Cyber Criminals & Internet'.
3. Diane Row Land, 'Information Technology Law'.
4. Vakul Sharma, 'Handbook of Cyber Laws', Mc Millian.

SOFTWARE PROJECT MANAGEMENT

Subject Code: BITE1-670

L T P C
3 0 0 3

Duration: 40 Hrs.

Course Objectives-Software development is a complex process involving such activities as domain analysis, requirements specification, communication with the customers and end-users, designing and producing different artifacts, adopting new paradigms and technologies, evaluating and testing software products, installing and maintaining the application at the end-user's site, providing customer support, organizing end-user's training, envisioning potential upgrades and negotiating about them with the customers, and many more. The proposed subject will take students through the various processes involved in project management.

Pre-requisite Knowledge- The basic understanding of concepts of Software engineering, computer networks and Database concepts.

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

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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. Suggested Tools – Rational Team Concert, MS Project.

MOBILE APPLICATION DEVELOPMENT LAB.

Subject Code: BITE1-629

L T P C

0 0 2 1

Implementation of all the programs related to theory concepts studied in Mobile Application Development. Practical will be based on the syllabus of theory paper of Practical lab Android Programming, Installing the SDK, Creating Android Emulator, Installing Eclipse Installing Android Development Tools, Supporting multiple screen sizes, Alert dialog, Custom dialog, Dialog as Activity, Using string arrays, Creating lists , Custom lists.

Database SQLite Programming

1. SQLiteOpenHelper
2. SQL API, spinner, List view
3. SQLiteDatabase
4. Cursor
5. Reading and updating Contacts
6. Reading bookmarks

Example: Develop an App to demonstrate database usage. CRUD operations must be implemented.

M.Sc. CHEMISTRY (1ST SEMESTER)

TOTAL CONTACT HRS. = 27, TOTAL CREDITS = 23

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MCHM1-101	Electronic Spectra & Magnetic Properties of Transition Metal Complexes	3	1	0	40	60	100	4
MCHM1-102	Organic Reactions & Mechanisms-I	3	1	0	40	60	100	4
MCHM1-103	Thermodynamics	3	1	0	40	60	100	4
Departmental Elective-I		3	1	0	40	60	100	4
MCHM1-156	Computational Skills & Simulations in Chemistry							
MCHM1-157	Polymer Chemistry							
MCHM1-158	Group Theory							
Open Elective-I		3	0	0	40	60	100	3
MCHM1-104	Inorganic Chemistry Lab.-I	0	0	4	60	40	100	2
MCHM1-105	Organic Chemistry Lab.-I	0	0	4	60	40	100	2
Total 5 Theory & 2 Lab. Courses		15	4	08	320	380	700	23

M.Sc. CHEMISTRY (2ND SEMESTER)

TOTAL CONTACT HRS. = 26, TOTAL CREDITS = 23

MRSPTU

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MCHM1-206	Spectroscopy-I	3	1	0	40	60	100	4
MCHM1-207	Organometallics	3	1	0	40	60	100	4
MCHM1-208	Organic Reactions & Mechanisms-II	3	1	0	40	60	100	4
MCHM1-209	Seminar-I	0	0	2	100	--	100	1
Departmental Elective-II		3	1	0	40	60	100	4
MCHM1-259	Nano Chemistry							
MCHM1-260	Bio-organic Chemistry							
MCHM1-261	Analytical Chemistry							
Departmental Elective-III		3	1	0	40	60	100	4
MCHM1-262	Bio-inorganic Chemistry							
MCHM1-263	Bio-physical Chemistry							
MCHM1-264	Asymmetric Synthesis							
MCHM1-210	Inorganic Chemistry Lab.-II	0	0	4	60	40	100	2
Total 6 Theory & 1 Lab. Courses		15	5	06	360	340	700	23

M.Sc. CHEMISTRY (3rd SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MCHM1-311	Spectroscopy-II	3	1	0	40	60	100	4
MCHM1-312	Quantum Chemistry	3	1	0	40	60	100	4
MCHM1-313	Heterocyclic Chemistry	3	1	0	40	60	100	4
MCHM1-314	Seminar-II	0	0	2	100	--	100	1
Departmental Elective-IV		3	1	0	40	60	100	4
MCHM1-365	Environmental Chemistry							
MCHM1-366	Medicinal Chemistry							
MCHM1-367	Green Chemistry							
Open Elective-II		3	0	0	40	60	100	3
MCHM1-315	Organic Chemistry Lab.-II	0	0	4	60	40	100	2
MCHM1-316	Physical Chemistry Lab.-I	0	0	4	60	40	100	2
Total 6 Theory & 2 Lab. Courses		15	4	10	420	380	800	24

TOTAL CONTACT HRS. = 29, TOTAL CREDITS = 24

MRSPTU

M.Sc. APPLIED CHEMISTRY (4th SEMESTER)

TOTAL CONTACT HRS. = 12, TOTAL CREDITS = 20

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MCHM1-417	Photochemistry	3	1	0	40	60	100	4
MCHM1-418	Natural Products	3	1	0	40	60	100	4
MCHM1-419	Physical Chemistry Lab.-I	0	0	4	60	40	100	2
MCHM1-420	Project + Seminar	--	-	--	--	300	300	10
Total 2 Theory, 1 Lab. & 1 Project + Seminar Courses		06	2	04	140	460	600	20

Total Marks = 700 + 700 + 800 + 600 = 2800

Total Credits = 23 + 23 + 24 + 20 = 90

CORES OF APPLIED CHEMISTRY MRSPTU, BATHINDA		
S.No.	Course Code	Course
01	MCHM1-101	Electronic Spectra & Magnetic Properties of Transition Metal Complexes
02	MCHM1-102	Organic Reactions & Mechanisms-I
03	MCHM1-103	Thermodynamics
04	MCHM1-104	Inorganic Chemistry Lab.-I
05	MCHM1-105	Organic Chemistry Lab.-I
06	MCHM1-206	Spectroscopy-I
07	MCHM1-207	Organometallics
08	MCHM1-208	Organic Reactions & Mechanisms-II
09	MCHM1-209	Technical Skills-I
10	MCHM1-210	Inorganic Chemistry Lab.-II
11	MCHM1-311	Spectroscopy-II
12	MCHM1-312	Quantum Chemistry
13	MCHM1-313	Heterocyclic Chemistry
14	MCHM1-314	Technical Skills-II
15	MCHM1-315	Organic Chemistry Lab.-II
16	MCHM1-316	Physical Chemistry Lab.-I
17	MCHM1-417	Photochemistry
18	MCHM1-418	Natural Products
19	MCHM1-419	Physical Chemistry Lab.-I
20	MCHM1-420	Project + Seminar

DEPARTMENTAL ELECTIVES OF APPLIED CHEMISTRY MRSSTU, BATHINDA		
S.No.	Course Code	Course
DEPARTMENTAL ELECTIVE-I		
56	MCHM1-156	Computational Skills & Simulations in Chemistry
57	MCHM1-157	Polymer Chemistry
58	MCHM1-158	Group Theory
DEPARTMENTAL ELECTIVE-II		
59	MCHM1-259	Nano Chemistry
60	MCHM1-260	Bio-organic Chemistry
61	MCHM1-261	Analytical Chemistry
DEPARTMENTAL ELECTIVE-III		
62	MCHM1-262	Bio-inorganic Chemistry
63	MCHM1-263	Bio-physical Chemistry
64	MCHM1-264	Asymmetric Synthesis
DEPARTMENTAL ELECTIVE-IV		
65	MCHM1-365	Environmental Chemistry
66	MCHM1-366	Medicinal Chemistry
67	MCHM1-367	Green Chemistry

F means that this Course can be opted by students of different semesters,

ELECTRONIC SPECTRA & MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

Subject Code: MCHM1-101

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-1**Course Objectives**

1. To understand the concept of symmetry elements and symmetry operations.
2. To introduce the concept of inter electronic repulsion parameters and crystal field strength in various fields.
3. To familiarize with the Orgel and correlation diagrams.
4. To understand molecular orbital diagrams for octahedral and tetrahedral diagrams

1. Symmetry (8 Hrs.)

Symmetry elements, symmetry operations, point group determination, determination of reducible and irreducible representations, character tables, use of symmetry in obtaining symmetry of orbitals in molecules, use of character table to determine which metal orbitals are used in σ and π bond formation in octahedral, tetrahedral and square planar transition metal complexes, qualitative splitting of s, p, d, f orbitals in octahedral, tetrahedral and square planar fields using character tables and without the use of character tables.

UNIT-2**2. Inter Electronic Repulsions (7 Hrs.)**

Spin-spin, orbital-orbital and spin orbital coupling, L.S. and jj coupling schemes, determination of all the spectroscopic terms of p^n , d^n ions, determination of the ground state terms for p^n , d^n , f^n ions using L.S. scheme, determination of total degeneracy of terms, order of inter electronic repulsions and crystal field strength in various fields, two type of electron repulsion parameters, term wave functions, spin orbit coupling parameters (λ) energy separation between different j states (Texts 1 and 3).

3. Free Ions in Crystal Field of various strengths (8 Hrs.)

The effect of V_{oct} on S, P, D and F terms (with help of the character table), Strong field configurations, transition from weak to strong crystal fields, evaluation of strong crystal field terms of d^2 cases in octahedral and tetrahedral crystal fields (using group theory), construction of the correlation energy level diagrams of d^2 configuration in octahedral and tetrahedral fields, study of energy level diagrams for higher configurations, derivation of selection rules of electronic transitions in transition metal complexes, relaxation of the selection rule in centrosymmetric and non-centrosymmetric molecules, Orgel diagrams, Tanabe Sugano diagrams,

UNIT-3**4. Covalent Character into the Metal Ligand Bond (8 Hrs.)**

Construction of Molecular orbital energy level diagrams for octahedral, tetrahedral and square planar complexes showing σ and π bonding. Variation of the Racah parameter, central field covalency, symmetry restricted covalency, differential radial expansion, intermediate coupling, nephelauxetic effect

UNIT-4**5. Electronic Spectra of Transition Metal Complexes (9 Hrs.)**

Spectrochemical series, band intensities, factors influencing band widths (variation of $10Dq$, vibrational structure, spin orbit coupling, low symmetry components, Jahn-Teller effect), discussion of electronic spectra of octahedral and tetrahedral $d^1 - d^9$ metal ions, calculation of $10Dq$ and B with and without the use of Tanabe Sugano diagrams, low spin complexes of

Mn^{3+} , Mn^{2+} , Fe^{3+} , Co^{3+} , Fe^{2+} , comment on the spectra of second and third transition series, Charge Transfer spectra, comparison of d – d band with f – f spectra.

6. Magnetic Properties (5 Hrs.)

General discussion about magnetism in metal complexes (magnetic susceptibility, para-, dia-, ferro-, antiferro- and ferri-magnetic behavior, Curie and Curie Weiss law, magnetic properties of d block transition metal ions for d^1 to d^9 configuration, quenching of orbital magnetic moment, spin only magnetic moment, first order orbital contribution to the magnetic moment, orbital contribution due to spin –orbit coupling.

Recommended Books

1. B.N. Figgis, 'Introduction to Ligand Field', Wiley Eastern, 1966.
2. A.B.P. Lever, 'Inorganic Electronic Spectroscopy', Elsevier, 1984.
3. R. L. Dutta and A. Syamal, 'Elements of Magnetochemistry', East-West Press Pvt. Ltd. Bangalore, 1993.
4. J.E. Huheey & Others, 'Inorganic Chemistry: Principles of Structure and Reactivity', Harper Inter-Science, 2006.
5. Russell S. Drago, 'Physical Method for Chemistry', W.B. Saunders Company, 1992.
6. F.A. Cotton and G. Wilkinson, 'Advanced Inorganic Chemistry', Wiley Inter-Science, 6th Ed., 2004.
7. F.A. Cotton, 'Chemical Application of Group Theory', Wiley Eastern, 3rd Ed., 2004.

ORGANIC REACTION AND MECHANISM – I

Subject Code: MCHM1-102

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-1

Course Objectives

1. To familiarize with methods determining mechanism and various reaction intermediates.
2. To familiarize with diversity of aliphatic and aromatic nucleophilic and electrophilic reactions.
3. To understand the effect of substrate, leaving group, reaction medium and attacking reagent on substitution and elimination reaction.
4. To understand the concept of oxidation and auto oxidation.

1. Reaction Mechanism: Structure and Reactivity (12 Hrs.)

Type of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects. Hard and soft acids and bases. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes.

Effect of structure on reactivity- resonance and field effects, steric effect, quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants. Stereochemistry: Basic concepts.

UNIT-2

2. Aliphatic Nucleophilic Substitution (8 Hrs.)

The S_N2 , S_N1 , missed S_N1 and S_N2 and SET mechanisms.

The neighbouring group mechanism, neighbouring group participation by π - and σ - bonds, anchimeric assistance. Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The S_{Ni} mechanism, Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transferr catalysis and ultrasound, ambident nucleophile, regioselectivity. Gabriel synthesis

3. Aliphatic Electrophilic Substitution (5 Hrs.)

Bimolecular mechanisms- S_{E2} and S_{Ei} . The S_{E1} mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity on the reactivity, Hell-Volard-Zelinsky reaction,

UNIT-3**4. Aromatic Nucleophilic Substitution (5 Hrs.)**

The S_{NAr} , S_{N1} , benzyne and S_{RN1} mechanisms, Reactivity – effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser, and Smiles rearrangements.

5. Aromatic electrophilic substitution (7 Hrs.)

The arenium ion mechanism, orientation and reactivity in mono substitution and di-substituted aromatics, energy profile diagram, the ortho/para ratio, ipso attack, orientation in other ring systems, quantitative treatment of reactivity in substrates and electrophiles. Diazo coupling, Vilsmeier reaction, Gatterman-Koch reaction, Bechmann reaction, Hohen-Hoesch reaction.

UNIT-4**6. Free Radical Reactions (8 Hrs.)**

Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Recommended Books

1. Jerry March & Michael Smith, 'March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure', John Wiley & Sons, 6th Ed., 2007.
2. Francis A. Carey & Richard J. Sundberg, 'Advanced Organic Chemistry: Structure and Mechanisms, Vol. A', Springer, 5th Ed., 2007.
3. Francis A. Carey & Richard J. Sundberg, 'Advanced Organic Chemistry: Reaction and Synthesis, Vol. B', Springer, 4th Ed., 2006.

THERMODYNAMICS**Subject Code: MCHM1-103****L T P C
3 1 0 4****Duration: 45 Hrs.****Course Objectives**

- 1 To recall concepts involved in laws of thermodynamics.
- 2 To introduce microstates, macrostates and different types statistics.
- 3 To recall concept of Thermodynamic equation of state.
- 4 To understand various thermodynamic properties and partition function.

UNIT -1

1. **Recall:** Concepts involved in first and second law of thermodynamics, Entropy, free energy and chemical equilibrium. Thermodynamic equation of state. Maxwell relations.
2. **Non-ideal Systems:** Excess functions for non-ideal systems. Activity and activity coefficients and their determination. Concept of fugacity and its experimental determination. Partial molal properties and their determination.

UNIT -2

3. **Third Law of the Thermodynamics:** Identification of statistical and thermodynamic entropy. Nernst postulate, Planck's contribution. Alternate formulation of third law. Cooling by adiabatic and demagnetisation. Evaluation of absolute entropy.

4. Thermodynamic and living systems: Simultaneous or coupled reactions. Coupled reactions and metabolism. Free energy utilisation in metabolism. Terminal oxidation chain. Overall metabolic plan. General thermodynamic consideration of living systems.

UNIT-3

5. **Statistical Thermodynamics:** General introduction, Phase space, microstates, macrostates, thermodynamic probability. Brief introduction to different types of statistics. Ensemble concept. Canonical, grand canonical and microcanonical ensembles. Stirling approximation, Maxwell Boltzmann distribution law.

UNIT-4

6. **Partition Function and Thermodynamic Properties:** Partition function and its factorization. Translational, rotational, vibrational; electronic and nuclear partition functions. Expressions for internal energy, entropy, Helmholtz function, Gibb's function, pressure, work and heat in terms of partition function. Thermodynamic properties of ideal gases. Vibrational, rotational, electronic and nuclear contributions to the thermodynamic properties.

Recommended Books

1. Aston and Fritz, 'Thermodynamic and Statistical Thermodynamics'.
2. Lee, Seers and Turcotte, 'Statistical Thermodynamics'.
3. Dickerson, 'Molecular Thermodynamics'.
4. Glasstone, 'Thermodynamics for Chemists'.
5. R. C. Srivastva, S. K. Saha, A. K. Jain, 'Thermodynamics: A Core Course', PH I, New Delhi, 2007.
6. P. Atkins, J. D. Paula, 'Physical Chemistry', 7th Indian Edn., Oxford University Press, 2007.
7. R. P. Rastogi & R. R. Mishra, 'An Introduction to Chemical Thermodynamics', 6th Edn., Vikas Publishing House, 2007.

INORGANIC CHEMISTRY LAB-I

Subject Code: MCHM1-104

L T P C

0 0 4 2

Course Objectives

1. To develop basic understanding of various lab practices including safety measures.
2. To synthesize inorganic complexes and their characterization.

1. Preparation of coordination compounds, their purification by chromatography, elemental analyses (m, S, halogen, C, H, N), m.w. determination (rast method) and elucidation of structures by physical methods (UV, IR, NMR, magnetic susceptibility)

- a) Synthesis of Tris(acetylacetonato)manganese(III), $Mn(acac)_3$ and their characterization.
- b) Synthesis and Characterization of Hexamminechromium(III) nitrate $[Cr(NH_3)_6](NO_3)_3$ using magnetic susceptibility balance (MSB) and IR spectroscopy (Green Preparation).
- c) Synthesis of Iron(III) dithiocarbamate and its characterization using magnetic susceptibility balance (MSB) and IR spectroscopy.
- d) Synthesis and characterization of nitro- and nitritopentamminecobalt(III) chlorides using IR spectroscopy.
- e) Synthesis of hexamminecobalt(III) chloride and pentammineaquocobalt(III) chloride.
- f) Synthesis of cis- and trans- potassiumdioxalato diaquochromate(III).
- g) Aquation of trans-dichlorobis(1,2-diaminoethane)cobalt(III) chloride.
- h) Synthesis and resolution of tris(ethylenediamine)cobalt(II) ion.
- i) Synthesis of Hexaamminenickel(II) chloride and estimation of Ni(II) in the complex by gravimetry and volumetry.

- j) Synthesis of tris(acetylacetonato)iron(III).
- k) Synthesis and reactivity of organocobaloximes.
- l) Synthesis of acetylferrocene and its purification by column chromatography.
- m) Synthesis of ferrocene carboxylic acid.

2. Synthesis of Green Reagents

Green Chemistry: Introduction, principles of green chemistry, some green reagents.

- a) Tetrabutylammonium tribromide (TBATB) and its applications.
- b) Ionic liquid, 1-methyl-3-pentyl-imidazolium bromide, [pmIm]Br and its applications.

3. General Principles of Qualitative Analysis

Principle of flame testing – theory of testing acid radicals (simple and interfering). Principle of grouping of cations – theory of testing cations.

4. Inorganic Analysis by using Green Methods

- a) Analysis of simple acid radicals: carbonate, sulfide, sulfate, thiosulfite, chloride, bromide, iodide, nitrate.
- b) Analysis of interfering acid radicals: fluoride, oxalate, borate, phosphate, arsenate, arsenite.
- c) Elimination of interfering acid radicals and identifying the groups of basic radicals.
- d) Analysis of basic radicals (group-wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium.
- e) Repeating the tests in no. 04
- f) Repeating the tests in no. 04
- g) Analysis of a mixture-I containing three cations and three anions (of which one is interfering type).
- h) Analysis of a mixture-II containing three cations and three anions (of which one is interfering type).
- i) Analysis of a mixture-III containing three cations and three anions (of which one is interfering type).
- j) interfering type).
- k) Analysis of a mixture-IV containing three cations and three anions (of which one is interfering type).

5. Complexometric Titrations

- a) Determination of calcium in the presence of magnesium using EGTA as titrant
- b) Determination of the total hardness (permanent and temporary) of water
- c) Determination of calcium in the presence of barium using CDTA as titrant.

6. Redox Titration:

- a) Determination of chlorate, preparation of 0.1M cerium(IV) sulphate.
- b) Determination of copper, determination of dissolved oxygen.
- c) Determination of hydrogen sulphide.
- d) Determination of antimony arsenic.

Recommended Books

1. H. Denny, W. Roesky, 'Chemical Curiosities', WILEY VCH, 1996.
2. G. Marr and B. W. Rocket, 'Practical Inorganic Chemistry', University Science Books, 1999.
3. G. Pass and H. Sutcliffe, 'Practical Inorganic Chemistry', Chapman and Hall, London, 2nd Edn., 1974.
4. J. Mendham, R. C. Denney, J. D. Barnes, M Thomas, 'Vogel's Textbook of Quantitative Analysis', 5th Edn., Pearson Education, 2006.
5. G. Svehla, 'Vogel's Textbook of Quantitative Analysis', Pearson Education, 2006.

6. Anil J. Elias, 'A Collection of interesting General Chemistry Experiments', Orient Longman Limited, Universities Press (India) Pvt. Ltd., 2008.
7. <http://dst.gov.in/green-chem.pdf>

ORGANIC CHEMISTRY LAB-1

Subject Code: MCHM1-105

L T P C

0 0 4 2

Course Objectives

1. To impart knowledge of syntheses of organic compounds
2. To develop experimental skills of various separation and purification techniques.

1. Distillation & separation

- a) To purify common organic solvents
- b) Extract rose oil from rose petals by steam distillation.
- c) Separation of given mixtures.

2. Chromatography

- a) To separate plant pigments by column chromatography.
- b) Identification of phytoconstituents using thin layer chromatography.
- c) Identification of sugars in fruit juices through paper chromatography.

3. Organic analysis:

Detection of common functional groups in the given organic compounds and identification of compound through derivatives.

4. Organic preparations:

- a) Benzoylation: Hippuric acid
- b) Oxidation: Adipic acid/p-Nitrobenzoic acid
- c) Aldol condensation: Dibenzalacetone/Cinnamic acid
- d) Sandmeyer's reaction: p-Chlorotoluene
- e) Benzfused Heterocycles: Benzimidazole
- f) Cannizzaro's reaction: p-Chlorobenzaldehyde as substrate
- g) Friedel Crafts reaction: S-Benzoylpropionic acid
- h) Aromatic electrophilic
- i) Substitution: p-Nitroaniline/p-Iodoaniline

Recommended Books

1. David T. Plummer, 'An introduction to Practical Biochemistry', 3rd Edn., Tata McGraw Hills, 1998.
2. A. I. Vogel, 'Text Book of Practical Organic Chemistry', 5th Edn., Pearson Education, 2005.
3. P.R. Singh, D.S. Gupta and K.S. Bajpai, 'Experimental Organic Chemistry', Vol 2, Tata Mc Graw Hill, 1981.
4. G. Mann, B.C. Saunders, 'Practical Organic Chemistry' ELBS Edn., 1989.
5. N.K. Vishnoi, 'Advanced Practical Organic Chemisry', 2nd Edn., Vikas Publishing House Pvt. Ltd., 1994.

COMPUTATIONAL SKILLS AND SIMULATIONS IN CHEMISTRY

Subject Code: MCHM1-156

L T P C

Duration: 47 Hrs.

3 1 0 4

Course Objectives

1. To learn principles of computational chemistry and computer-based molecular

design.

2. To understand the basic concepts of molecular mechanics, semi-empirical method and density-functional theory.
3. To familiarize with different software packages, including MOLDEN for general model building.
4. To understand GAMESS Gaussian for quantum chemical calculations, and BOSS for liquid simulations.

UNIT – I

1. OVERVIEW OF THE COURSE (8 Hrs.)

Promises of computational chemistry, molecular mechanics of bond vibrations. Minimization methods, forces in polyatomic molecules, intermolecular forces, parameterization and testing of force fields, docking.

2. MONTE CARLO METHOD (4 Hrs.)

Principles, chemical & biochemical applications.

UNIT – II

3. MO THEORY (10 Hrs.)

Foundations, semi-empirical MO theory, Ab Initio MO Theory: Basis Sets; Hartree–Fock theory: Principles and applications.

UNIT – III

4. TREATMENT OF ELECTRON CORRELATION (10 Hrs.)

MCSCF, CI methods, Treatment of electron correlation: MP and CC methods.

UNIT – IV

5. SPECTROSCOPY (7 Hrs.)

Vibrational spectroscopy and gas phase thermodynamics, description of electronically excited states. Description of solvent effects.

6. DENSITY FUNCTIONAL THEORY (DFT) (6 Hrs.)

Principles, applications in materials. Transition states in gas phase reactions.

Recommended Books

1. Peter Comba, Trevor W. Hambley, ‘Molecular Modelling of Inorganic Compounds’, John Wiley & Sons, 2009.
2. F. Jensen, ‘Introduction to Computational Chemistry’, John Wiley & Sons, 1998.
3. Warren J. Hehre, ‘A Guide to Molecular Mechanics and Quantum Chemical Calculations’, 2003.
4. H. D. Holtje, W. Sippl, D. Rognan, G. Folkers, ‘Molecular Modeling: Basic Principles and Applications’, Wiley, 2008.
5. Christopher Cramer, ‘Essentials of Computational Chemistry, Theories & Models’, 2nd Edn., Wiley, 2002.
6. Note: Freely available packages like GAMESS, MOLDEN, AVOGADOOS, MOPAC may be used for computational Lab.

POLYMER CHEMISTRY

Subject Code: MCHM1-157

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To impart knowledge about polymers and polymerization mechanism.
2. To understand the difference between crystalline and amorphous polymers.
3. To familiarize polymer characterization with various spectroscopic techniques.

4. To learn molecular weight measurement by osmometry, mass spectrometry and Viscometry.

UNIT-I

1. INTRODUCTION TO POLYMERS (6 Hrs.)

IUPAC nomenclature of vinyl, non-vinyl polymers, copolymers and end groups. Abbreviations for polymers. Introduction to industrial polymers-plastic thermoplastic- & thermosetting plastics), fibres (commonly used natural & synthetic fibre).

2. POLYMERIZATION MECHANISMS (6 Hrs.)

Mechanism of free radical chain polymerization & ionic chain polymerization-initiators, inhibitors & stereochemistry. Mechanism of coordination chain polymerization (Ziegler-Natta, Cossee), polycondensation step polymerization, polyaddition step polymerization & ring opening step polymerization.

UNIT-II

3. KINETICS OF POLYMERIZATION MECHANISMS (5 Hrs.)

Kinetics of free radical chain polymerization, ionic chain polymerization, catalyzed and non-catalyzed polycondensation polymerization including kinetic chain length, chain transfer reactions.

4. AVERAGE MOLECULAR WEIGHT OF POLYMERS (6 Hrs.)

Number average molecular weight – its measurement by osmometry (membrane & vapour phase), end group analysis, mass spectrometry. Weight average molecular weight – its measurement by light scattering method (dissymmetry method & Zimm plot method).

Viscosity average molecular weight – its measurement by viscometry. Determination of molecular weight distribution by gel permeation chromatography (size exclusion chromatography).

UNIT-III

5. CHEMICAL STRUCTURE & POLYMER MORPHOLOGY (5 Hrs.)

Macrostructure of polymers. Geometrical isomerism & optical isomerism, Tacticity, degree of crystallinity, liquid crystallinity, crystallizability, crystallites (bundles), spherulites, polymer single (ideal) crystals. Glass transition temperature- concept of glassy state, viscoelastic state, viscofluid state for amorphous and crystalline substances including polymers. Specific volume change vs temperature curves.

6. POLYMER PROPERTIES (6 Hrs.)

Mechanical properties - tensile strength, compressive strength, flexural strength, impact strength, toughness, fatigue, yield point, elongation at break, tensile modulus, relaxation & retardation (creep) phenomena. Thermal stability, flammability & flame resistance, chemical resistance, degradability, electrical conductivity, nonlinear optical properties. Polymer additives to modify mechanical, surface, chemical, aesthetic & processing properties.

UNIT-IV

7. FIBRES REINFORCED POLYMER COMPOSITES (5 Hrs.)

Introduction to composites. Polymer matrix materials & fibres reinforcement. Types of fibres- glass, aramid, & silica fibres. Advantages & disadvantages of polymer composites.

8. CHARACTERIZATION TECHNIQUES OF POLYMERS (6 Hrs.)

Infrared, Raman, NMR, ESR, UV-Vis, fluorescence studies. X-ray scattering, SEM, thermal- DSC, DTA, TMA, TGA studies.

Recommended Books

1. D. Campbell and J.R. White, 'Polymer Characterization: Physical Techniques', Chapman and Hall, New York, 1989.

2. Malcolm P. Stevens, 'Polymer Chemistry: An Introduction', 3rd Edn., Oxford University Press, Indian Edn., Reprint, 2011.
3. A.H. Fawcett, 'Polymer Spectroscopy', Wiley, New York, 1996.
4. R.J. Young, 'Spectroscopy of Polymers', Wiley, New York, 1996.
5. M. Lewin, S.M. Atlas, E.M. Pearce, 'Flame Retardant Polymeric Materials', Plenum Press, New York, 1975.
6. E.M. Pearce, Y.P. Khanna, D. Raucher, 'Thermal Characterization of Polymeric Materials', Academic Press, New York, 1981.
7. I.M. Ward, 'Mechanical Properties of Polymers', Wiley Interscience, New York, 1971.
8. Jan M. Gooch, 'Encyclopedic Dictionary of Polymers', Springer, 2007.
9. Anita J. Brandolini, Deborah D. Hills, 'NMR Spectra of Polymers & Polymer Additives', Marcel Dekker, New York, 2000.
10. Fred W. Wilmeyer, 'Text Book of Polymer Science', A. Wiley Interscience Publication, 1994.
11. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar; 'Polymer Science', New Age International, 1986.

GROUP THEORY

Subject Code: MCHM1-158

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To educate about the importance of symmetry elements and operations.
2. To understand Great Orthogonality Theorem.
3. To develop an understanding of molecular orbital theory and ligand field theory with respect to symmetry properties.
4. To equip with the identification of IR active and Raman active vibrations and hybridization of central atom in molecule with the help of character table.

UNIT-1

1. Symmetry Elements and Operations (5 Hrs.)

Symmetry planes and reflections, inversion centre, proper axes and proper rotations, improper axes and improper rotations.

2. Relations among Symmetry Elements (8 Hrs.)

Products of symmetry operations, equivalent symmetry elements and equivalent atoms, general relations among symmetry elements and operations, symmetry point groups, symmetry classification of elements of a Group, order of a group. Group Multiplication Table.

UNIT-2

3. Representations of Groups (8 Hrs.)

Matrix multiplication, character of matrix, Matrix notation for symmetry operations, Block factored matrices, The Great Orthogonality Theorem, Important rules about irreducible representations and their characters, relationship between reducible and irreducible representations with examples. Construction of character tables.

UNIT-3

4. Hybridization and Spectroscopy Applications (6 Hrs.)

Hybridization scheme in Sigma and Pi bonding, Identification of IR active & Raman active vibrations.

5. Molecular Orbital Theory for Inorganic Compounds (10 Hrs.)

Transformation properties of atomic orbitals, molecular orbitals for sigma bonding in tetrahedral and octahedral molecules.

UNIT-4

6. Ligand Field Theory (8 Hrs.)

Introduction, Electronic structure of free atoms and ions, splitting of levels and terms in a chemical environment, construction of energy level diagram.

Recommended Books

1. A. Salahuddin Kunju & G. Krishnan, 'Group Theory and Its Applications in Chemistry', PHI Learning Private Limited, New Delhi, 2010.
2. F. A. Cotton, 'Chemical Applications of Group Theory', 3rd Ed., Wiley Eastern, 2004.
3. J.N. Murrell et. al, 'Valence Theory', John Wiley, 1970.
4. R.B. Woodward and R. Hoffmann, 'Conservation of Orbital Symmetry', Academic Press, 1970.
5. B.N. Figgis, 'Introduction to Ligand Fields', John Wiley, 1996.

SPECTROSCOPY – I

Subject Code: MCHM1-206

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives

1. To introduce the concept of spectroscopy, selection rules, line width and broadening.
2. To familiarize with the terms chromophores, auxochromes, red, blue, hypo and hyperchromic effect.
3. To understand vibrations of polyatomic molecules and use of group theory to determine the number of active lines.
4. To evaluate the utility of spectroscopy as a qualitative and quantitative method for structure elucidation.

UNIT-1

1. General Features of Spectroscopy (5 hrs.)

Units and conversion factors, Introduction to spectroscopy, Nature of radiation, Energies corresponding to various kinds of radiation, Intensities of spectral lines, selection rules and transition moments, Line widths, Broadening (Book 1)

UNIT-2

2. Pure Rotational Spectra (10 Hrs.)

Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raman Spectra, anisotropic polarizability, specific selection rule in Raman Spectra, Stokes and anti – Stokes lines.

3. Vibrational Spectra (5 Hrs.)

Diatomic molecules, Force constants, Fundamental vibration frequencies, Anharmonicity of molecular vibrations and its effect on vibrational frequencies, Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO, P, Q and R branches.

UNIT-3

4. Infrared and Raman Spectra (15 Hrs.)

Vibrations of polyatomic molecules. Examples of CO₂, H₂O. Mechanics of measurement of infrared and Raman spectra, absorption of common functional groups, their dependence on chemical environment (bond order, conjugation, H – bonding), Use of group theory to

determine the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, Application of IR in structure elucidation of organic compounds – Various Carbonyl compounds, alkane, alkenes, alkynes, unsubstituted, mono and di-substituted aromatic compounds, alcohols, phenols, ethers, Far IR region, Metal ligand vibrations, – CN, Nitro-nitrito- and CO ligands and the effect of their co-ordination with metal ions and IR spectra.

UNIT-4

5. UV and Visible Spectroscopy of Organic Molecules (10 Hrs.)

Measurement technique, Beer – Lambert's Law, molar extinction coefficient, oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra. Chromophores, auxochromes, electronic spectra of polyatomic molecules, Woodward rules for conjugated dienes and α , β - unsaturated carbonyl groups, extended conjugated and aromatic sterically hindered systems, red shift, blue shift, hypo- and hyperchromic effect.

Recommended Books

1. Russell S. Drago, 'Physical Method for Chemistry', 2nd Edn., Surfside Scientific Publishers, 1992.
2. R.M. Silverstein, G.C. Bassler, T.C. Morrill, 'Spectrometric Identification of Organic Compounds', 3rd Edn., Wiley, 1974.
3. William Kemp, 'Organic Spectroscopy', 3rd Edn., W.H. Freeman, 1991.
4. Dudley H. Williams & Ian Fleming, 'Spectroscopic Methods in Organic Chemistry', 6th Edn., McGraw-Hill, Science, 2008.
5. J.R. Dyer, 'Application of Absorption Spectroscopy of Organic Compounds' Prentice-Hall, Englewood Cliffs, N.J., 1965.
6. Dudley H. Williams & Ian Fleming, 'Spectroscopic Problems in Organic Chemistry' 5th Edn., McGraw-Hill, London, 1985.
7. R.C. Banks, E.R. Matjeka, G. Mercer, 'Introductory Problems in Spectroscopy' Manlo Park, CA, 1980.
8. G.M. Barrow 'Introduction to Molecular Spectroscopy' McGraw-Hill, New York, 1962.
9. C.N. Banwell 'Fundamentals of Molecular Spectroscopy' 4th Edn., Tata McGraw-Hill Education, 1994.
10. D.L. Pavia, G.M. Lampman and G. S. Kriz, 'Introduction to Spectroscopy' 4th Edn., Cengage Learning, 2008.

ORGANOMETALLICS

Subject Code: MCHM1-207

L T P C

Duration: 45 Hrs.

3 1 0 4

Course Objectives

1. To recall classification of ligands and nomenclature of organometallic compounds.
2. To understand structure, bonding and reactivity of organometallic compounds.
3. To familiarize with the role of organometallic compounds in organic syntheses.
4. To understand the applications of organometallic compounds as catalysts.

UNIT-1 (11 Hrs.)

1. Introduction- Stability & decomposition pathways, classification of ligands, nomenclature of Organometallic compounds.
2. 18 valence electron rule- Introduction to the 18 valence electron rule, total electron counts and finding metal-metal bonds & related problems.

UNIT-2 (11 Hrs.)

3. Synthesis, structure, bonding & reactivity of organotransition metal complexes.
 - (i) Carbenes, Carbynes, Alkenes, Alkynes, Allyl moieties, Butadiene, Cyclobutadiene, Cyclopentadiene, Arenes, Cycloheptadienyl moieties & Cyclo octatetraene moieties, Ring slippage reactions.
 - (ii) Ferrocenes- Structure & bonding of ferrocenes, basic chemical reactions of ferrocenes, chirality in ferrocene derivatives, ferrocene based condensation polymers.

UNIT-3 (10 Hrs.)

4. Organometallic compounds in organic Synthesis-Green rules, synthesis & use of Zinc dialkyls, Collaman's reagent, organ mercuric & chromium carbonyls in organic synthesis, Heck reaction, Hydrozirconation.

UNIT-4 (13 Hrs.)

5. Applications of organometallic complexes to Catalysis-Basic principles, Industrial requirements of catalysts, sequences involved in catalytic reaction, asymmetric synthesis using catalyst, Hydrogenation catalysts & their classification, hydrogenation by lanthanide organometallic compounds. Hydro formylation: Cobalt catalyst & phosphine modified cobalt catalysts, Rhodium-phosphine catalysts, factors affecting n/iso ratio of hydro formylation products. Monsanto, Cativa & Wacker processes, polymerization & oligomerisation of olefins & dienes, catalytic converters.

Recommended Books

1. 'Basic Organometallic Chemistry: Concepts, Synthesis & Application of Transition Metals', CRC Press & Univ. Press, 2010.
2. R.C. Mehrotra & A. Singh, 'Organometallic Chemistry, A Unified Approach', New age International.
3. B.D. Gupta & A.J. Elias, 'Basic Organometallic Chemistry', Universities Press.
4. F.A. Cotton & G. Wilkinson, 'Advanced Inorg, Chemistry', Wiley Intersciences.

ORGANIC REACTION AND MECHANISMS –II

Subject Code: MCHM1-208

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives

1. To extend knowledge of mechanistical and stereochemical aspects of organic reactions.
2. To impart knowledge of various oxidative and reductive processes in organic syntheses.
3. To understand the mechanism of various organic reactions including Beckmann, Neber, Hofmann, Schmidt and Fries rearrangement.
4. To familiarize with syntheses of prostaglandins, strychnine, reserpine and biotin etc.

UNIT-1

1. Addition to Carbon-Carbon and Carbon-Hetero Multiple Bonds (10 Hrs.):

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Hydroboration. Michael reaction. Sharpless asymmetric epoxidation. Addition of Grignard reagents, organozinc, organolithium and Gilman reagents to carbonyl and unsaturated carbonyl compounds. Use of other organometallic reagents in addition reactions. Wittig reaction, Mechanism of condensation reactions involving enolates – Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.

UNIT-2

2. Elimination Reactions (5 Hrs.):

The E2, E1 and E1cB mechanisms and their spectra. Orientation of the double bond. Reactivity – effects of substrate structures, attacking base, the leaving group and the medium. Mechanism and orientation in pyrolytic elimination.

3. Oxidation (7 Hrs.):

Introduction. Different oxidative processes. Hydrocarbons- alkenes, aromatic rings, saturated C-H groups) activated and inactivated). Alcohols, diols, aldehydes, ketones, ketals and carboxylic acids. Amines, hydrazines, and sulphides.

Oxidations with ruthenium tetroxide, iodobenzene diacetate and thallium (III) nitrate, DDQ, PCC, CAN, selenium dioxide, peroxyacids, DCC. Oxidation reactions with special emphasis on Baeyer-villegier reaction, Cannizarro oxidation-reduction reaction,

UNIT-3

4. Reduction (10 Hrs.):

Introduction. Different reductive processes, Hydrocarbons- alkanes, alkenes, alkynes and aromatic rings, Carbonyl compounds – aldehydes, ketones, acids, ester and nitriles. Epoxides, Nitro, nitroso, azo and oxime groups, Hydrogenolysis. Sodium borohydride, sodium cyano borohydride, LAH, disobutyl aluminium hydride, tin hydride, trialkyl tin hydride, trialkyl silanes, alkoxy substituted LAH, DIBAL, diborane, diisoamyl borane, hexyl borane, 9-BBN, isopinocampheyl and diisopinocampheyl borane. Reduction reactions with particular emphasis on Wolf-Kishner reduction, Clemmensen reduction,

UNIT-4

5. Rearrangements (8 Hrs.):

General mechanistic consideration – nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements, Pinacol-pinacolone, Wagner-Meerwein, Demjanov, Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Beckmann, Hofman, Curtius, Schmidt, Shapiro reaction, Fries rearrangement

6. Selected Natural Product Synthesis (5 Hrs.)

Corey's synthesis of prostaglandins (PGF₂ and PGE₂), Woodward synthesis of Strychnine and Reserpine, Synthesis of Biotin by Hoffman-LaRoch, synthesis of Indolizomycin by Danishefsky, Synthesis of Taxol by K.C. Nicolau.

Recommended Books:

1. Jerry March & Michael Smith, 'March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure', 6th Edn., John Wiley & Sons, **2007**.
2. Francis A. Carey & Richard J. Sundberg, 'Advanced Organic Chemistry: Structure and Mechanisms, Vol, A', 5th Edn., Springer, **2007**.
3. Francis A. Carey & Richard J. Sundberg, 'Advanced Organic Chemistry: Reaction and Synthesis, Vol. B', 4th Edn., Springer, **2006**.
4. K.C. Nicolaou and E.J. Sorensen, 'Classics in Total Synthesis: Targets, Strategies, Methods', Wiley, **1996**.

SEMINAR-I

Subject Code: MCHM1-209

L T P C

0 0 2 1

1. Each of these Courses of Seminar will consist of 100 marks (internal only) having L T P C as 0 0 2 1.

- In the beginning of the semester, a teacher will be allocated maximum 30 students. The latter will guide/teach them how to prepare/present 15 minutes Power Point Presentation for the Seminar.
- If there are more than 30 students in the class, then class will be divided into two groups having equal students. Each group may be allocated to a different teacher.
- Each student will be allotted a topic by the teacher at least one week in advance for the presentation. The topic for presentation may be from the syllabus or relevant to the syllabus of the programme.
- During the presentation being given by a student, all the other students of his/her group will attend the Seminar. The assessment/evaluation will be done by the teacher. However, Head of Department and other faculty members may also attend the Seminar, ask questions and give their suggestions.
- This is a turn wise continuous process during the semester and a student will give minimum two presentations in a Semester.
- For the evaluation, the following criteria will be adopted,
 - Attendance in Seminar: 25 Marks
 - Knowledge of Subject along with Q/A handling during the Seminar: 25 Marks
 - Presentation and Communication Skills: 25 Marks
 - Contents of the Presentation: 25 Marks.

INORGANIC CHEMISTRY LAB-II

Subject Code: MCHM1-210

L T P C

0 0 4 2

Course Objectives

- To extend knowledge of use of standard laboratory equipment, modern instrumentation and classical techniques to carry out experiments.
- To synthesize various inorganic complexes and their qualitative determination by UV, IR, NMR and ESR techniques.
 - Reaction of Cations and Anions:** Analysis of mixture of cations and anions.
 - Gravimetric Analysis of Cations and Anions:** Iodide, thiocyanate, Sulphate, oxalate chloride, nickel, copper cobalt, zinc and their mixture.
 - Preparation of Inorganic and Coordination compounds,** their purification, elemental analyses, M.W determination and elucidation of structures by physical methods:
 - Synthesis of nitro- and nitropentamminecobalt(III) chlorides.
 - Synthesis of hexamminecobalt(III) chloride and pentammineaquocobalt(III) chloride.
 - Synthesis of cis and trans potassiumdioxalatodiaquochromate(III).
 - Aquation of trans-dichlorobis(1,2-diaminoethane)cobalt(III) chloride.
 - Synthesis and resolution of tris(ethylenediamine)cobalt(II) ion.
 - Synthesis of hexaamminenickel(II) chloride and estimation of Ni (II) in the complex by gravimetry and volumetry.
 - Synthesis of tris(acetylacetonato)iron(III).
 - Synthesis and reactivity of organocobaloximes.
 - Synthesis of acetylferrocene and its purification by column chromatography.
 - Synthesis of ferrocene carboxylic acid.
 - Determination of Metal Ions Using Solvent Extraction:**
 - Determination of copper as the diethyldithiocarbamate complex
 - Determination of copper as the neocuproin complex
 - Determination of iron as the 8hydroxyquinolate

- d) Determination of nickel as the dimethylglyoxime complex,
 e) Extraction and determination of lead, cadmium, and copper using ammonium pyrrolidine dithiocarbamate.
- 5. Electro Analytical Techniques**
 pHmetric, Conductometric and Amperometric Titration: Representative acid/base and redox titrations.
- 6. Colorimetry and Spectrophotometry**
 a) Determination of λ_{\max} the absorption curve and concentration of a substance
 b) Simultaneous spectrophotometric determination (chromium and manganese)
 c) Spectrophotometric determination of pK value of an indicator
 d) Determination of copper (II) with EDTA
 e) Determination of iron (III) with EDTA.
- 7. Atomic Absorption Spectroscopy**
 a) Determination of cations by AAS.
 b) Determination of magnesium and calcium in tap water.
 c) Determination of trace elements in contaminated soil.
 d) Determination of vanadium in lubricating oil, determination of trace lead in a ferrous alloy.
- 8. Qualitative determination by UV, IR, NMR, ESR.**

Recommended Books:

1. H. Denny, W. Roesky, 'Chemical Curiosities', WILEY VCH, 1996.
2. G. Marr and B.W. Rocket, 'Practical Inorganic Chemistry', University Science Books, 1999.
3. G. Pass and H. Sutcliffe, 'Practical Inorganic Chemistry', Chapman and Hall, London, 1968.
4. J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, 'Vogel's Textbook of Quantitative Analysis', Pearson Education, 2006.
5. G. Svehla, 'Vogel's Textbook of Quantitative Analysis', Pearson Education, 2006.
6. Anil J. Elias, 'A Collection of Interesting General Chemistry Experiments', University Press, 2002.

Note: The students are required to perform atleast 2 experiments from each section.

NANOCHEMISTRY

Subject Code: MCHM1-259

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To understand the concept of self-assembly and its applications to various nano structures.
2. To understand synthesis of nano materials.
3. To learn characterization of nano materials.
4. To understand the applications of nano materials in biological system.

UNIT-1

1. Introduction (5 Hrs.):

Introduction to nanochemistry and nanotechnology, definition & classification of nanomaterials. Properties & applications of nanomaterials.

2. Self-Assembly and Nanostructures (10 Hrs.):

Types of self-assemblies, self-assembling materials. Use of self-assembly in nano rod devices, nano wires, nano tubes, molecular logic gates, molecular storage devices, DNA, fullerenes, nano gas sensors.

UNIT-1I

3. Nano Material Synthesis (10 Hrs.):

Top down and bottom up approach, synthesis: Vapour phase synthesis by chemical routes; Nucleation & growth from solutions, stabilization against agglomeration. Processing of nano materials; Nano structured sol gel materials. Consolidation of nano crystalline materials by compaction and sintering, nanolithography.

UNIT-1II

4. Characterization Techniques (15 Hrs.):

Characterization of nano structured materials – by scattering techniques, proximal microscopy (AFM & STM).

UNIT-1V

5. Applications (5 Hrs.):

Bionano composites, biometrics, nano technology enabled sensors, Microelectronics, drug delivery, bionano information.

Course Learning Outcomes:

1. Introduction to the concept of nanochemistry and its classification and terminology.
2. Synthesis of nanomaterials by different routes and their characterization.
3. Applications in biological and electronic systems.

Recommended Books:

1. C.P. Poole & F.J. Owens, 'Introduction to Nanotechnology', Wiley, **2003**.
2. M. Ratner & D. Ratner, 'Nanotechnology', Prentice Hall, **2003**.
3. M. Wilson, K. Kannagara, G. Smith, M. Simmons & B. Raguse, 'Nanotechnology', CRC Press Boca Raton, **2002**.
4. A. Ozin Geoffery & C. Andre, 'Nanochemistry, A Chemical Approach to Nanomaterials', Arsenault Royal Society of Chemists, **2005**.
5. E. Foster Lynn, 'Nanotechnology, Science Innovation & Opportunity', Pearson Education, **2007**.

BIO-ORGANIC CHEMISTRY

Subject Code: MCHM1-260

L T P C

Duration: 45 Hrs.

3 1 0 4

Course Objectives

1. To illustrate the link between organic chemistry and biochemistry by discussing the organic chemistry of selected processes of living systems.
2. To integrate the chemical principles with biological applications with examples drawn from biochemistry, molecular and cell biology.
3. To understand the mechanism of enzyme catalysis.
4. To understand the mechanism of combinatorial synthesis in medicinal chemistry.

UNIT-1 (11 Hrs.)

Amino Acids and Proteins: Structure, classification, synthesis and properties of amino acids, isoelectric point, biosynthesis of amino acids. Peptides: oligo- and polypeptides, geometry of peptide linkage, N-terminal and C-terminal residue analysis, synthesis of peptides-amino and carboxyl protecting groups-solid phase peptide synthesis. Proteins: classification and properties (denaturation, isoelectric point and electrophoresis), primary, secondary, tertiary and quaternary structures of proteins, collagen and triple helix.

UNIT-II (11 Hrs.)

Enzymes and Cofactors: Mechanism of enzyme catalysis, Factors influencing enzyme action, Examples of typical enzyme mechanisms: chymotrypsin, ribonuclease and lysozyme,

Enzyme-catalyzed addition, elimination, condensation, carboxylation and decarboxylation, isomerization, group transfer and rearrangement reactions-structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD⁺, NADP⁺, FMN, FAD, lipoic acid and Vitamin B12. Mechanisms of reactions catalyzed by the above cofactors.

UNIT-III (12 Hrs.)

Nucleic Acids and Protein Synthesis: Nucleotides and nucleosides, DNA: primary and secondary structure-replication of DNA. RNA and protein synthesis: Messenger RNA synthesis-transcription, Ribosomes-rRNA, Transfer RNA, genetic code translation. Determination of base sequence of DNA. Polymerase Chain Reaction (PCR). Antisense technology in chemotherapy and other nucleic acid-targeted drugs-intercalates, sequence specific drugs. A brief account of ribozyme and iRNA.

UNIT-IV (11 Hrs.)

Lead and Analogue Synthesis-1: Designing organic synthesis-disconnection approach-synthons and synthetic equivalents-one group disconnections: alcohol, olefin, ketone, acids-two group disconnections: 1,2-, 1,3-, 1,4- and 1,5-difunctional compounds-convergent synthesis-functional group interconversions- functional group additions-carbon heteroatom bonds-methods for 3- to 6-membered rings.

Lead and Analogue Synthesis-2: Combinatorial synthesis in medicinal chemistry: Solid phase techniques-methods of parallel synthesis-mix and split techniques-dynamic combinatorial chemistry-screening and deconvolution-limitations of combinatorial synthesis Asymmetric synthesis: basic principles-stereo selective and stereospecific reactions- methods for determining enantiomeric excess-chiral auxiliary, reagents and catalysts and their applications (wherever applicable) in alkylation, hydrogenation, hydroxylation, epoxidation and hydroboration of alkenes, reduction of ketones-Cram and Felkin-ahn models. Noyori's BINAP – Jacobson catalyst – Evans catalyst.

Recommended Books:

1. Hermann Dugas and C. Penny, 'Bioorganic Chemistry: A Chemical Approach to Enzyme action', Springer-Verlag.
2. N.C. Price and L. Stevens, 'Fundamentals of Enzymology', Oxford University Press.
3. C. Walsh, W.H. Freeman, 'Enzymatic Reaction Mechanisms'.
4. Stuart Warren, 'Designing Organic Synthesis: The Disconnection Approach', 2nd Edn., Wiley, 1984.
5. H.B. Kagan, 'Asymmetric Synthesis', Thieme Medical Publishers, 2003.
6. Francis A. Carey and Richard B. Sundberg, 'Advanced Organic Chemistry: Part-A and Part-B', 5th Edn., Springer, 2007.

ANALYTICAL CHEMISTRY

Subject Code: MCHM1-261

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives

1. To learn the theory and importance of analytical chemistry.
2. To acquire knowledge about various methods of quantitative estimations.
3. To know the methods of analysing the chemicals applying the electroanalytical and thermogravimetric instruments.
4. To know the methods of separating the mixture of compounds by chromatographic Techniques.

UNIT-1

1. Introduction to Analytical Chemistry

Types of analytical methods: Importance of analytical methods in qualitative and quantitative analysis: chemical and instrumental methods- advantages and limitations of chemical and instrumental methods. Data handling: Introduction, sensitivity and detection limit, noise and sources, Uncertainties, errors, calibrations, mean, standard deviations. Least square fit, computer aided analysis.

2. Thermoanalytical Techniques

Principle of thermogravimetry, differential thermal analysis, differential scanning calorimetry - instrumentation for TGA, DTA and DSC-characteristics of TGA and DTA curves - factors affecting TGA and DTA curves. Applications of thermal analysis.

UNIT-2

3. Electrochemical Techniques

Basic principle, instrumentation and applications of cyclic voltametry and coulometry, potentiometry, voltametry, polarography.

4. High Performance Liquid Chromatography

Principle, instrumentation, supports in HPLC. Applications of HPLC systems, supercritical fluid chromatography(SFC). Recent developments in SFC and applications.

UNIT-3

5. Microscopy Techniques

Basic principle, instrumentation and applications of electron microscopy - SEM, TEM, scanning probe microscopy – AFM.

6. X- Ray Diffraction

Crystal shapes and point groups, reciprocal lattices, unit cells, Miller indices, Bragg's law in reciprocal space, Diffraction pattern assignments, dimensions and contents of the unit cell, X-ray intensities and atomic positions, Fourier synthesis.

UNIT-4

7. Neutron Diffraction

Elementary theory of neutron diffraction, study of hydrogen bonds, hydrates and other hydrogen containing compounds, magnetism, limitations.

8. Electron Diffraction

Scattering of electrons by gases, visual method, sector method structure of some molecules studies by electron diffraction, limitation of electron diffraction.

Recommended Books:

1. A Douglas, Skoog and Donald M. West, F.J. Holler, 'Fundamentals of Analytical Chemistry', 8th Edn., Harcourt College Publishers, **2004**.
2. Skoog, Holder, Nieman, 'Principles of Instrumental Analysis', 5th Edn., Thomson Books, **1998**.
3. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, 'Vogel's Text Book of Quantitative Chemical Analysis', 6th Edn., Pearson Education, **2006**.
4. R. Gopalan, P.S. Subramaniam and K. Rengarajan, 'Elements of Analytical Chemistry', 3rd Edn., Sultan Chand and Sons, **2003**.
5. S. Usharani, 'Analytical Chemistry', Macmillan Publishers, India, **2000**.
6. G. H. Stout and L. H. Jensen, 'X-ray Structure Determination- A Practical Guide', 2nd Ed., Wiley New, York, **1989**.
7. P.J. Wheatley, 'Determination of Molecular Structure', Oxford, **1968**.
8. D. F. Shriver and P. W. Atkins, 'Inorganic Chemistry', 4th Ed., Oxford, **2006**.
9. A. Braithwaite and F.J. Smith, 'Chromatographic Methods', 5th Ed., Blackie Academic and Professional, London, **1996**.

BIO-INORGANIC CHEMISTRY

Subject Code: MCHM1-262

L T P C
3 1 0 4

Duration: 48 Hrs.

Course Objectives

1. To understand structures, processes and chemical interactions of enzymes with metal ions in biological systems.
2. To understand the transport mechanisms of enzymes in physiological systems.
3. To acquire knowledge of metal complexes with various nucleic acids.
4. To study the role of metal complexes in transcription of nucleic acid.

UNIT-I & UNIT-II**1. Inorganic Chemistry of Enzymes (30 Hrs.)**

Introduction, non-photosynthetic processes, metallo-porphyrines, cytochromes, biochemistry of iron, iron storage and transport, ferritin transferring, bacterial iron transport, haemoglobin and myoglobin, nature of heme-dioxygen binding, model systems, cooperativity in haemoglobin, physiology of myoglobin and haemoglobin, structure and function of haemoglobin.

Structure and function, inhibition and poisoning Vitamin B₁₂ and B₁₂ coenzymes metallothioneins, nitrogen fixation, in-vitro and in-vivo nitrogen fixation, bio-inorganic chemistry of Mo and W, nitrogenases: other elements V, Cr, Ni (essential and trace elements in biological systems).

Other iron-prophyrin biomolecules, structure and function of hemoglobin. Other iron-porphyrin biomolecules, peroxidases and catalases, cytochrome P450 enzymes, other natural oxygen carriers, hemerythrins, electron transfer, respiration and photosynthesis; ferridoxins, and subredonim carboxypeptidase, carbonic anhydrase, metallothioneins.

UNIT-III & UNIT-IV**2. Metal Ions in Biological Systems (18 Hrs.)**

Metal complexes of polynucleotides, nucleosides and nucleic acids (DNA & RNA). Template temperature, stability of DNA.

Role of metal ions in replication and transcription process of nucleic acids. Biochemistry of calcium as hormonal messenger, muscle contraction blood clotting, neurotransmitter, calcification reclaiming of barren land. Metals in the regulation of biochemical events.

Transport and storage of metal ions *in vivo*.

Course Learning Outcomes

1. Structures, properties and transport mechanisms of enzymes in physiological systems
2. Metal complexation with various nucleic acids and their role in transcription of nucleic acids

Recommended Books

1. J.E. Huheey, E.A. Keiter and R.L. Keiter, 'Inorganic Chemistry: Principles of Structure and Reactivity', 4th Edn., Haper Collins.
2. B. Douglas, D. McDaniel and J. Alexander, 'Concepts and Models of Inorganic Chemistry', 3rd Edn., John Wiley and Sons.
3. F.A. Cotton and G. Wilkinson, 'Advanced Inorganic Chemistry: A Comprehensive Text', 5TH EDN., JOHN WILEY.
4. Ch. Elschenbroich and A. Salzer, Organometallics. A Concise Introduction, Second Edition, VCH.
5. D.F. Shriver and P.W. Atkins, 'Inorganic Chemistry', 3rd Edn., Oxford University Press.
6. J.A. Cowan, 'Inorganic Biochemistry', 2nd Edn., Wiley-VCH.
7. G. Wulfsberg, 'Inorganic Chemistry', University Science Books.

8. S.J. Lippard & J.M. Berg, 'Principles of Bioinorganic Chemistry', Univ. Science Books, 1994.
9. S.J. Lippard, 'Progress in Inorganic Chemistry', Vols. 18, 38, Wiley-Interscience, 1991.

BIO-PHYSICAL CHEMISTRY

Subject Code: MCHM1-263

L T P C
3 1 0 4

Duration: 43 Hrs.

Course Objectives

1. To equip with basic knowledge of the physical principles that governs chemical systems.
2. To provide knowledge of various biological systems with emphasis on biochemical reactions.
3. To recall enzymes, their role in chemical and biological catalysis.
4. To understand various principles that govern cellular processes.

UNIT-1

Biological Cell and its Constituents (4 Hrs.):

Biological cell, DNA and RNA in living systems. Basic consideration. Proximity effects and molecular adaptation.

Enzymes (6 Hrs.):

Introduction and historical perspective, chemical and biological catalysis, Remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Line Weaver-Burk plots, reversible and irreversible inhibition.

UNIT-2

Kinds of Reactions Catalyzed by Enzymes (5 Hrs.):

Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reaction, enolic intermediates in isomerization reactions, b-cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.

Co-Enzyme Chemistry (5 Hrs.):

Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological function of coenzyme A, thiamine pyrophosphate, Pyridoxal phosphate, NAD⁺, NADP⁺, FMN, FAD, lipoic acid, vitamin B12. Mechanism of reaction catalyzed by the above cofactors.

UNIT 3

Biological Macromolecules (4 Hrs.)

The Nucleic Acids: Nucleotide, torsion angles in poly nucleotide chains, the helical structure of polynucleic acids, high order structure in polynucleotides.

Interactions in Macromolecules: (4 Hrs.)

Basic principles of interaction between molecules, water structure and its interaction with biomolecules, dipole interactions, side chain interactions, electrostatic interactions, base pairing in nucleic acids, base stacking, hydration and the hydrophobic effect.

Structural Transition in Bio-macromolecules (3 Hrs.):

Coil – helix transitions in proteins, statistical methods for predicting protein secondary structures; melting and annealing of polynucleotide duplexes, helical transitions in double stranded DNA, super coil dependent DNA transitions predicting helical structures in

genomic DNA.

UNIT-4

Bioenergetics and ATP cycle (8 Hrs.)

Standard free energy change in biochemical reaction, exergonic, endergonic reactions. Hydrolysis of ATP, synthesis of ATP from ADP, metal complexes and transition of energy, chlorophylls, photo system I and photo system II in cleavage of water.

Thermodynamics of Biopolymer Solutions (4 Hrs.)

Thermodynamics of biopolymers solutions, osmotic pressure, membrane equilibrium, muscular contraction and Energy generations in mechano-chemical system.

Recommended Books:

1. A.L. Lehninger, 'Principles of Biochemistry', Worth Publishers.
2. Voet; 'Voet Biochemistry', John Wiley, 1995.
3. E.E. Conn, P.K. Stumpe, 'Outlines of Biochemistry', John Wiley.
4. Hermann Dugas, C. Penny, 'Bioorganic Chemistry: Chemical Approach to Enzyme Action', Springer Verlag, 1982.
5. M.I. Page, A. Williams, 'Enzyme Mechanisms,' Royal Society of Chemistry.
6. Richard B. Silverman, 'Organic Chemistry of Enzyme Catalyzed Reaction'.
7. I. Bertini, H.B. Gray, S.J. Lippard, J.S. Valentine, 'Bioinorganic Chemistry', University Science Books.
8. William Jolley, 'Bioinorganic Chemistry'.
9. K.E. Van Holde, W.C. Johnson, P.S. Ho, 'Principles of Physical Biochemistry', Prentice Hall, 1998.
10. L. Stryer, 'Biochemistry', W.H. Freeman.
11. J. David Rawn, 'Biochemistry', Neil Patterson.
12. F. Wold, 'Macromolecules: Structure and Function', Prentice Hall.
13. C.R. Cantor, P.R. Schimmel, 'Biophysical Chemistry, Vol. 1-3', Freeman, 1980.

ASYMMETRIC SYNTHESIS

Subject Code: MCHM1-264

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To learn the theory and importance of asymmetric Synthesis.
2. To acquire knowledge about various Principles of asymmetric Synthesis.
3. To give an understanding of various methods of asymmetric Synthesis.
4. To know the methods of separating the mixture of meso-compounds by various techniques.

UNIT – I

1. Basic Principles of Asymmetric Synthesis (10 Hrs.)

Definition: (enantiotropic and diast- ereotropic) groups and faces – Symmetry, substitution and addition criteria. Prochirality nomenclature: Pro – R, Pro – S, Re and Si.

Selectivity in synthesis: Stereospecific reactions (substrate stereoselectivity), Srereo selective reaction (Product stereoselectivity), Enantioselectivity and diastereoselectivity.

Conditions of Stereoselectivity: Symmetry and transition state criteria, kinetic and thermodynamic control. Methods for inducing enantio- and diastereoselectivity.

UNIT – II

2. Analytical Methods (10 Hrs.)

Determining % Enantiomer excess, % Enantioselectivity, Optical Purity, % Diastereomeric excess and % diastereoselectivity. Resolving agents and resolution of racemic compounds having common functional groups e.g. alcohol, amine, acid. Techniques for determination of Enantioselectivity. Specific rotation; Chiral ^1NMR , Chiral lanthanide shift reagents and chiral HPLC.

UNITS – III & IV

3. Classification of Asymmetric Reactions (25 Hrs.)

- i) Substrate controlled asymmetric synthesis: Nucleophilic addition to chiral carbonyl compounds, 1,2 –Asymmetric induction, Cram's rule and Felkin-Anh model, Double stereo differentiation; matched pair and mismatched pair, Examples from aldol condensation and hydroboration reactions
- ii) Chiral auxiliary controlled asymmetric synthesis: α -alkylation of chiral enolates, azaenolates, imines and hydrazones, chiral sulphoxides. 1,4-asymmetric induction and Prelog's rule, use of chiral auxiliary in Diels-Alder and Cope reactions.
- iii) Chiral reagent controlled asymmetric synthesis: Asymmetric reduction using BINAL-H. Asymmetric Michael addition to α , β -unsaturated carbonyl compounds, Chiral lithium amides- enantioselective deprotonation, applications of chiral organoboranes.
- iv) Chiral catalyst controlled asymmetric synthesis: Sharpless, Jacobson and Shi asymmetric epoxidation, Sharpless asymmetric dihydroxylation and amino hydroxylation. Asymmetric hydrogenations using chiral Wilkinson biphosphine and Noyori catalyst. Chiral catalyst controlled Diels-Alder and Michael reactions, Utility metal-semicorrinato complexes and Jacobson Catalysts-Evans Catalyst- Aziridination, Enzyme mediated enantioselective synthesis.

Recommended Books

1. J.D. Morrison and H.S. Moscher, 'Asymmetric Organic Reactions', Vol 1-5, Academic Press, 1983.
2. E.N. Jacobsen, A. Pfaltz, H. Yamamoto, 'Comprehensive Asymmetric Catalysis' Eds. Springer, 2000.
3. Nogardi, 'Asymmetric Synthesis'.
4. R S Ward, 'Stereoselectivity in Organic Molecules', Wiley, New York, 1999.
5. Y. Izumi, 'Stereo Differentiating Reactions', Academic Press, 1977.
6. E. L. Eliel, 'Stereochemistry of Carbon Compounds' Wiley, 1992.
7. W. Carruthers, 'Some Modern Methods of Organic Synthesis', Cambridge University Press, 4th Edn., 2012.
8. I. Ojima, 'Catalytic Asymmetric Synthesis' VCH-NY, Pergamon, 1998.
9. R.E. Gawley, J Aube, 'Principles of Asymmetric Synthesis' (Tetrahedron Series in Organic Chemistry), Pergamon, 1996.
10. H.B. Kagan, 'Asymmetric Synthesis', Edn., I, Thieme Medical Publishers, 2003.
11. G. Proctor, 'Asymmetric Synthesis', Oxford University Press, USA, 1997.

SPECTROSCOPY – II**Subject Code: MCHM1-311****L T P C
3 1 0 4****Duration: 45 Hrs.****Course Objectives**

1. To equip with the knowledge of the effects of various phenomenon including spin-spin splitting, long range coupling, fluxionality on the NMR.
2. To acquire knowledge about NOE, DEPT.
3. To understand the difference between ^1H NMR and ^{13}C NMR.
4. To understand the utility of various spectroscopic processes UV, IR, NMR and mass spectroscopy for structure elucidation.

UNIT-1**1. Nuclear Magnetic Resonance Spectroscopy (20 Hrs.)**

The nuclear spin, precessional motion. Larmor frequency, the NMR isotopes, population of nuclear spin levels, spin – spin and spin – lattice relaxation, measurement techniques, Solvents used, Chemical Shift, shielding constant, range of typical chemical shifts simple applications of chemical shift ring currents and aromaticity, shifts of ^1H and ^{13}C , inductive effect, ring current effect and anisotropy chemical bonds, intermolecular forces effecting the chemical shifts. Spin – spin interactions, low and high resolution NMR with various examples. ^1H bond to other nuclei such as nitrogen, oxygen and sulphur. spin – spin interaction. Interaction between two or more nuclei, splitting due to vicinal and germinal protons, long range coupling. ABX and ABC systems with their coupling constants, shifts reagents. Effects of chemical exchange, fluxional molecules, Hindered rotation on NMR spectrum, Karplus relationship. Nuclear magnetic double resonance, spin decoupling, Nuclear Overhauser Effect (NOE).

UNIT-2**2. ^{13}C -Nuclear Magnetic Resonance Spectroscopy (5 Hrs.)**

^{13}C - ^1H coupling, ^{13}C spectra, Differences from ^1H NMR, DEPT, Intensities of lines in ^{13}C .

UNIT-3**3. Mass Spectra (15 Hrs)**

Introduction, methods of ionization EI & CI, Laser desorption, Fast Atom Bombardment (FAB). Secondary Ion Mass Spectrometry (SIMS), field desorption etc. Ion analysis methods (in brief), isotope abundance, Metastable ions, Electron Impact mass spectra, fragmentation patterns for aliphatic compounds, amines, aldehydes, ketones, esters, amides, nitriles, carboxylic acids ethers, aromatic compounds, general rules predicting the fragmentation patterns. (Books 2, 3, 5)

UNIT-4**4. Structure Elucidation (5 Hrs.)**

Structure elucidation by combined application of UV, IR, NMR and mass spectra. Solving first 20 problems from reference book 6 and first 20 problems from reference book 7. Tutorials.

Recommended Books

1. C.N. Banwell 'Fundamentals of Molecular Spectroscopy' 4th Edn., Tata McGraw-Hill Education, 1994.
2. William Kemp, 'Organic Spectroscopy', 3rd Edn., W.H. Freeman, 1991.
3. Dudley H. Williams & Ian Fleming, 'Spectroscopic Methods in Organic Chemistry', 6th Edn., McGraw-Hill, Science, 2008.
4. Russell S. Drago, 'Physical Method for Chemistry', 2nd Edn., Surfside Scientific Publishers, 1992.

5. R.M. Silverstein, G.C. Bassler, T.C. Morrill, 'Spectrometric Identification of Organic Compounds', 3rd Edn., Wiley, 1974.
6. D.L. Pavia, G.M. Lampman and G. S. Kriz, 'Introduction to Spectroscopy' 4th Edn., Cengage Learning, 2008.
7. R.C. Banks, E.R. Matjeka, G. Mercer, 'Introductory Problems in Spectroscopy' Manlo Park, CA, 1980.

QUANTUM CHEMISTRY

Subject Code: MCHM1-312

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To understand various postulates of quantum mechanics and uncertainty principles.
2. To equip with the knowledge of spherical harmonics and virial theorem.
3. To compare perturbation and variation method.
4. To understand electronic structure of diatomic and polyatomic molecules.

UNIT-I (11 Hrs.)

Introduction to Classical mechanics, Lagrange's and Hamilton's equations of motion in classical mechanics, Configuration space and phase space. Hermitian operators and their properties. Commutation relations. Postulates of quantum mechanics. Uncertainty Principle, Schrodinger equation and its interpretation.

UNIT-II (11 Hrs.)

Linear harmonic oscillator and its solution in terms of ladder operators (factorization method). Selection rules, expectation values, virial theorem. Hydrogen atom and its complete solution (including solution of the radial equation using factorization method). Spherical harmonics as wave functions of a rigid rotor. Total wave function of the hydrogen like atoms, shapes of atomic orbitals, Radial distribution function. Virial theorem.

UNIT-III (11 Hrs.)

Angular momentum, Spin. Coupling of angular momenta; spin-orbit coupling. Molecular term symbols.

Approximate Methods: Time-Independent (Non-degenerate, degenerate states) perturbation theory. Application of time-dependent perturbation theory. The variation method. LCAO-MO approximation. Comparison of perturbation and variation method.

UNIT-IV (12 Hrs.)

The Born-Oppenheimer approximation. Its Validity and Breakdown. Non-adiabatic transitions. Valence-bond and molecular orbital approaches, their comparison and equivalence limit. Electronic structure of diatomic and polyatomic molecules-An introductory treatment. General molecular orbital theory. The pi-electron approximation. Huckel theory of conjugated systems. Applications to ethylene, butadiene and benzene.

Recommended Books

1. P.W. Atkins and R.S. Friedman, 'Molecular Quantum Mechanics', 4th Edn., Oxford University Press, 2004.
2. D. McQuarrie, 'Quantum Chemistry', '2nd Edn., University Science Books', 2008.
3. I.N. Levine, 'Quantum Chemistry', 5th Edn., Prentice Hall, 2006.
4. F.L. Pilar, 'Elementary Quantum Chemistry', McGraw Hill, 1968.
5. N.H. March, 'Self-Consistent Fields in Atoms', Pergamon Press, 1975.
6. A.K. Chandra, 'Introductory Quantum Chemistry', Tata-McGraw Hill, 1988.

7. J.A. Pople and D.L. Beveridge, 'Approximate Molecular-Orbital Theory', McGraw Hill, NY, 1970.
8. J.P. Lowe, 'Quantum Chemistry', Academic Press, 1993.

HETEROCYCLIC CHEMISTRY

Subject Code: MCHM1-313

L T P C

Duration: 45 Hrs.

3 1 0 4

Course Objectives

1. To familiarize with the structures of important classes of heterocyclic aromatic organic compounds.
2. To classify simple heterocyclic aromatic compounds as electron deficient or electron rich.
3. To explain the syntheses of electron deficient nitrogen containing heterocycles; pyridines, diazines and their benzo condensed analogs.
4. To explain the syntheses of electron rich nitrogen containing heterocycles; furans, thiophenes, 1,3-azoles and their benzo condensed analogs.

UNIT-1

1. Nomenclature of Heterocycles (4 Hrs.)

Replacement and systematic nomenclature (Hantzsch Widman system) for monocyclic, fused and bridged heterocycles.

2. Aromatic Heterocycles (6 Hrs.)

General chemical behaviour of aromatic heterocycles, classification (structural type), criteria of aromaticity (bond length, ring current and chemical shifts in ¹H NMR-spectra, empirical resonance energy, delocalization energy and Dewar resonance energy, diamagnetic susceptibility exaltation). Heteroaromatic reactivity and tautomerism in aromatic heterocycles.

3. Non Aromatic Heterocycles (6 Hrs.)

Strain bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3 diaxial interaction. Stereo-electronic effects – anomeric and related effects. Attractive interactions – hydrogen bonding and intermolecular nucleophilic – electrophilic interactions.

4. Heterocyclic Synthesis (5 Hrs.)

Principles of heterocyclic synthesis involving cyclization reactions and cycloaddition reactions.

5. Small Ring Heterocycles (6 Hrs.)

Three membered and four membered heterocycles- synthesis and reactions of aziridines, oxiranes, thiiranes, azetidines, oxetanes and thietanes.

6. Benzo-Fused Five-Membered Heterocycles (6 Hrs.)

Synthesis and reactions including medicinal applications of benzopyrroles, benzofurans, and benzothiophenes.

7. Meso-Ionic Heterocycles (5 Hrs.)

General classification, chemistry, chemistry of some important meso-ionic heterocycles of type-A and B and their applications.

8. Six-Membered Heterocycles with One Heteroatom (7 Hrs.)

Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium & thiopyrylium salts and pyridones. Synthesis & reactions of quinolizinium and benzopyrelum sals, coumarins and chromones.

Recommended Books

1. R.R. Gupta, M. Kumar and V. Gupta, 'Heterocyclic Chemistry: Principles, Three- and Four-Membered Heterocycles, Vol. 1', Springer Berlin Heidelberg, **1998**.
2. R.R. Gupta, M. Kumar and V. Gupta, 'Heterocyclic Chemistry: Five-Membered Heterocycles, Vol. 2', Springer Berlin Heidelberg, **1999**.
3. T. Eicher and S. Hauptmann, 'The Chemistry of Heterocycles', Georg Thieme, Stuttgart, **1995**.
4. J. A. Joule, K. Mills and G. F. Smith, 'Heterocyclic Chemistry', 5th Edn., John Wiley & Sons, **2010**.
5. T.L. Gilchrist, 'Heterocyclic Chemistry', 3rd Edn., Pearson Education India, **2007**.
6. G.R. Newkome and W.W. Paudler, 'Contemporary Heterocyclic Chemistry', Wiley-Inter Science, New York, **1982**.
7. R.M. Acheson, 'An Introduction to the Heterocyclic Compounds', John Wiley & Sons Ltd., New York-London, **1976**.
8. A.R. Katritzky and C.W. Rees, 'Comprehensive Heterocyclic Chemistry', Pergamon Press, Oxford, **1984**.

Learning Outcomes

After completion of the course the student will,

1. Be familiar with the structures of important classes of heterocyclic aromatic organic compounds,
2. Be able to classify simple heterocyclic aromatic compounds as electron deficient or electron rich and explain their reactivity based on these properties,
3. Know how selected organometallic reactions can be applied in heterocyclic chemistry,
4. Be able to explain on a mechanistic level, reactions and synthesis of important electron deficient nitrogen containing heterocycles; pyridines, diazines and their benzo-condensed analogs,
5. Be able to explain on a mechanistic level, reactions and synthesis of important electron rich heterocycles; furans, pyrroles and thiophenes and 1,3-azoles, and benzo-condensed analogs.

SEMINAR-I

Subject Code: MCHM1-209

L T P C

0 0 2 1

1. Each of these Courses of Seminar will consist of 100 marks (internal only) having L T P C as 0 0 2 1.
2. In the beginning of the semester, a teacher will be allocated maximum 30 students. The latter will guide/teach them how to prepare/present 15 minutes Power Point Presentation for the Seminar.
3. If there are more than 30 students in the class, then class will be divided into two groups having equal students. Each group may be allocated to a different teacher.
4. Each student will be allotted a topic by the teacher at least one week in advance for the presentation. The topic for presentation may be from the syllabus or relevant to the syllabus of the programme.
5. During the presentation being given by a student, all the other students of his/her group will attend the Seminar. The assessment/evaluation will be done by the teacher. However, Head of Department and other faculty members may also attend the Seminar, ask questions and give their suggestions.

6. This is a turn wise continuous process during the semester and a student will give minimum two presentations in a Semester.
7. For the evaluation, the following criteria will be adopted,
 - (a) Attendance in Seminar: 25 Marks
 - (b) Knowledge of Subject along with Q/A handling during the Seminar: 25 Marks
 - (c) Presentation and Communication Skills: 25 Marks
 - (d) Contents of the Presentation: 25 Marks.

ORGANIC CHEMISTRY LAB-II

Subject Code: MCHM1-315

L T P C

0 0 4 2

Course Objectives

1. To introduces the basic techniques and procedures in isolation, purification.
2. To understand Beckmann and Benzilic acid rearrangement.
3. To introduce Fischer Indole Synthesis.
4. To prepare Cinnamic acid, Chalcone, phenacetin.

1. Beckman Rearrangement

- a) Benzene-Benzophenone Benzophenone Oxime Benzanilide
- b) Benzene Acetophenone Acetophenone Oxime-Acetanilide.
- c) Cyclohexanone Oxime-Caprolactam.

2. Benzilic acid Rearrangement

- a) Benzoin-Benzil-Benzilic-acid.
- b) Benzoin-Benzil-Benzil monohydrazone.

3. Fischer Indole Synthesis

- a) N-Arylmaleinilic acid N-aryl maleimide.
- b) 1, 2, 3, 4- Tetrahydrocarbazole.
- c) 2-Phenylindole from Phenylhydrazone.

4. Other Organic Preparations

- a) Cinnamic acid by Perkin reaction.
- b) Benzaldehyde by Beckmann rearrangement.
- c) Chalcone by aldol condensation.
- d) Ethyl p-aminobenzoate (benzocaine).
- e) Preparation of Benzopinacolone by Pinacol-Pinacolone rearrangement.
- f) Synthesis of N-phenylmaleimide.
- g) Preparation of p-bromoaniline.
- h) from acetanilide.
- i) Preparation of phenacetin from p-aminophenol.
- j) Preparation of eosin from phthalic anhydride.
- k) Preparation of p-chlorobenzoic acid from p-toluidine.

Recommended Books

1. 'Vogel's Text Book of Practical Organic Chemistry', 5th Edn., Prentice Hall, 1996.
2. Julius B. Cohen, '**Practical Organic Chemistry**', 1910.
3. David T. Plummer, 'An Introduction to Practical Biochemistry', 3rd Edn., Tata McGraw Hills, 1998.
4. A.I. Vogel, 'Text Book of Practical Organic Chemistry', 5th Edn., Pearson Education, 2005.
5. P.R. Singh, D.S. Gupta and K.S. Bajpai, 'Experimental Organic Chemistry', Vol 2, Tata Mc Graw Hill, 1981.

6. G. Mann and B.C. Saunders, 'Practical Organic Chemistry', ELBS Edn., 1989.
7. N.K. Vishnoi, 'Advanced Practical Organic Chemistry', 2nd Edn., Vikas Publishing House Pvt. Ltd., 1994.

ENVIRONMENTAL CHEMISTRY

Subject Code: MCHM1-365

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To introduce basic concepts of pollution and the importance of green chemistry.
2. To introduce physic-chemical analysis of water and waste water treatment.
3. To understand the effect of pesticides and contamination of soil with toxic inorganic compounds.
4. To understand the effect of toxic metal ions (Pb, Hg, Al, Ni and AS) and organic toxicants such as pesticides and solvents on human health.

UNIT-I

The Environment (3 Hrs.)

Introduction, components, chemical and physical characteristics of the atmosphere, Environment, pollution, classification of pollutants.

Air Pollution (8 Hrs.)

- a) Natural and Anthropogenic air pollution, Sources and types of air pollutants, carbon oxides, sulphur compounds, nitrogen compounds, Hydrocarbons, and their derivatives particulate matter.
- b) Cause affect relationship between a pollutant and community Health problems, Health effect of criteria pollutants such as carbon monoxide, sulphur oxides, nitrogen oxides particulate matter, hydrocarbons, ozone, lead, Health effects of Hazardous air pollutants such as Be, Hg, Asbestos, vinyl chloride, Benzene.
- c) Analysis of air pollutant such as CO, SOX, NOX and particulate matters.

UNIT-II

Water Pollution (11 Hrs.)

- a) Definition and types of water pollution, limits of various pollutants, water quality parameters.
- b) Physico-chemical analysis of water: colour, Turbidity, total solids, total alkalinity and acidity as CaCO₃, Dissolved oxygen (DO), BOD, COD, Analysis of anions and cations by recommended technique.
- c) Waste-water treatment/sewage: Treatment and disposal. Primary, secondary and tertiary treatment of water.

UNIT-III

Soil Pollution (12 Hrs.)

Definition of soil, components, its function and formation, sources pollution: Chemical pesticides, disposal of industrial and domestic solid wastes on soils. Contamination with toxic inorganic compounds. Prevention and elimination of inorganic chemical contaminants, Advantages and disadvantages of organic wastes to soil.

Soil Analysis, Sampling, site selection, method of collection and sample preparation.

Determination of physical constants, determination of pH, electrical conductivity, calcium carbonate, water soluble salts, organic matter, N, P and K of the soil.

UNIT-IV

Toxicology (11 Hrs.)

Definition of toxicology, its history, scope and its literature, Dose-response relationship.

Absorption, distribution and excretion of toxic materials. Toxicity of metal ions, (Pb, Hg, Al, Ni, As) organic toxicants such as Halogenated hydrocarbons, pesticides and solvents, Chemical Carcinogens.

Recommended Books

1. Thad Godish, 'Air Quality'.
2. R.K. Trivedy, 'Chemical and Biological Methods for Water Pollution Studies'.
3. Kanwar & Chopra, 'Analytical Agricultural Chemistry'.
4. Nyle, C. Brady, 'The Nature and Properties of Solids'.
5. Caserett & Doulls, 'Toxicology: The Basic Science of Poisons'.
6. E.P. Odum, 'Fundamental of Ecology'.

MEDICINAL CHEMISTRY

Subject Code: MCHM1-366

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To understand types, classification, structural activity of various antibacterial, Antiviral and Antimalarial agent.
2. To know the synthetic procedures for Chloroquine, amodiaquine, mefloquine and sontoquine.
3. To familiarize with CNS depressant and CNS stimulants.
4. To know the synthetic procedure for thioridazine, haloperidol, diazepam.

UNIT-1

1. Antibacterial and Antiviral Agents (10 Hrs.)

History of antibacterial drugs, types, classification, structural activity relationship, fluoroquinolones. Mechanism of action of antibacterial, β -lactams, bacterial resistance against antibacterial drugs. Target for anti HIV drugs, anti HIV agents, HIV-protease inhibitors, amprenavir, foseprenavir, alazanavir etc., anti-HIV nucleosides: lamivudine, retrovir, videx, hivid, zlarit, viread, carbovir, delavirdine, ziduvudine, etavirenz, calanolide, capravine, nevirapine. DNA polymerase inhibitors: acyclovir, ganciclovir, penciclovir, famciclovir, valaciclovir, valomaciclovir, codofvir

UNIT-2

2. Anti-malarials (5 Hrs.)

Cinchona alkaloids, 4-aminoquinolines, 8-aminoquinolines, pyrimidines and sulfones, 9-aminoacridines, biguanides, mefloquine, sulfonamides.

3. Commercial Synthetic Routes to (5 Hrs.)

Chloroquine, pamaquine, primaquine, proguanil, amodiaquine, mefloquine, pyremethamine, sontoquine.

UNIT-3

4. CNS Active Drugs: CNS depressants: Hypnotics and Sedatives (3 Hrs.)

Barbiturates, non-barbiturates, amides and imides, glutethimide, benzodiazepines, aldehydes and derivatives, methaqualone and other miscellaneous agents.

5. Anticonvulsants (3 Hrs.)

Barbiturates, hydantoin, oxazolindiones, succinimides, benzodiazepines, thenacemide, glutethimide.

6. CNS-Stimulants & Psychoactive Drugs (6 Hrs.)

Analeptics, purines, psychomotor stimulants, sympathomimetics, monamine oxidase inhibitors, tricyclic antidepressants, miscellaneous psychomotor stimulants. Hallucinogens

(psychedelics, psychometrics): Indolethylamines, R-phenylethylamines, butyrophenones and other miscellaneous drugs.

7. Commercial Synthetic Routes to (3 Hrs.)

Thioridazine, haloperidol, chlorpromazine, phenytoin, Phenobarital, Carbamazepine valproic acid, methaqualone, nitrazepam, oxazepam, diazepam, chloridazepoxide.

UNIT-4

8. Diuretics (5 Hrs.)

Osmotic agents, acidifying salts, mercurials, purines and related heterocycles, sulfonamides, benzothiadiazene and related compounds, chlorothiazides and analogs, sulfamoylbenzoic acid and analogs, endocrine antagonists, miscellaneous diuretics.

9. Commercial Synthetic Routes to (5 Hrs.)

Furosemide, methalthiazide methylchlorothiazide: Chlorothiazide, triameterene, hydrochlorothiazide, amiloride, chlorthalidone.

Recommended Books

1. Wilson and Gisvolds, 'Textbook of Organic Medicinal and Pharmaceuticals Chemistry', 8th Edn., edited by R.F. Deorge, J.B. Lippincott Company, Philadelphia, 1982.
2. B.G. Reuben and H.A. Wittcoff, 'Pharmaceutical Chemicals in Perspective', John Wiley & Sons, New York, 1989.
3. W.O. Foye, T.L. Lamke, D.A. Williams, 'Principles of Medicinal Chemistry', 5th Ed. Lippincott Williams and Wilkins, 2002.

PHOTOCHEMISTRY

Subject Code: MCHM1-417

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives

1. To discuss molecular organic photochemistry and pericyclic reactions.
2. To focus on primary photochemical reactions of n, π^* states.
3. To lay emphasis on primary photochemical reactions of π , π^* states.
4. To study some important applications of photochemistry.

UNIT-1

Introduction to organic photochemistry. Primary photochemical reactions of n, π^* states. Photophysical process of n, π^* states: Electronic energy transfer. Detail analysis of primary photochemical process of α -cleavage. Detail analysis of primary photochemical process of hydrogen abstraction. Detail analysis of primary photochemical process of addition to π system. Detail analysis of primary photochemical process of electron transfer reactions.

UNIT-2

Primary photochemical reactions of π , π^* states. Detail analysis of cis-trans isomerization. Study on di- π -methane rearrangements. Introduction to pericyclic reaction. In depth analysis of Cycloaddition and Diels –Alder reactions. In depth analysis of Electrocyclic reactions. Detail study of Sigmatropic reactions.

UNIT-3

Chelotropic reaction. Group transfer reactions. Ene and retro ene reactions. Coarctate reaction. Photochemical production and reactions of carbenes. Photochemical production and reactions of nitrenes. Photochemical reaction of azo compounds. Photochemical Oxygenations-Singlet Oxygen.

UNIT-4

Photochemistry of halogen containing compounds. Photoinduced electron transfer reactions. Factors influencing the course of photochemical reaction. Applications of photochemistry.

Recommended Books

1. J.C. Calvert and J. N. Pitts, Jr., 'Photochemistry', Wiley, New York, 1966.
2. N.J. Turro, 'Modern Molecular Photochemistry' (MMP), University Press, Menlo Park, CA, 1978.
3. A. Gilbert and J. Baggott, 'Essentials of Molecular Photochemistry', CRC Press, London, UK, 1991.
4. J. Mattay and A. Griesbeck, eds., 'Photochemical Key Steps in Organic Synthesis', VCH, New York, 1994.
5. J.D. Coyle, ed., 'Photochemistry in Organic Synthesis', Royal Society of Chemistry, London, 1986.
6. W.H. Horspool, ed., 'Synthetic Organic Photochemistry', Plenum, New York, 1984.
7. Bryce-Smith, et. al, eds. 'Specialist Reports of the Chemical Society: D. Photochemistry (Annual reports on all of photochemistry since 1969)'.
8. I. Ninomiya and T. Naito, eds., 'Photochemical Synthesis', Academic Press, London, 1989.
9. J.C. Scaiano, ed., 'CRC Handbook of Organic Photochemistry', vol. 1 and 2, CRC Press, Boca Raton, Florida, 1989.

Learning Outcomes

After completion of the course the student will be able to,

1. Acquire basic knowledge on theoretical and applied photochemistry,
2. Overview basic photochemical reactions, photochemical reactions in imaging systems,
3. Handle silver halide photography, photodegradation and photostabilization of materials,
4. Utilize this knowledge in analysis of status and design of protection of objects of heritage.

NATURAL PRODUCTS

Subject Code: MCHM1-418

L T P C
3 1 0 4

Duration: 45 Hrs.

Course Objectives

1. To acquire basic knowledge of isolation, purification, identification and standardization of natural products.
2. To discuss structure elucidation of alkaloids and terpenoids.
3. To discuss isolation, purification and structure elucidation of sterols
4. To understand the importance of vitamins, xanthophyll and carotenes.

UNIT-1

1. Introduction & General Methods

Isolation, purification, identification and standardization of natural products. Carbohydrates and metabolism: Introduction, stereoisomerism, mutarotation, configuration and ring structure of monosaccharides, disaccharides and polysaccharides. Glycolysis, alcoholic and lactic acid fermentation, citric acid cycle.

UNIT-2

2. Alkaloids and Terpenoids

Introduction, classification, isolation and purification of alkaloids and terpenoids. Structure elucidation of alkaloids (atropine, quinine, morphine) and terpenoids (camphor and menthol). Biosynthesis of alkaloids and terpenoids.

UNIT-3

3. Steroids

General introduction, isolation, purification and structure elucidation stereochemistry of sterols with special reference to cholesterol. Vitamin D group and bile acids. Biosynthesis of sterols.

UNIT-4

4. Carotenoids and Vitamins

Introduction to carotenoids and vitamins, Carotenes. Vitamin A, xanthophyll, vitamin B complex, vitamin K and vitamin E group.

Recommended Books

1. I.L. Finar, 'Organic Chemistry, Volume 2: Stereochemistry and The Chemistry Natural Products', Vol. II, 5th Edn., Longman Scientific & Technical, 1988.
2. O.P. Agarwal, 'Chemistry of Organic Natural Products', Vol. I, 40th Edn., Krishna Prakashan Media, 2010.
3. O.P. Aggarwal, 'Organic Chemistry Natural Products', Vol. II, 38th Edn., Krishna Prakashan Media, 2010.

PHYSICAL CHEMISTRY LAB-I

Subject Code: MCHM1-419

L T P C

0 0 2

Course Objectives

To develop basic understanding of various lab practices including safety measures.

To calculate various physical parameters while performing experiments.

Note: Students will perform any ten experiments out of the following experiments.

1. To determine the freezing point depression constant of camphor using naphthalene as solute. Hence determine the molecular weight of acetanilide by Rast's micro method.
2. Determination of heat of solution of a substance by solubility method.
3. To construct phase diagram of 3-component system ($\text{CH}_3\text{COOH} + \text{CHCl}_3 + \text{H}_2\text{O}$).
4. To prepare and study Hardy – Schulze's rule for arsenious sulphide/Ferric hydroxide Sols.
5. To determine the relative strength of acids by study kinetics of hydrolysis of an ester.
6. To determine the iodine value of given sample of oil (Linseed oil).
7. To determine the saponification value of given sample of oil (Ground nut oil).
8. To obtain the mutual solubility curve of phenol + H_2O , and hence the Upper Consolute Point.
9. To determine the coefficient of viscosity of given liquid by Ostwald's viscometer.
10. To find the molecular weight of polymer by viscosity measurements.
11. Determination of surface tension of given liquid by drop no. method by stalgmeter.
12. To determine the C.M.C. of a soap (sodium or potassium lauryl sulphate by surface tension measurements
13. To determine the distribution coefficient of I_2 between CCl_4 and H_2O .
14. Determination of transition temperature of given substance by thermometric/dilatometric method.
15. i) Find water equivalent of Dewar's flask and ii) heat of neutralization of strong acid vs strong base, weak base vs. strong acid using Dewar's flask.
16. Determination of specific and molar refraction of a liquid by Abbe refractometer.
17. Determine the refraction equivalents of C, H and Cl atoms.
18. Study and verify the Freundlich adsorption isotherm for adsorption of CH_3COOH from its

aqueous solution by activated charcoal.

Recommended Books

1. 'Findlay's Practical Physical Chemistry'.
2. J.B. Yadav, 'Advanced Practical Physical Chemistry'.
3. L.V. Cock and C. van Rede, 'Laboratory Handbook for Oil & Fat Analysis'.

GREEN SYNTHESIS

Subject Code: MCHM1-367

L T P C
3 1 0 4

Duration: 42 Hrs.

Course Objectives

1. To understand the importance of ultrasonic and microwaves in organic syntheses.
2. To understand the role of ionic liquids in organic syntheses.
3. To familiarize with phase transfer catalysis and crown ethers.
4. To study the mechanistic aspect of multicomponent reactions.

UNIT-I

Use of Ultrasound and Microwaves in Organic Synthesis (10 Hrs.)

Use of ultrasound: Introduction, instrumentation, the phenomenon of cavitation.

Sonochemical esterification, substitution, addition, alkylation, oxidation, reduction and coupling reactions.

Use of Microwaves: Introduction, concept, reaction vessel/medium, specific effects, atom efficiency (% atom utilization), advantages and limitations. N-alkylation and alkylation of active methylene compounds, condensation of active methylene compounds with aldehydes and amines. Diels-Alder reaction. Deprotection of esters and silyl ethers. Oxidation of alcohols and sulfides.

UNIT-II

Ionic-liquids (3Hrs.):

Introduction, structure, synthesis and applications of some important ionic liquids in organic synthesis.

Polymer supported Reagents in Organic Synthesis (8 Hrs.):

Introduction- properties of polymer support, advantages of polymer supported reagents and choice of polymers.

Applications: Substrate covalently bound to the support: Synthesis of oligosaccharides, Dieckmann cyclisation. Preparation of polymer bound aldehyde and application in aldol and Wittig reactions. Synthesis of polystyryl boronic acid and use in diol protection reaction.

Reagent linked to a polymeric material: Preparation of sulfonazide polymer and application in diazo-transfer reaction. Synthesis of polymer bound per acid and its applications.

Polymer supported catalytic reactions: Preparation of polymer supported $AlCl_3$ and application in etherification and acetal formation reactions.

UNIT-III

Phase transfer catalysis and Crown Ethers (10 Hrs.):

Phase transfer catalysis: Introduction, definition, mechanism of phase transfer catalysis.

Types of phase transfer catalysts and reactions and their Advantages.

Preparation of catalysts and their application in substitution, elimination, addition, alkylation, oxidation and reduction reactions.

Crown ethers: Introduction, nomenclature, features, nature of donor site. General synthesis of Crown ethers.

Synthetic applications: Alkylation, generation of carbenes, aromatic substitution and displacement reactions. Generation and application of superoxide anions. Cation deactivation

reactions.

UNIT-IV

Multi-component Reactions (11 Hrs.):

Studies on the mechanistic aspects and use of the following reactions in organic synthesis: Passerini-Ugi; Hantsch; Biginelli; Doebner-Miller; Ritter; Jacobson; Betti; Robinson-Schopf; Barbier; Baylis-Hillmann; Ivanov and Suzuki coupling reaction.

Recommended Books

1. E.L. Eliel, S.H. Wilen and L.N. Mander, 'Stereochemistry of Carbon Compounds', John Wiley & Sons, 1994.
2. Potapov, Stereochemistry, MIR, Moscow, 1984.
3. Nasipuri, D., 'Stereochemistry', New Age, 1999.
4. J. March, 'Advanced Organic Chemistry', 4th Edn., John Wiley, 2008.
5. 'Organic Chemistry', R.E. Ireland Prentice-Hall India, New Delhi, 1975.
6. W. Caruthers, 'Some Modern Methods of Organic Synthesis', 2nd Edn., Cambridge Uni. Press London, **1998.**
7. D. Nasipuri, 'Stereochemistry of Organic Compounds- Principle and Applications', 2nd Edn., New Age International Publishers, 2001.
8. G.D. Lin, Y.M. Li and A.S.C. Chan, 'Principles and Applications of Asymmetric Synthesis', Wiley Interscience, 2001.
9. V.K. Ahluwalia and M. Goyal, 'A Textbook of Organic Chemistry', Narosa Publishing House, New Delhi, 2000.
10. V.K. Ahluwalia and R. Aggarwal, 'Organic Synthesis: Special Techniques', Narosa, New Delhi, 2003.
11. R. Sanghi and M.M. Srivastava, 'Green Chemistry, Environment Friendly Alternatives', Narosa, New Delhi, 2003
12. 'Green Chemistry-An Introduction Text', Royal Society of Chemistry, UK, 2002.
13. I.L. Finar, 'Organic Chemistry Vol. 2', 6th Edn., Longman, 1992.
14. G.W. Gokel, 'Crown Ethers & Cryptands', Monograph, The Royal Society of Chemistry, **1991.**
15. G.W. Gokel, S.M. Korzeniowski, Vol 1 to 3, 'Macrocyclic Polyether Chemistry', Wiley, NY, **1978, 1981, 1987.**
16. W.B. Weber, G.W. Gokel, 'Phase Transfer Catalysis in Organic Synthesis', Springer, Berlin, 1977.
17. E.V. Dehmlov, S.S. Dehmlov, 'Phase Transfer Catalysis', 2nd Edn., Verlag Chemie, Wienheim, 1983.
18. N.K. Mathur, C.K. Narang and R.E. Williams, 'Polymers as Aids in Organic Synthesis', Academic Press, NY, 1980.
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ENVIRONMENT MANAGEMENT

Subject Code – MCIE6-157

L T P C
3 1 0 4

Duration – 45 Hrs

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. Gilbert 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.

MRSPTU

MRSPTU M.Sc. PHYSICS SYLLABUS 2016 BATCH ONWARDS

M.Sc. Physics (1st Semester)

Total Contact Hrs = 28

Total Credits = 22

		Semester 1 st							
Code	Course Name	Contact Hrs.			Marks			Credits	
		L	T	P	Internal	External	Total		
MPHY1-101	Classical Mechanics	4	0	0	40	60	100	4	
MPHY1-102	Statistical Physics	4	0	0	40	60	100	4	
MPHY1-103	Mathematical Physics	4	0	0	40	60	100	4	
MPHY1-104	Electronics	4	0	0	40	60	100	4	
MPHY1-105	Electronics Lab	0	0	6	60	40	100	3	
MPHY1-106	Computer Programming Lab	0	0	6	60	40	100	3	
Total							600	22	

M.Sc. Physics (2nd Semester)

Total Contact Hrs = 30

Total Credits = 23

MPHY1-207	Quantum Mechanics –I	4	0	0	40	60	100	4
MPHY1-208	Electrodynamics	4	0	0	40	60	100	4
MPHY1-209	Atomic & Molecular Physics	4	0	0	40	60	100	4
MPHY1-210	Condensed Matter Physics-I	4	0	0	40	60	100	4
MPHY1-211	Advanced Optics and Spectroscopy Lab	0	0	6	60	40	100	3
MPHY1-212	Condensed Matter Lab	0	0	6	60	40	100	3
MPHY1-213	Seminar-I	0	0	2	100	0	100	1
Total							700	23

M.Sc. Physics (3rd Semester)

Total Contact Hrs = 27

Total Credits = 23

MPHY1-314	Nuclear Physics	4	0	0	40	60	100	4
MPHY1-315	Quantum Mechanics –II	4	0	0	40	60	100	4
MPHY1-316	Condensed Matter Physics-II	4	0	0	40	60	100	4
MPHY1-317	Nuclear Physics Lab	0	0	6	60	40	100	3
MPHY1-318	Seminar-II	0	0	2	100	0	100	1
xxxxxxx	Deptt. Elective-I	4	0	0	40	60	100	4
	Open Elective-I**	3	0	0	40	60	100	3
Total							700	23

M.Sc. Physics (4th Semester)

Total Contact HRs = 17+ Project, Total Credits = 22

MPHY1-419	Particle Physics	4	0	0	40	60	100	4
MPHY1-420	Project***	-	-	-	300		300	6
MPHY1-421	Workshop	0	0	2	60	40	100	1
xxxxxxx	Deptt. Elective-II	4	0	0	40	60	100	4
xxxxxxx	Deptt. Elective-III	4	0	0	40	60	100	4
	Open Elective-II**	3	0	0	40	60	100	3
Total							800	22
Total Credit During M.Sc Program		Credits earned in Four Semesters (I+II+III+IV)						90
Total Marks During M.Sc Program		Marks earned in Four Semesters (I+II+III+IV)						2800

*Subject to the availability of teacher and minimum 10 students/as per university guidelines.

** Student must choose open elective subject from other department.

MRSPTU M.Sc. PHYSICS SYLLABUS 2016 BATCH ONWARDS

*** The student is to carry out literature survey on the topic assigned to him/her by his/her supervisor. The student has to carry out survey 15-20 papers, out of which atleast 10 should be international repute. The student is to write a review paper and present to his/her supervisor in the form of soft and hard copy. He/she will also have to give 15 minutes presentation through power point slides in the front of 3 teachers as decided by Head of department including project supervisor. Evaluation is to be done on his/her performance.

List of Department Elective Subjects

SEMESTER 3 rd								
Deptt. Elective-I								
Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
MPHY1-356	Advanced Mathematical Physics	4	0	0	40	60	100	4
MPHY1-357	Science of Renewable energy sources	4	0	0	40	60	100	4
MPHY1-358	Fibre optics and Laser Technology	4	0	0	40	60	100	4
MPHY1-359	Microprocessor	4	0	0	40	60	100	4
SEMESTER 4 th								
Deptt. Elective-II, III								
MPHY1-460	Nuclear Accelerators & Radiation Physics	4	0	0	40	60	100	4
MPHY1-461	Physics of Materials	4	0	0	40	60	100	4
MPHY1-462	Nano Physics	4	0	0	40	60	100	4
MPHY1-463	Soft Matter Physics	4	0	0	40	60	100	4

List of Open Elective Subjects

Open Elective Subjects Offered by Physics Department								
Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
MPHY0-F91	Physics of Materials	4	0	0	40	60	100	3
MPHY0-F92	Science of Renewable Energy Sources	4	0	0	40	60	100	3

CLASSICAL MECHANICS

Subject Code: MPHY1-101

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

1. Lagrangian and Hamilton's Formulation (12 Hrs)

Mechanics of a system of particles; constraints of motion, generalized coordinates, D'Alembert's Principle and Lagrange's velocity dependent forces and the dissipation function, Applications of Lagrangian formulation, Calculus of variations, Hamilton's principle, Lagrange's equation from Hamilton's principle, extension to non-holonomic systems, advantages of variational principle formulation, symmetry properties of space and time and conservation theorems.

UNIT 2

2. Rigid Body Motion (12 Hrs)

Independent co-ordinates of rigid body, orthogonal transformations, Eulerian Angles and Euler's theorem, infinitesimal rotation, Rate of change of a vector, Coriolis force, angular momentum and kinetic energy of a rigid body, the inertia tensor, principal axis transformation, Euler equations of motion, Torque free motion of rigid body, motion of a symmetrical top.

UNIT 3

3. Small Oscillations and Hamilton's Equations (12 Hrs)

Small Oscillations: Eigen value equation, Free vibrations, Normal Coordinates, Vibrations of a triatomic molecule (small oscillation). Legendre Transformation, Hamilton's equations of motion, Cyclic-co-ordinates, Hamilton's equations from variation principle, Principle of least action.

UNIT 4

4. Canonical Transformation and Hamilton-Jacobi Theory (12 Hrs)

Canonical transformation and its examples, Poisson's brackets, Equations of motion, Angular momentum, Poisson's Bracket relations, Infinitesimal canonical transformation, Conservation Theorems. Hamilton-Jacobi equations for principal and characteristic functions, Action-angle variables for systems with one-degree of freedom.

Recommended Books

1. H. Goldstein, C. Poole and J. Safko, 'Classical Mechanics', Pearson Education Asia, New Delhi.
2. K.C. Gupta, 'Classical Mechanics of Particles and Rigid Bodies', Wiley Eastern, New Delhi.
3. L.N. Hand and J.D. Finch, 'Analytical Mechanics', Cambridge University Press, Cambridge.
4. L.D. Landau and E.M. Lifshitz, 'Mechanics', Pergamon, Oxford.
5. N.C. Rana and P.J. Joag, 'Classical Mechanics', Tata McGraw Hill, New Delhi.

STATISTICAL PHYSICS

Subject Code: MPHY1-102

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Statistical Basis of Thermodynamics (12 Hrs)

Foundation of statistical mechanics, macroscopic and microscopic states, contact between statistics and thermodynamics, classical ideal gas, Entropy of mixing and Gibbs paradox, Phase space and Liouville's theorem.

UNIT 2

Ensemble Theory (12 Hrs)

Micro-canonical ensemble theory and its application to ideal gas of monatomic particles; Canonical ensemble and its thermodynamics, partition function, classical ideal gas in canonical ensemble theory, energy fluctuations, equipartition and virial theorems, a system of quantum harmonic oscillators as canonical ensemble, statistics of paramagnetism; The grand canonical ensemble and significance of statistical quantities, classical ideal gas in grand canonical ensemble theory, density and energy fluctuations

UNIT 3

Quantum Statistics of Ideal Systems (13 Hrs)

Quantum states and phase space, an ideal gas in quantum mechanical ensembles, statistics of occupation numbers; Ideal Bose systems: basic concepts and thermodynamic behavior of an ideal Bose gas, Bose-Einstein condensation, discussion of gas of photons (the radiation fields) and phonons (the Debye field); Ideal Fermi systems: thermodynamic behaviour of an ideal Fermi gas, discussion of heat capacity of a free-electron gas at low temperatures, Pauli paramagnetism.

UNIT 4

Theory of Phase Transition (11 Hrs)

First and Second order transition, Diamagnetism, paramagnetism and ferromagnetism, Ising model, Diffusion equation, random walk and Brownian motion, introduction to nonequilibrium processes.

Recommended Books:

1. R.K. Pathria, 'Statistical Mechanics', 2nd Edn., Butterworth-Heinemann, Oxford.
2. K. Huang, 'Statistical Mechanics', Wiley Eastern, New Delhi.
3. B.K. Agarwal and M. Eisner, 'Statistical Mechanics', Wiley Eastern, New Delhi.
4. C. Kittel, 'Elementary Statistical Physics', Wiley, New York.
5. S.K. Sinha, 'Statistical Mechanics', Tata McGraw Hill, New Delhi.

MATHEMATICAL PHYSICS

Subject Code: MPHY1-103

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Linear Algebra and Vector space (13 Hrs)

Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Rank of matrix, Gauss Jordan method to find inverse of matrix, reduction to normal form, Consistency and solution of linear algebraic equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Reduction to diagonal form, Contour Integration.

UNIT 2

Integral Transform (12 Hrs)

Fourier series of periodic functions, even and odd functions, half range expansions and Fourier series of different wave forms, Fourier transforms: Infinite and Finite Fourier transform (General, Sine, Cosine Fourier transform).

Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms and Solve Differential Equation using Inverse Laplace.

UNIT 3

Partial Differential Equations (12 Hrs)

Formation of PDE, Linear PDE, Homogeneous PDE with constant coefficients, Classification of PDE, Application of PDE: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables, Gamma function, Beta function.

UNIT 4

Special Functions (11 Hrs)

Ordinary and Singular points, Power series solution of differential equations, Frobenius method. Bessel functions of first and second kind, Generating function, integral representation and recurrence relations for Bessel's functions of first kind, orthogonality. Legendre functions: generating function, recurrence relations and special properties, orthogonality.

Recommended Books

1. Anil Makkar, Abstract Algebra, Sharma Publications.
2. M.D. Raisinghania, 'Advanced Differential Equation', S. Chand.
3. M.L. Boas, 'Mathematical Methods in the Physical Sciences', Wiley, New York.
4. E.D. Rainville, 'Special Functions', MacMillan, New York.
5. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers.

ELECTRONICS

Subject Code: MPHY1-104

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Electronic Devices (12 Hrs)

Semiconductor Devices (diode, transistors), MESFETs and MOSFETs, Charge Coupled (CCDs) devices, Unijunction transistor (UJT), four layer (PNPN) devices, construction and working of PNPN diode, Semiconductor controlled rectifier (SCR) and Thyristor, Transducers.

UNIT 2

Electronic Circuits (12 Hrs)

Multivibrators (Bistable Monostable and Astable), Differential amplifier, Operational amplifier (OP-AMP), OP-AMP as inverting and non-inverting, scalar, summer, integrator, differentiator. Schmitt trigger and logarithmic amplifier, Electronic analog computation circuits.

UNIT 3

Digital Principles (12 Hrs)

Binary and Hexadecimal number system, Binary arithmetic, Logic gates, Boolean equation of logic circuits, Karnaugh map simplifications for digital circuit analysis, and design, Encoders & Decoders, Multiplexers and Demultiplexers, Parity generators and checkers, Adder-Subtractor circuits.

UNIT 4

Sequential Circuits and Microprocessor (12 Hrs)

Flip Flops, Registers, Up/Down counters, Basics of semiconductor memories: ROM, PROM, EPROM, and RAM, D/A conversion using binary weighted resistor network, Ladder, D/A converter, A/D converter using counter, Successive approximation A/D converter, Microprocessor INTEL 8085 basic.

Recommended Books

1. Millman and Halkias, 'Electronic Devices and Circuits', Tata Mc Graw Hill, 1983.
2. Ben G. Streetman, 'Solid State Electronic Devices', Prentice Hall, New Delhi, 1995.
3. A.P. Malvino and D.P. Leach, 'Digital Principles and Applications', Tata McGraw Hill, New Delhi, 1986.
4. A.P. Malvino, 'Digital Computer Electronics', Tata Mc Graw Hill, New Delhi, 1986.
5. Millman, 'Microelectronics', Tata Mc Graw Hill, London, 1979.
6. W.H. Gothmann, 'Digital Electronics', Prentice Hall, New Delhi, 1980.

ELECTRONICS LAB

Subject Code: MPHY1-105

**L T P C
0 0 6 3**

Duration: 72 Hrs.

Note: Students will be required to perform at least ten experiments from the given list of experiments

1. Design of Regulated power supply and study of its characteristics.
2. To Study the various gates and verify their truth tables using IC's.
3. To study the Encoder and decoder circuits.
4. To study the INTEL 8085 Microprocessor and WAP to addition and subtraction of two 8 bit numbers.
5. WAP to addition and Subtraction of two 16 bit numbers.
6. WAP to multiply and divide of two 8 bit numbers.
7. To study the use of digital to analog and analog to digital converter.
8. Plot VI characteristics of depletion and enhancement type MOSFET.
9. Design 2:1 MUX circuit using basic gates and verify.
10. To study the construction of thyristor and plot VI characteristics of SCR.
11. Plot the frequency response of op-amp on semi-log graph paper.
12. Application of op-amp as inverting and non-inverting Amplifier.
13. To use the op-amp as summing, scalling and averaging amplifier.
14. Design differentiator and integrator using op-amplifier.

COMPUTER PROGRAMMING LAB

Subject Code: MPHY1-106

**L T P C
0 0 6 3**

Duration: 72 Hrs.

Note: Students will be required to perform at least ten experiments from the given list of experiments.

1. Introduction to Numerical methods: Computer algorithms, interpolations cubic spline fitting, Numerical differentiation – Lagrange interpolation, Numerical integration by Simpson and Weddle's rules, random generators, Numerical solution of differential equations by Euler, predictor-corrector and Runge-Kutta methods, problems.
2. Computer hardware, software, programming languages, Fortran 77, classification of data, variables, dimension and data statement, input/output, format, branching, IF statements, DO statements, subprograms, operations with files.

or

2. Programming with C++: Introduction to the Concept of Object Oriented Programming; Advantages of C++ over conventional programming languages; Introduction to Classes, Objects; C++ programming syntax for Input/Output, Operators, Loops, Decisions, simple and inline functions, arrays, strings, pointers; some basic ideas about memory management in C++.

3. List of Numerical Problems:

Section A

1. Data handling: find standard deviation, mean, variance, moments etc. of at least 25 entries.
2. Choose a set of 10 values and find the least squared fitted curve.
3. Generation of waves on superposition like stationary waves and beats.
4. Fourier analysis of square waves.
5. Wave packet and uncertainty principle.

Section B

6. Study the charging and discharging of a capacitor in RC circuit with a DC source using Euler method. Graphically demonstrate the variation of charge with time for two values of time step size.

Modify the program to include AC source instead of D.C. Source.

7. Study the growth and decay of current in RL circuit containing (a) DC source and (b) AC source using Runge Kutta method. Draw graphs between current and time in each case. Perform power analysis in the circuit for two values of time step size for the case.

8. Study graphically the path of a projectile with and without air drag, using FN method. Find the horizontal range and maximum height in either case. Write your comments on the findings.

9. Motion of artificial satellite.

10. Study of motion of a one-dimensional harmonic-oscillator without and with damping effect (use Euler method). Draw graphs showing the relations (a) velocity vs time (b) acceleration vs time (c) position vs time.

Recommended Books

1. J.B. Scarborough, 'Numerical Mathematical Analysis', 4th Edn., Oxford Book Co.
2. P.L. DeVries, 'A first course in Computational Physics', 2nd Edn., Wiley, 2011.
3. 'Computer Applications in Physics', 2nd Edn., S. Chandra (Narosa), **2008.**
4. R.C. Verma, P.K. Ahluwalia and K.C. Sharma, 'Computational Physics', 1st Edn., New Age, 2005.
5. 'Object Oriented Programming with C++: Balagurusamy', 2nd Edn., Tata McGraw Hill, 2002.

QUANTUM MECHANICS –I

Subject Code: MPHY1-207

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Basic Formulation and quantum Kinematics (11 Hrs)

Stern Gerlach experiment as a tool to introduce quantum ideas, analogy of two level quantum system with polarisation states of light. Complex linear vector spaces, ket space, bra space and inner product, operators and properties of operators. Eigenkets of an observable, eigenkets as base kets, matrix representations. Measurement of observable, compatible vs. incompatible observable, commutators and uncertainty relations. Change of basis and unitary transformations. Diagonalisation of operators. Position, momentum and translation.

UNIT 2

Quantum Dynamics (11 Hrs)

Time evolution operator and Schrodinger equation, energy eigen kets, time dependence of expectation values, Schrodinger vs. Heisenberg picture, unitary operator, Heisenberg equations

Unit 3

One Dimensional Systems (11 Hrs)

Potential Step, potential barrier, potential well. Scattering vs. Bound states. Simple harmonic oscillator, energy eigen states, wave functions and coherent states.

Unit 4

Theory of Angular momentum (15 Hrs)

Orbital angular momentum commutation relations. Eigen value problem for L^2 , Angular momentum algebra, commutation relations. Introduction to the concept of representation of the commutation relations in different dimensions. Eigen vectors and eigen functions of J^2 and J_z . Addition of angular momentum and C.G. coefficients.

Recommended Books:

1. J.J. Sakurai, 'Modern Quantum Mechanics', Pearson Education Pvt. Ltd., New Delhi, 2002.
2. L.I. Schiff, 'Quantum Mechanics', Tokyo Mc Graw Hill, 1968.
3. 'Feynmann lectures in Physics', Vol. III, Addison Wesley, 1975.
4. Powel and Craseman, 'Quantum Mechanics', Narosa Pub., New Delhi, 1961.
5. Merzbacher, 'Quantum Mechanics', John Wiley & Sons, New York, 1970.

ELECTRODYNAMICS

Subject Code: MPHY1-208

**L T P C
4 0 0 4**

Duration: 48 Hrs.

Unit 1

Electrostatics and Magnetostatics (12 Hrs)

Review of basic concept of Electrostatics (Coulomb's law, Guass's law, Poisson's equation, Laplace equation), Solution of boundary value problem: Green's function, method of images and calculation of Green's function for the image charge problem in the case of a sphere, Laplace equation, uniqueness theorem. Electrostatics of dielectric media, multipole expansion, Boundary value problems in dielectrics; molecular polarizability, electrostatic energy in dielectric media.

Magnetostatics: Review of basic concept of Magnetostatics and Electromagnetic induction (Biot and Savart's law, Ampere's law, Gauss law, Faraday's Law) Boundary Conditions for the field vectors D, E, B, H.

Unit 2

Time-varying fields (12 Hrs)

Physical Significance of Maxwell's equations, vector and scalar potential, Gauge transformations; Lorentz gauge and Coulomb gauge. Poynting theorem. conservation laws for a system of charged particles and electromagnetic field, continuity equation

Unit 3

Electromagnetic Waves (14 Hrs)

Plane wave like solutions of the Maxwell equations. Polarisation, linear and circular polarisation. Superposition of waves in one dimension. Group velocity. Reflection and refraction of electromagnetic waves at a plane surface between dielectrics. Polarisation by reflection and total internal reflection. Fresnal Law, Waves in conductive medium. EM wave guides, TE, TM and TEM waves, Rectangular wave guides. Energy flow and attenuation in wave guides, Cavity resonators.

Unit 4

Relativistic formulation of electrodynamics (10 Hrs)

Postulate of Special theory of relativity, Review of Lorentz's transformations for length contraction and time dilation, Structure of space-time, four scalars, four vectors and tensors, Relativistic electrodynamics, Magnetism as a relativistic phenomenon and field transformations, Recasting Maxwell equations in the language of special relativity, covariance and manifest covariance, field tensor. Lagrangian formulation for the covariant Maxwell equations.

Recommended Books:

1. Classical Electrodynamics - J.D. Jackson-John & Wiley Sons Pvt. Ltd. New York, **2004.**
2. Introduction to Electrodynamics - D.J. Griffiths-Pearson Education Ltd., New Delhi, **1991.**
3. Classical Electromagnetic Radiation - J.B. Marion-Academic Press, New Delhi, **1995.**

ATOMIC AND MOLECULAR PHYSICS

Subject Code: MPHY1-209

L T P C

Duration: 48 Hrs.

4 0 0 4

Unit 1

One Electron Atom (12 Hrs)

Vector model of a one electron atom, Quantum states of an electron in an atom, Hydrogen atom spectrum, Spin-orbit Coupling, Relativistic correction, Hydrogen fine structure, Spectroscopic terms, Hyperfine structure.

Unit 2

Two valance Electron Atom (10 Hrs)

LS coupling, Pauli exclusion principle, Interaction energy for LS coupling, Lande interval rule, jj coupling, interaction energy for jj coupling.

Unit 3

Atom in Magnetic and Electric Field (10 Hrs)

Zeeman effect, Magnetic moment of a bound electron, Magnetic interaction energy in weak field. Paschen-Back effect, Magnetic interaction energy in strong field. Stark effect, First order Stark effect in hydrogen.

Unit 4

Molecular Spectroscopy (16 Hrs)

Rotational and vibrational spectra of diatomic molecule, Raman Spectra, Electronic spectra, Born-Oppenheimer approximation, Vibrational coarse structure, Franck-Condon principle, Rotational fine structure of electronic-vibration transitions. Spin Resonance Spectroscopy: Electron spins resonance and nuclear magnetic resonance spectroscopy.

Recommended Books:

1. H.E. White, 'Introduction to Atomic Spectra', McGraw Hill, 1934.
2. C.N. Banwell and E.M. McCash, 'Fundamentals of Molecular Spectroscopy', Tata McGraw Hill, 1994.

CONDENSED MATTER PHYSICS-I

Subject Code: MPHY1-210

L T P C

Duration: 48 Hrs.

4 0 0 4

Unit 1

Crystallography and Defects in Solids (15 Hrs)

Crystal structure, Bravais lattices and its classification, Miller Indices, X-Ray Diffraction, Braggs law of Crystallography, Braggs spectrometer, Ordered Phase of matter: kinds of liquid crystalline order, Quasi Crystals.

Defects: Point defects, Impurities, Vacancies- Schottky and Frankel vacancies, Color centres and coloration of crystals, F-centres, Line defects (dislocations), Edge and screw dislocations, Berger Vector, Planar (stacking) Faults, Grain boundaries.

Unit 2

Lattice Dynamics and Phonons (12 Hrs)

Concept of photons and phonons, Quantization of lattice vibrations, Energy and momentum of phonons, inelastic scattering of photons by phonons, Dispersion relation for lattice waves in monoatomic linear lattice, Vibration modes of diatomic linear lattice.

Unit 3

Specific Heat for solid (12 Hrs)

Molar Specific heat at constant pressure and volume, Dulong Petit's Law, Eienstein model of specific heat-low and high temperature, Failure of Dulong Petit's Law at low temperature,

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Drawback of Eienstein model, Debye model of specific heat and its comparison with Einstein model, Debye T^3 law, Drude Model of Electrical and Thermal Conductivity.

Unit 4

Diffusion Phenomenon in solids (9 Hrs)

Diffusion in solids, Classification of diffusion process, Mechanism of atomic diffusion, Fick's law, Factor affecting diffusion and applications, Kirkendal law.

Recommended Books

1. C. Kittel, 'Introduction to Solid State Physics'.
2. N.W. Ashcroft and N.D. Mermin, 'Solid State Physics'.
3. J.M. Ziman, 'Principles of the Theory of Solids'.
4. A.J. Dekker, 'Solid State Physics'.
5. G. Burns, 'Solid State Physics'.
6. M.P. Marder, 'Condensed Matter Physics'.
7. B.D. Cullity, 'Elements of X-Ray Diffraction'.
8. L.V. Azaroff, 'Introduction to Solids'.

ADVANCED OPTICS AND SPECTROSCOPY LAB.

Subject Code: MPHY1-211

L T P C
0 0 6 3

Duration: 72 Hrs.

Note: Students will be required to perform at least ten experiments from the given list of experiments.

1. To find the wavelength of monochromatic light using Feby Perot interferometer.
2. To find the wavelength of sodium light using Michelson interferometer.
3. To calibrate the constant deviation spectrometer with white light and to find the wavelength of unknown monochromatic light.
4. To find the grating element of the given grating using He-Ne laser light.
5. To find the wavelength of He-Ne laser.
6. To verify the existence of Bohr's energy levels with Frank-Hertz experiment.
7. To determine the charge to mass ratio (e/m) of an electron with normal Zeeman Effect.
8. To determine the velocity of ultrasonic waves in a liquid using ultrasonic interferometer.
9. Laboratory spectroscopy of standard lamps.
10. To study the Kerr effect using Nitrobenzene.
11. To study polarization by reflection - Determination of Brewster's angle.
12. To measure numerical aperture and propagation loss and bending losses for optical fibre as function of bending angle and at various wavelengths.
13. To study the Magnetorestriction effect using Michelson interferometer.
14. Experiments with microwave (Gunn diode): Young's double slit experiment, Michelson interferometer, Feby-Perot interferometer, Brewster angle, Bragg's law, refractive index of a prism.
15. To measure (i) dielectric constant of solid/liquid; (ii) Q of a cavity. Use of Klystron-based microwave generator.

CONDENSED MATTER LAB

Subject Code: MPHY1-212

L T P C
0 0 6 3

Duration: 72 Hrs.

Note: Students will be required to perform at least ten experiments from the given list of experiments

1. To study the characteristics of a LED and determine activation energy.

- To study magneto-resistance and its field dependence.
- To trace hysteresis loop and calculate retentivity, coercivity and saturation magnetization
- To prepare the thin films of ferroelectric material/ composite films in laboratory by using solvent cast and spin cast method.
- To prepare electrical contacts on thin films through vacuum/sputtering technique.
- To study dielectric permittivity of different polymer/ composites as a function of frequency.
- To study dielectric losses (Tan Delta) spectra of different polymer/ composites as a function of frequency.
- To study the temperature dependence of dielectric losses (Tan Delta) of different polymer/ composites at different frequencies.
- To study of ferro-electricity in a ferroelectric material/ composite film
- To study the dielectric behavior of PZT ceramic by determining Curie temperature, dielectric strength & dielectric constant.
- Determination of crystal structure & lattice parameters using X-rays diffraction technique.
- Sizing nano-structures (UV-VIS spectroscopy).
- DSC/DTA/TGA studies for thermal analysis of materials.

NUCLEAR PHYSICS

Subject Code: MPHY1-314

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Nuclear Interactions (13 Hrs)

Two nuclear system, deuteron problem, binding energy, nuclear potential well, pp and pn scattering experiments at low energy, Nucleon- nucleon interaction, Exchange forces and tensor forces, meson theory of nuclear forces, Nucleon- nucleon scattering, Effective range theory, Spin dependence of nuclear forces, independence and charge symmetry of nuclear forces, Yukawa interaction.

UNIT 2

Nuclear Reactions (12 Hrs)

Direct and compound nuclear reaction mechanisms, Cross section in terms of partial wave amplitude, Compound nucleus, Scattering matrix, Reciprocity theorem, Breit-Wigner one-level formula-Resonance Scattering.

UNIT 3

Nuclear Methods (11 Hrs)

Liquid Drop Model-Bohr-Wheeler theory of fission- Experimental evidence for shell effects-Shell Model- spin- Orbit coupling-Magic numbers-Angular momenta and parities of nuclear ground states- Qualitative discussion and estimates of transition rates- Magnetic moments and Schmidt lines- Collective model of Bohr and Mottleson.

UNIT 4

Nuclear Decay (12 Hrs)

Beta decay, Fermi theory of beta decay, Shape of beta spectrum, Total decay rate, Angular momentum and parity selection rules, Comparative half-lives, Allowed and forbidden transitions, Two component theory of neutrino decay, Detection and properties of neutrino, Gamma decay, Multiple transitions in nuclei, Angular momentum and parity selection rules, Internal conversion, Nuclear isomerism.

Recommended Books:

- R.R. Roy & B.P. Nigam, 'Nuclear Physics', New Age International Ltd., 2001.
- M.A. Preston and R.K. Bhaduri, 'Structure of Nucleus', Addison-Welsey, 2000.

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3. M.K. Pal, 'Theory of Nuclear Structure', East-West Press, Delhi, 1983.
4. 'Kaplan Irving Nuclear Physics', Narosa Publishing House, 2000.
5. D.C. Tayal, 'Nuclear Physics', Himalaya Publication home, 2007.
6. A. Bohr and B.R. Mottelson, 'Nuclear Structure', Vol. 1 (1969) and Vol.2 Benjamin, Reading, A.1975.
8. Kenneth S. Krane, 'Introductory Nuclear Physics', Wiley, New York, 1988.
9. G.N. Ghoshal, 'Atomic and Nuclear Physics', Vol.2, S. Chand and Co., 1997.

QUANTUM MECHANICS-II

Subject Code: MPHY1-315

L T P C
4 0 0 4

Duration: 48 Hrs.

Unit 1

Identical Particles (10 Hrs)

Brief introduction to identical particles in quantum mechanics (based on Feynmann Vol. III) symmetrisation postulates-symmetric and antisymmetric wave functions, Pauli Exclusion Principle, Spin statistic Connections-Bose Einstein and Fermi Dirac Statistics, Application to 2-electron systems.

Unit 2

Time-independent and dependent Approximation Methods (15 Hrs)

Non-degenerate perturbation theory & its applications, degenerate case, variational methods, WKB approximation. Time-dependent perturbation theory, transition probability calculations, Fermi-golden rule, adiabatic approximation, sudden approximation.

Unit 3

Scattering Theory (12 Hrs)

Partial wave analysis, Diffraction and Scattering Cross-sections, unitarity and phase shifts. Determination of phase shift, Optical theorem. Born approximation, extend to higher orders. Validity of Born approximation.

Unit 4

Relativistic Quantum Mechanics (11 Hrs)

Klein Gordon equation. Dirac Equation, Lorentz covariance of Dirac equation. Positive and negative energy solutions of Dirac equation, positrons. Properties of gamma matrices. Parity operator and its action on states. Semi-classical theory of radiation.

Recommended Books:

1. J.J. Sakurai, 'Modern Quantum Mechanics', Pearson Education Pvt. Ltd., New Delhi, 2002.
2. L.I. Schiff, 'Quantum Mechanics', Tokyo McGraw Hill, 1968.
3. 'Feynmann lectures in Physics', Vol. III, Addison Wesley, 1975.
4. Powel and Craseman, 'Quantum Mechanics', Narosa Pub., New Delhi, 1961.
5. Merzbacher, 'Quantum Mechanics'. John Wiley & Sons, New York, 1970.

CONDENSED MATTER PHYSICS-II

Subject Code: MPHY1-316

L T P C
4 0 0 4

Duration: 48 Hrs.

Unit 1

Theory of Magnetic Materials (15 Hrs)

Classification of magnetic materials, the origin of permanent magnetic dipoles, diamagnetic susceptibility, classical and quantum theory of paramagnetism, Quenching of orbital angular momentum, Paramagnetic susceptibility of conduction electrons, Ferro magnetism, Weiss molecular theory, Ferromagnetic domains, super exchange interaction, the structure of

ferrites, saturation magnetisation, Neel's theory of ferrimagnetism, Curie temperature and susceptibility of ferrimagnets.

Unit 2

Superconductivity (12 Hrs)

Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & II superconductors, London Equations, London penetration depth, Isotope effect, BCS Theory of superconductivity, Josephson Effect (DC & AC), Applications of Superconductors.

Unit 3

Dielectric Properties and Ferro Electrics (11 Hrs)

Macroscopic field, local field, Lorentz field, Clausius-Mossotti relations, Different contribution to polarization: dipolar, electronic and ionic polarizabilities, Response and Relaxation Phenomenon, General properties of ferroelectric materials, dipole theory of ferroelectricity, Ferroelectric Domains, thermodynamics of ferroelectric transitions.

Unit 4

Free Electrons Theory of Metal (10 Hrs)

Difficulties of the classical theory, the free electron model, The Fermi-Dirac distribution, electronic specific heat, Paramagnetism of free electrons, Thermionic emission from metals, energy distribution of the emitted electrons, Field-enhanced electron emission from metals, Changes of work function due to adsorbed atoms, contact potential between two metals, photoelectric effect of metals.

Recommended Books

1. C. Kittel, 'Introduction to Solid State Physics'.
2. N.W. Ashcroft and N.D. Mermin, 'Solid State Physics'.
3. J.M. Ziman, 'Principles of the Theory of Solids'.
4. A.J. Dekker, 'Solid State Physics'.
5. G. Burns, 'Solid State Physics'.
6. M.P. Marder, 'Condensed Matter Physics'.
7. B.D. Cullity, 'Elements of X-Ray Diffraction'.
8. L.V. Azaroff, 'Introduction to Solids'.

NUCLEAR PHYSICS LAB

Subject Code: MPHY1-317

**L T P C
0 0 6 3**

Duration: 72 Hrs.

Note: Students will be required to perform at least ten experiments from the given list of experiments

1. Analysis of pulse height of gamma ray spectra.
2. To study absorption of beta rays in Al and deduce end-point energy of a beta emitter.
3. To study the dead time and other characteristics of G.M. counter.
4. To study Gaussian distribution and Source strength of a beta-source using G.M. counter.
5. Recording and calibrating a gamma ray spectrum by scintillation counter.
6. Detecting gamma radiation with a scintillation counter.
7. Identifying and determining the activity of weakly radioactive samples.
8. To calibrate the given gamma-ray spectrometer and determine its energy resolution.
9. Energy resolution and calibration of a gamma-ray spectrometer using multi-channel analyzer.
10. Time resolution and calibration of a coincidence set-up using a multi-channel analyzer.
11. Formation and Counting of alpha particle tracks on Solid State Nuclear Track

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12. Detectors using Optical Microscope/ spark counter.
13. Determination of Ionization Potential of Lithium.
14. Determination of Lande's factor of DPPH using Electron-Spin resonance (E.S.R.) Spectrometer.

PARTICLE PHYSICS

Subject Code: MPHY1-419

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Elementary Particles and Their Properties (12 Hrs)

Historical survey of elementary particles and their classification, determination of mass, life time, decay mode, spin and parity of muons, pions, kaons and hyperons. Experimental evidence for two types of neutrinos, production and detection of some important resonances and antiparticles.

UNIT 2

Symmetries and Conservation Laws (13 Hrs)

Conserved quantities and symmetries, the electric charge, baryon number, leptons and muon number, particles and antiparticles, hypercharge (strangeness), the nucleon isospin, isospin invariance, isospin of particles, parity operation, charge conservation, time reversal invariance, Elementary ideas of CP and CPT invariance, unitary symmetry SU(2), SU (3) and the quark model.

UNIT 3

Weak Interaction (12 Hrs)

Classification of weak interactions, Fermi theory of beta decay, matrix element, classical experimental tests of Fermi theory, Parity non conservation in beta decay, Weak decays of strange-particles and Cabibbo's theory.

UNIT 4

Gauge theory and GUT (11 Hrs)

Gauge symmetry, field equations for scalar (spin 0), spinor (spin $\frac{1}{2}$), vector (spin-1) and fields, global gauge invariance, local gauge invariance, Feynmann rules, introduction of neutral currents. Spontaneously broken symmetries in the field theory, standard model.

Recommended Books:

1. H. Fraunfelder and E.M. Henley, 'Subatomic Physics', N.J. Prentice Hall.
2. D. Griffiths, 'Introduction to Elementary Particles', Wiley-VCH, 2008.
3. D.H. Perkins, 'Introduction to High Energy Physics', Cambridge University Press, 2000.
4. I.S. Hughes, 'Elementary Particles', Cambridge University Press, Cambridge, 1996.
5. F.E. Close, 'Introduction to Quarks and Partons', Academic Press, London, 1981.
6. M.P. Khanna, 'Introduction to Particle Physics', Prentice Hall of India, New Delhi, 2004.

ADVANCED MATHEMATICAL PHYSICS

Subject Code: MPHY1-356

**L T P C
4 0 0 4**

Duration: 48 Hrs.

Unit 1

Complex Analysis (12 Hrs.)

Limits, Continuity and Derivative of the function of Complex variable, Analytic Function, Cauchy- Riemann Equations, Harmonic Function, Orthogonal System, Conjugate Function, Taylor and Laurent series, Complex integration: Line Integral, Singularities, Cauchy integration Theorem, Cauchy's Integral formula, residues and evaluation of integrals, Contour Integration.

Unit 2

Group Theory (12 Hrs.)

Definition of a group, Composition table, Conjugate elements and classes of groups, direct product, Isomorphism, homeomorphism, permutation group, Definitions of the three dimensional rotation group and SU(2), O(3).

Unit 3

Sampling and Probability Distribution (12 Hrs.)

Random Variables: Definition, Probability Distribution-Binomial, Poisson and Normal distributions. Sampling Distributions: Population and samples, Concept of sampling Distributions-Student's t test, F-test and Chi-square test, Curve Fitting, Least square fitting.

Unit 4

Tensors (12 Hrs.)

Review of tensor, Equality of Tensors - Symmetric and Skew – symmetric tensors - Outer multiplication, Contraction and Inner Multiplication - Quotient Law of Tensors - Reciprocal Tensor of Tensor - Relative Tensor - Cross Product of Vectors, Riemannian Space - Christoffel Symbols and their properties.

Recommended Books

1. J.N. Sharma, 'Complex Analysis', Krishna Publishers.
2. S.C. Gupta & V.K. Kapoor, 'Mathematical Statistics', S. Chand.
3. Josaph A. Gallian, 'Contemporary Abstract Algebra', Narosa.
4. A.R. Vasishtha, 'Modern Algebra', Krishna Prakashan.
5. Erwin Kreyszig, 'Advanced Mathematical Physics'.
6. J.L. Synge and A. Schild, 'Tensor Calculus', Toronto, 1949.

PHYSICS OF MATERIALS

Subject Code: MPHY1-461

L T P C

Duration: 48 Hrs.

4 0 0 4

Unit 1

Polymer Materials (12 Hrs)

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 2

Composite Materials (12 Hrs)

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 3

Nano-Materials (11 Hrs)

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 4

Electrical, Magnetic and Thermal Properties of Materials (13 Hrs)

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', John Wiley & Sons, Inc.
2. G.M. Chow & K.E. Gonsalves, 'Nanotechnology - Molecularly Designed Materials', 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', Emperial College Press, 2004.

NUCLEAR ACCELERATORS & RADIATION PHYSICS (NARP)

Subject Code: MPHY1-460

**L T P C
4 0 0 4**

Duration: 48 Hrs.

Unit 1

Interactions of Nuclear Radiations and Neutron Detection (12 Hrs)

Introduction to radiations, types of radiations, Radiation dose, units, safety limits, Biological effects of radiation, radiation monitoring.

Neutron discovery, neutron classification, neutron sources, Neutron detectors, Diffusion of thermal neutrons.

UNIT 2

Nuclear Radiation Detectors (12 Hrs)

Detection of nuclear radiation, classification of detectors, Gas filled detectors, multiplicative regions, ionization chamber, Proportional counter, Geiger-Muller counter, Solid state detectors, Cerenkov detector, Wilson cloud chamber, Bubble chamber, Spark chamber, Nuclear emulsions, Solid state nuclear track detectors, Semiconductor detectors.

Unit 3

Nuclear Accelerators (10 Hrs)

Introduction of accelerators of charged particles: Classification and performance characteristics of accelerator, ion sources, Electrostatic accelerators (Cockroft---Walton accelerators), Cyclotron, Betatron, principle of phase stability, Synchro-cyclotron, Electron and Proton synchrotron, Microtron, Linear accelerator, drift tube and wave guide accelerator.

Unit 4

Nuclear reactors (14 Hrs)

Nuclear chain reactor, Four factor formula, reactor design, classification of reactors, research reactor: graphite moderator, water boiler, swimming pool, light water-moderator, tank type; Heavy water-moderator: tank type, production reactor, power reactor: pressurized water reactor, Boiling water reactors, heavy water moderated reactors, organic moderated reactors, Gas cooled reactors, Sodium graphite reactors, Liquid fuel reactor, Fast reactor, breeder reactors.

Recommended Books

1. Edward J.N. Wilson "Ann introduction to Paricle Accelerators", Oxford University

Press,2003.

2. James Rosenzweig “Fundamental of Beam Physics”, Oxford University Press,2001.
3. P N Cooper “Introduction to Nuclear Radiation Detectors”, Cambridge University press, 1986.
4. Kapoor S S and Ramamurthy V S “Nuclear Radiation Detectors”, Wiley Eastern, new Delhi, 1986.
5. Knoll G. F., Radiation Detection and Measurement, John Wiley & Sons (1989).
6. Krane K. S., Introductory Nuclear Physics, John Wiley & Sons (1975).
7. Singuru R. M., Introduction to experimental nuclear physics, Wiley Eastern Publications (1987).

NANO-PHYSICS

Subject Code: MPHY1-462

**L T P C
4 0 0 4**

Duration: 48 Hrs.

UNIT 1

Introduction to the Nanoscience (6 Hrs)

Nano scale, Surface to volume ratio, Electron confinement in infinitely deep square well, Confinement in one and two-dimensional wells, Idea of quantum well, quantum wire and quantum dots, Comparison of Density states for 0D, 1D and 2D confined nanostructured materials with the bulk.

UNIT 2

Synthesis of Nanostructures (15 Hrs)

Top down and Bottom up approach for synthesis of nanoparticles, growth of nuclei, Growth controlled by diffusion and surface process in Zero Dimensional nanostructures.

Synthesis of One-Dimensional Nanostructures: Template-Based Synthesis, Electrochemical deposition, Electrophoretic deposition, Electrospinning and Lithography.

Synthesis of two-Dimensional Nanostructures: Fundamentals of Film Growth, Physical Vapor Deposition, Molecular beam epitaxy, Sputtering, Chemical Vapor Deposition, Atomic Layer Deposition, Self-Assembly, Sol-Gel Films, Langmuir-Blodgett Films.

UNIT 3

General Characterization Techniques (15 Hrs)

Determination of particle size, Structural Characterization: X-ray diffraction, Small angle X-ray scattering, Morphological Characterization: Scanning electron microscopy, Transmission electron microscopy, Atomic Force Microscopy, Scanning probe microscopy.

Optical Characterization: photo luminescence (PL), Raman and FTIR spectroscopy of nanomaterials.

Special Nanomaterials and its Applications (12 Hrs)

Structure of Fullerene, Methods of synthesis of Carbon Nanotubes, Properties of CNT; Electrical, Optical, Mechanical, Vibrational properties etc., Applications: Molecular Electronics and Nanoelectronics, Carbon Nanotube Emitters, Solar cells, Fuel Cells, Display devices.

Recommended Books:

1. Chow G-M & K.E. Gonsalves, ‘Nanotechnology - Molecularly Designed Materials’, American Chemical Society.
2. K.P. Jain, ‘Physics of Semiconductor Nanostructures’, Narosa Publishing House, 1997.
3. G. Cao, ‘Nanostructures and Nanomaterials: Synthesis, Properties and Applications’, Emperial College Press, 2004.

SCIENCE OF RENEWABLE ENERGY SOURCES

Subject Code: MPHY0-F92

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Unit 1

Introduction (5 Hrs)

Production and reserves of energy sources in the world and in India, need for alternatives, renewable energy sources.

Unit 2

Energy (12 Hrs)

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 photoelectrochemical solar cells. Applications.

Unit 3

Hydrogen Energy (12 Hrs)

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 (7 Hrs)

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', New Age, New Delhi.

M.Sc. Mathematics (1st YEAR)

Total Contact Hours = 22

Total Marks = 600

Total Credits = 21

1 st SEMESTER		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMAT1-101	Abstract Algebra	4	0	0	40	60	100	4
MMAT1-102	Real Analysis	4	0	0	40	60	100	4
MMAT1-103	Mechanics	4	0	0	40	60	100	4
MMAT1-104	Differential Equation	4	0	0	40	60	100	4
MCAP0-193	Fundamentals of Computer & C Programming	4	0	0	40	60	100	4
MCAP0-194	Fundamentals of Computer & C Programming Lab	0	0	2	100	--	100	1
Total	Theory = 5 Labs = 1	20	0	2	300	300	600	21

Total Contact Hours = 22

Total Marks = 600

Total Credits = 21

2 nd SEMESTER		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMAT1-205	Advance Algebra	4	0	0	40	60	100	4
MMAT1-206	Measure Theory and Integration	4	0	0	40	60	100	4
MMAT1-207	Complex Analysis	4	0	0	40	60	100	4
MMAT1-208	Tensors & Differential Geometry	4	0	0	40	60	100	4
MMAT1-209	Numerical Analysis	4	0	0	40	60	100	4
MMAT1-210	Numerical Analysis Lab	0	0	2	100	--	100	1
Total	Theory = 5 Labs = 1	20	0	2	300	300	600	21

Total Contact Hours = 25

Total Marks = 700

Total Credits = 24

3 rd SEMESTER		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMAT1-311	Topology	4	0	0	40	60	100	4
MMAT1-312	Operations Research	4	0	0	40	60	100	4
MMAT1-313	Mathematical Statistics	4	0	0	40	60	100	4
MMAT1-314	Mathematical Methods	4	0	0	40	60	100	4
MMAT1-315	Seminar-I	0	0	2	100	--	100	1
Departmental Elective - I (Select any one)								
MMAT1-356	Fourier Analysis & Applications	4	0	--	40	60	100	4
MMAT1-357	Sampling Techniques							
MMAT1-358	Numerical Methods for Partial Differential Equations							
Open Elective – I (Select any one)		3	0	0	40	60	100	3
Total	Theory = 6 Labs = Nil	23	0	2	340	360	700	24

M.Sc. Mathematics (2nd YEAR)

Total Contact Hours = 25

Total Marks = 700

Total Credits = 24

4 th SEMESTER		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMAT1-416	Number Theory	4	0	0	40	60	100	4
MMAT1-417	Functional Analysis	4	0	0	40	60	100	4
MMAT1-418	Partial Differential Equations	4	0	0	40	60	100	4
MMAT1-419	Seminar-II	0	0	2	100	0	100	1
Departmental Elective - II (Select any one)								
MMAT1-459	Optimization	4	0	0	40	60	100	4
MMAT1-460	Spectral Approximation							
MMAT1-461	Multivariate Calculus							
Departmental Elective – III (Select any one)								
MMAT1-462	Graph Theory	4	0	0	40	60	100	4
MMAT1-463	Sampling Distribution and Estimation Theory							
MMAT1-464	Fuzzy Set Theory and Application							
Open Elective II (Select any one)								
		3	0	0	40	60	100	3
Total	Theory = 6 Labs = Nil	23	0	2	240	360	700	24

Overall

Semester	Marks	Credits
1 st	600	21
2 nd	600	21
3 rd	700	24
4 th	700	24
Total	2600	90

Open Electives

Subject Code	Subject Name	Offered by Department
MPHY0-F92	Science of Renewable Energy Sources	Applied Physics
MBAD0-F91	Principles and Practices of Management	Management
MBAD0-F93	Human Resource Management	Management
MCAPO-F92	Computer Application in Business	Computer Application
MCAPO-F91	Introduction to information Technology & Office Automation	Computer Application
MTEX0-F93	Research Methodology	Textile Engineering
MCIE0-F91	Environmental Management	Civil Engineering
MCIE0-F92	Transportation Safety	Civil Engineering

ABSTRACT ALGEBRA**Subject Code: MMAT1-101****L T P C
4 0 0 4****Contact Hrs.: 45****Learning Objectives**

To Introduce the Concepts and to Develop Working Knowledge On Class Equation, Solvability of Groups, Composition Series, Ideals, Factorization Domain.

UNIT-I (13 Hrs.)

Group Theory: Groups, Subgroups, Normal subgroups, Quotient groups, Homomorphism, Automorphism, Cyclic groups, Permutation groups, Conjugate elements and conjugacy classes, Class equation of a finite group and its applications, Sylow's theorems, Direct products, Normalizer and centralizer.

UNIT-II (10 Hrs.)

Composition Series: Normal and sub normal series, Composition series, Zassenhaus's lemma, Scherer's refinement theorem and Jordan-holder theorem, Derived group, Solvable groups, Fundamental theorem of arithmetic.

UNIT-III (10 Hrs.)

Ring Theory: Rings, Subrings, Quotient rings, Ideals, Maximal ideals, Prime ideals, Nilpotent and nil ideals, Field of quotients of an integral domain.

UNIT-IV (12 Hrs.)

Factorization Domain: Factorization theory in integral domains, Divisibility, Rings of Gaussian integers, Unique factorization domains, Polynomial rings over unique factorization domains, Principal ideal domain (PID), Euclidian domain(ED) and their relationships.

Recommended Books

1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, 'Basic Abstract Algebra', Cambridge University Press, 1997.
2. I. N. Herstein, 'Topics in Algebra', 2nd Edn., Wiley Eastern, 1975.
3. Surjeet Singh, Quzai Zameeruddin, 'Modern Algebra', Vikas Publishing House, New Delhi,
4. David S. Dummit, 'Abstract Algebra', 2nd Edn., Pearson, 2010.
5. Joseph A. Gallian, 'Contemporary Abstract Algebra', 4th Edn., Narosa, 2008.
6. Artin Michael, 'Algebra', 2nd Edn., Pearson, 2010.

REAL ANALYSIS**Subject Code: MMAT1-102****L T P C
4 0 0 4****Contact Hrs.: 45****Learning objectives**

To work comfortably with completeness of \mathbb{R} , convergence of sequence in metric space, uniform continuity in metric space, Riemann - Stieltjes integration.

UNIT-I (12 Hrs.)

Set Theory: Bounded sets, Superimum and infimum, the completeness property of \mathbb{R} , the Archimedean property, Finite, Countable and uncountable sets, Equivalent sets, Metric spaces, Open and closed sets, Compact sets, Elementary properties of compact sets, K -cells, Compactness of k -cells, Compact subsets of Euclidean space \mathbb{R}^k . Perfect sets, Cantor set, Separated sets, connected sets, Connected subsets of real line.

UNIT-II (10 Hrs.)

Convergence in Metric Space: Convergent Sequences (In Metric Spaces), Cauchy Sequences, Subsequences, Complete Metric Space, Cantor's Intersection Theorem, Category of A Set and Baire's Category Theorem, Banach Contraction Principle.

UNIT-III (12 Hrs.)

Continuity in Metric Space: Limits of functions (in metric spaces), Continuous functions, Continuity and compactness, Continuity and connectedness, Discontinuities, Monotonic functions, Uniform continuity.

UNIT-IV (11 Hrs.)

Riemann Stieltjes Integral: Riemann stieltjes integral: definition and existence of integral, Properties of integral, Integration and differentiation, Fundamental theorem of calculus, First and second mean value theorems for riemann stieltjes integral.

Recommended Books

1. Apostol, "Mathematical Analysis" Addition –Wesley
2. R.G. Bartle and D.R. Sherbert, 'Introduction to Real Analysis', 3rd Edn., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
3. W. Rudin, 'Principles of Mathematical Analysis', 3rd Edn., McGraw Hill, Kogakusha, 1976.
4. G.F. Simmons, 'Introduction to Topology and Modern Analysis', McGraw-Hill Ltd., 2008.
5. G.B. Folland, 'Real Analysis', 2nd Edn., John Wiley, New York, 1999.
6. H.L. Royden, 'Real Analysis', Macmillan, New York, 1988.

MECHANICS

Subject Code: MMAT1-103

L T P C
4 0 0 4

Contact Hrs.: 45

Learning Objectives

To study mechanical systems under generalized coordinate systems, Virtual work, Energy and momentum, To study mechanics developed by langrange, Hamilton, Jacobi and small oscillation.

UNIT-I (10 Hrs)

Lagrangian Mechanics: Generalised coordinates, Holonomic and non-holonomic systems, Scleronomic and rhenomic systems, Generalized potential, Lagrange's equations of motion of first kind and second kind, Energy equation for conservative field.

UNIT-II (12 Hrs)

Hamiltonian Mechanics: Hamilton variables, Hamilton canonical equation, Cyclic coordinates, Canonical transformations, Hamilton's principle, Principle of least action, Whittaker's equations, Donkin's theorem.

UNIT-III (12 Hrs)

Small Oscillations for Conservative System: Small oscillations of conservative system, Lagrange's equation for small oscillations, Nature of roots of frequency equation, Principle oscillations. Normal coordinates Hamilton- Jacobi equation and Jacobi theorem.

UNIT-IV (11 Hrs)

Poisson Brackets and Lagrange Bracket: Poisson brackets, Poisson's identity, Jacobi - poisson theorem, Lagrange bracket, Condition of canonical character of transformation in terms of LaGrange bracket and Poisson brackets. Poincare- carton integral invariant, invariance of lagrange bracket and Poisson brackets under canonical transformation.

Recommended Books

1. F. Gantmacher, 'Lectures in Analytic Mechanics', Mir Publisher, Moscow, 1975.

2. H. Goldstien, C. Ppoole and J.L. Sofco, 'Classical Mechanics', 3rd Edn., Addison Wesley, 2002.
3. L.D. Landau and E.M. Lipshitz, 'Mechanics', Pergamon Press, Oxford, 1976.
4. J.E. Marsden, 'Lectures on Mechanics', Cambridge University Press, 1992.

DIFFERENTIAL EQUATION

Subject Code: MMAT1-104

L T P C
4 0 0 4

Contact Hrs.: 45

Learning objectives

To introduce the theoretical concepts of ordinary and partial differential equations

UNIT-1 (13 Hrs.)

Existence of Differential Equation

Existence and uniqueness and continuation of solutions of a differential equation and system of differential equation

Boundary Value Problems

Boundary value problems for second order differential equations, Green's function and its applications, Eigen value problems, Self adjoint form, Sturm-liouville problem and its applications.

UNIT-2 (10 Hrs.)

Stability Theory: Autonomous systems, Phase plane and its phenomenon, Critical points and stability for linear and non-linear systems, Liapunov's direct method, Periodic solutions, Limit cycle, Poincare-Bendixson theorem.

UNIT-3 (12 Hrs.)

First Order Partial Differential Equation: First order pde: partial differential equations, origins and classification of first order PDE, Initial value problem for quasi-linear first order equations: existence and uniqueness of solutions, Non-existence and non-uniqueness of solutions, Surfaces orthogonal to a given System of surfaces, Non-linear PDE of first order, Cauchy method of characteristics, Compatible systems of first order equations, Charpit's method, Solutions satisfying given conditions, Jacobi's method.

UNIT-4 (9 Hrs.)

Second Order Partial Differential Equation

Second order PDE: the origin of second order pde, Equations with variable coefficients, classification and canonical forms of second order equations in two variables, Classification of second order equations in n variables.

Recommended Books

1. M. Braun, 'Differential Equations and Their Applications', 4th Edn., Springer, 2011.
2. F. Braue and J.A. Nohel, 'The Qualitative Theory of Ordinary Differential Equations', Dover Publications, 1989.
3. E.A. Coddington, 'Ordinary Differential Equations', Tata McGraw Hill, 2002.
4. G.F. Simmons, 'Differential Equations with Applications and Historical Notes', 2nd Edn., Tata McGraw Hill, 2003.
5. W.E. Boyce and R.C. Dprima, 'Elementary Differential Equations and Boundary Value Problems'.
6. E.C. Zachmanoglou, D.W. Thoe, 'Introduction to Partial Differential Equations with Applications', Dover Publications, 1986.
7. I.N. Sneddon, 'Elements of Partial Differential Equations', McGraw-Hill Book Company, 1988.
8. T. Amarnath, 'An Elementary Course in Partial Differential Equations', 2nd Edn., Narosa Publishing House, 2012.

FUNDAMENTALS OF COMPUTER AND C PROGRAMMING

Subject Code: MCAPO-193

**L T P C
4 0 0 4**

Contact Hrs.: 45

Learning objectives

1. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of information technology and office tools.
2. The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming).

UNIT-1 (8 Hrs.)

Computer Fundamentals: Block diagram of a computer, Characteristics of computers, Hardware- input devices, Output devices, Memories, Software, System software, Application software, Compiler, Interpreter, utility program, Introduction to operating systems-Windows based/MACOS/LINUX, Significance and advantages of operating systems.

UNIT-2 (8 Hrs.)

C programming: Introduction to C language, Evolution and characteristics of C language, Character set, Keywords, Identifiers, Data types, Variables, Constants, Operators, Expressions, Type conversion and type casting, Overview of pre-processors, Structure of a C program, Input and output statements.

Control statements (7 Hrs.)

Basic programming constructs, 'if', 'if-else', 'nested-if' statements, Conditional operator, 'for', 'while', 'do - while', Switch, Break, Continue.

UNIT-3 (11 Hrs.)

Arrays and strings (7 Hrs.)

Need for an array, Declaration and initialization, Basic operation on arrays, Multi-dimensional array, Structures, Union, Introduction to strings, String handling.

Pointers (4 Hrs.)

Introduction, Declaration and initialization, Pointers and arrays: Similarities and advantages/disadvantages of using pointers. Introduction to structures and unions.

UNIT-4 (11 Hrs.)

Functions and Storage Classes (9 Hrs.)

Need for functions, Prototype, Function definition, Function call, return type and return statement, Passing arguments, Functions and arrays, Functions and pointers, Recursive functions, Difference between recursion and iteration storage classes.

Files (2 Hrs.)

Introduction, File Operations, Character I/O, String I/O, Numeric I/O, Formatted I/O, Block I/O.

Recommended Books

1. Shubhnandan Jamwal, 'Programming in C', 3rd Edn., Pearson.
2. E. Balagurusamy, 'Programming in ANSI C', 3rd Edn., Tata McGraw Hill.
3. V. Rajaraman, 'Fundamentals of Computers', 3rd Edn., PHI.
4. P.K Sinha, 'Computer Fundamental', 5th Edn., BPB PUBLICATION.
5. Brian Kernighan and Dennis Ritchie, 'C Programming Language', 2nd Edn., PHI.
6. Byron Gottfried, 'Programming with C', 2nd Edn., Tata McGraw Hill.
7. Yashvant P. Kanetkar, 'Let us C', 4th Edn., BPB Publications, New Delhi.
8. R.S. Salaria, 'Application Programming in C', Edn', Khanna Book Publishing.

FUNDAMENTALS OF COMPUTER AND C PROGRAMMING LAB

Subject Code: MCAP0-194

L T P C
0 0 2 1

Contact Hrs.: 60

WORD PROCESSING & PRESENTATION TOOL

Salient features of word, Installation of word, Starting and quitting of word, File, Edit, View, Insert, Format, Tools, Tables, Window, Help options and all of their features, Options and sub options etc. Transfer of files between word processors and software packages.

Salient features of power point, Installation, Starting and quitting, File, Edit, View, Insert, Format, Tools, Slide Show, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between presentation tool and software packages.

SPREADSHEET TOOL

Spread sheet. Getting started with excel worksheet, entering data into Work sheet, editing cell addressing, Ranges and range names, Commands, Menus, Copying and Moving cell contents, Inserting and deleting rows and columns, Column width control, Cell protection, Printing reports, Creating and displaying graphs, Statistical functions.

C Programming

1. **Operators:** Arithmetic, Logical, Conditional, Assignment, Increment/Decrement operators
2. **Decision Making:** switch, if-else, nested if, else-if ladder, break, continue, go to
3. **Loops:** while, do-while, for
4. **Functions:** Definition, Declaration, call by value, Call by reference, Recursive functions
5. **Arrays:** Array declarations, Single and multi-dimensional, Strings and string functions
6. **Pointers:** Pointer declarations, Pointer to function, Pointer to array

Recommended Books

1. Shubhmandan Jamwal, 'Programming in C', 3rd Edn., Pearson.
2. E. Balagurusamy, 'Programming in ANSIC', 3rd Edn., Tata McGraw Hill.
3. V. Rajaraman, 'Fundamentals of Computers', 3rd Edn., PHI.
4. P.K. Sinha, 'Computer Fundamentals', 5th Edn., BPB PUBLICATION.
5. Brian Kernighan and Dennis Ritchie, 'C Programming Language, 2nd Edn., PHI.
6. Byron Gottfried, 'Programming with C', 2nd Edn., Tata McGraw Hill.
7. Yashvant P. Kanetkar, 'Let us C', 4th Edn., BPB Publications, New Delhi.
8. R.S. Salaria, 'Application Programming in C', 2nd Edn., Khanna Book Publishing.

ADVANCE ALGEBRA

Subject Code: MMAT1-205

L T P C
4 0 0 4

Contact Hrs.: 45

Learning objectives

To study field extension, Roots of polynomials, Galois theory, Finite fields, Orthonormal basis and inner product space.

UNIT-1 (11 Hrs.)

Inner Product Space: Dual of a vector space, Dual basis, Reflexivity, Annihilators, Inner product spaces, Orthogonal and ortho-normal basis, Gram Schmidt orthonormalization Process.

UNIT-2 (12 Hrs.)

Field Extension: Finite, Algebraic and Transcendental extensions, Irreducible polynomials. Gauss lemma, Eisenstein's criterion, Kronecker's theorem, Algebraic extensions, algebraically closed fields.

UNIT-3 (12 Hrs.)

Finite Field: Splitting fields, Normal extensions, Multiple roots, Finite fields, Separable extensions, Perfect fields, Primitive elements, Lagrange's theorem on primitive elements.

UNIT-4 (10 Hrs.)

Galois Theory: Galois extensions, Galois group of an extension and fundamental theorem of Galois theory.

Recommended Books

1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, 'Basic Abstract Algebra', Cambridge University Press, **1997**.
2. I.N. Herstein, 'Topics in Algebra', 2nd Edn., Wiley Eastern, **1975**.
3. Surjeet Singh, Quzai Zameeruddin, 'Modern Algebra', 8th Edn., Vikas Publishing House, New Delhi, **2006**.
4. David S. Dummit, 'Abstract Algebra', 2nd Edn., Pearson, **2010**.
5. A. Gallian Joseph, 'Contemporary Abstract Algebra', 4th Edn., Narosa, **2008**.
6. Artin Michael, 'Algebra', 2nd Edn., Pearson, **2010**.

MEASURE THEORY AND INTEGRATION

Subject Code: MMAT1-206

**L T P C
4 0 0 4**

Contact Hrs.: 45

Learning Objectives

To introduce measure on the real line, Lebesgue measurability, Integrability, Differentiability, Functions of bounded variation and Completeness of L^p Space.

UNIT-1 (12 Hrs.)

Lebesgue Measure of Sets and Functions: Lebesgue measure, Measurable sets, Regularity, Non-measurable sets, Measurable functions, Borel and lebesgue measurability, Littlewood's three principles.

UNIT-2 (11 Hrs.)

Lebesgue Integration: The lebesgue integral of a simple function and bounded function, Comparison of Riemann and lebesgue integral, Bounded convergence theorem, Integral of non-negative functions, Fatou's Lemma, Monotone convergence theorem, The general lebesgue integral, Lebesgue convergence theorem, Integration of series.

UNIT-3 (12 Hrs.)

Lebesgue Differentiation: Vitali's lemma, the four Dini derivate, Continuous non differentiable functions, Functions of bounded variation, Lebesgue differentiation theorem, Differentiation and integration, the lebesgue set.

UNIT-4 (10 Hrs.)

Theory on L^p -Space: Convex functions, Jensen's inequality, L^p -spaces, Holder's and Minkowski's inequalities. Convergence in mean, Completeness of L^p , Approximation in L^p spaces.

Recommended Books

1. G.de Bara, 'Measure Theory and Integration', Ellis Horwood Limited, England, **2003**.
2. G.B. Folland, 'Real Analysis', 2nd Edn., John Wiley, New York, **1999**.
3. E. Kreyszig, 'Introductory Functional Analysis with Applications', John Wiley, **1989**.
4. H.L. Royden, 'Real Analysis', Macmillan, New York, **1988**.
5. P.K. Jain and V.P. Gupta, 'Lebesgue Measure and Integration', 2nd Edn.

COMPLEX ANALYSIS

Subject Code: MMAT1-207

L T P C
4 0 0 4

Contact Hrs.: 45

Learning objectives

To Study Cauchy integral formula, Local properties of analytic functions, General form of Cauchy's theorem and evaluation of definite integral and harmonic functions.

UNIT-1 (11 Hrs.)

Theory of Analytic Function: Function of complex variable, Continuity and differentiability, Analytic functions, Conjugate function, Harmonic function, Cauchy Riemann equation (Cartesian and polar form), Construction of analytic functions, Stereographic projection and the spherical representation of the extended complex plane.

UNIT-2 (10 Hrs.)

Complex Integration: Complex line integral, Cauchy's theorem, Cauchy's integral formula and it's generalized form, Cauchy's inequality, Poisson's integral formula, Morera's theorem, Liouville's theorem.

UNIT-3 (12 Hrs.)

Singularities: Power series, Taylor's theorem, Laurent's theorem, Zero's, Singularities, Residue at a pole and at infinity, Cauchy's residue theorem, Jordan's lemma, Integration round unit circle, Evaluation of improper integrals, Fundamental theorem of algebra and Rouché's theorem, Maximum modulus principle, Schwarz lemma.

UNIT-4 (12 Hrs)

Bilinear Transformation: Conformal transformation, Bilinear transformation, Critical points, Fixed points, Problems on cross-ratio and bilinear transformation.

Recommended Books

1. L.V. Ahlfors, 'Complex Analysis', 2nd Edn., Mc Graw-Hill International Student Edition, 1990.
2. E.T. Capson, An Introduction to the Theory of functions of a complex Variable, Oxford university press, 1995.
3. R. Churchill, J.W. Brown, 'Complex Variables and Applications', 6th Edn., New York, McGraw-Hill, 1996.
4. A.R. Shastri, 'An Introduction to Complex Analysis', Macmillan India Ltd., 2003.
5. S. Ponnusamy, 'Foundation of Complex Analysis', Narosa Book Distributors, 2011.

TENSORS AND DIFFERENTIAL GEOMETRY

Subject Code: MMAT1-208

L T P C
4 0 0 4

Contact Hrs.: 45

Learning objectives

The course aims to introduce vector algebra and vector calculus and introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surfaces are explored.

UNIT-1 (10 Hrs.)

Tensors Analysis: Systems of different orders, Summation convention, Kronecker symbols, Transformation of coordinates in S_n , Invariants, Covariant and contravariant vectors, Tensors of second order, Mixed tensors, Zero tensor, Tensor field, Algebra of tensors, Equality of tensors, Symmetric and skew – symmetric tensors, Outer multiplication, Contraction and inner multiplication, Quotient law of tensors, Reciprocal tensor of tensor, Relative tensor, Cross product of vectors.

UNIT-2 (10 Hrs.)

Riemannian Tensor and Christoffel Symbols: Riemannian space, Christoffel symbols and their properties, Covariant differentiation of tensors, Riemannian christoffel curvature tensor, Intrinsic differentiation.

UNIT-3 (13 Hrs.)

Introduction to Differential Geometry: A simple arc, Curves and their parametric representations, Arc length, Tangent, Principal normal, Bi- normal, Serret-Frenet formula, Curvature and torsion, Definition of a surface, Curves on a surface, Two fundamental forms, Helicoids, Metric, Direction coefficients, Families of curves, Isometric correspondence, Intrinsic properties.

UNIT-4 (12 Hrs.)

Geodesics: Geodesics, Differential equation of geodesics, Canonical geodesic equations, Normal property of geodesics, Existence theorems, Geodesics curvature, Gauss - Bonnet theorem, Gaussian curvature.

Recommended Books

1. S. Kobayashi and K. Nomizu, 'Foundations of Differential Geometry', Interscience Publishers, **1963**.
2. D.T. Struik, 'Lectures on Classical Differential Geometry', Addison - Wesley, Mass, **1950**.
3. J. L. Synge and Schild A., 'Tensor Calculus', Toronto, **1949**.
4. Ahsan Zafar, 'Tensors, Mathematics of Differential Geometry and Relativity', EEE, PHI, **2015**.
5. Weather Burn Ce, 'An introduction to Riemannian Geometry and the Tensor Calculus', CUP, **1938**.

NUMERICAL ANALYSIS

Subject Code: MMAT1-209

**L T P C
4 0 0 4**

Contact Hrs.: 45

Learning objectives

Construction and use of numerical systems, Influence of data representation and computer architectures on algorithms choice and development, use numerical methods for solving a problem, locate and use good mathematical software, get the accuracy you need from the computer, assess the reliability of the numerical results, and determine the effect of round off error or loss of significance.

UNIT-1 (10 Hrs.)

Introduction to Number System & Methods to Find Roots of Polynomials: Number system, Error in evaluating a function, Absolute, Relative, Truncation and round off errors, Floating point arithmetic, Bounds on error, Error propagation in computation. Algebraic and transcendental equations: Bisection method, Iteration method, Regula-falsi method, Secant method, Newton-Raphson method. Convergence of these methods, Methods for multiple roots: Newton Raphson method, Muller's method, Solution of Non-linear simultaneous equations: Fixed point iteration method, Seidel method and Newton Raphson method.

UNIT-2 (10 Hrs.)

Methods to Solve System of Linear Equations: System of linear algebraic equations: Gauss elimination method, Gauss – Jordan method, LU factorization method, Jacobi and Gauss-Seidal methods, Convergence of iteration methods, Round-off errors and refinement, ill-conditioning, Partitioning method, Inverse of matrices. Eigen values and Eigen vectors: Rayleigh power method, Given's method and House –Holder method.

UNIT-3 (13 Hrs.)

Interpolation, Numerical Differentiation and Integration: Interpolation: Finite differences, Newton Gregory forward and Backward formula, Lagrange's formulae with error, Divided differences, Newton's formulae, Central differences, Hermite interpolation. Numerical differentiation and integration: Differentiation at tabulated and non-tabulated points, Maximum and minimum values of tabulated function, Newton-Cotes Formulae-Trapezoidal, Simpson's, Boole's and Weddle's rules of integration, Romberg integration, Gaussian integration, Double integration by Trapezoidal and Simpson rules.

UNIT-4 (12 Hrs.)

Methods to Solve Ordinary Differential Equation: Ordinary differential equations: Taylor series and Picard's methods, Euler and modified Euler methods, Runge-Kutta methods, Predictor-Corrector methods: Adams-Bashforth and Milne methods, Error analysis and accuracy of these methods, Solution of simultaneous and higher order equations, Boundary value problems: Finite difference and shooting methods

Recommended Books

1. B. Bradie, 'A friendly introduction to Numerical Analysis', Pearson Prentice Hall, **2006**.
2. K.E. Atkinson, 'Introduction to Numerical Analysis', 2nd Edn., John Wiley, **1989**.
3. S.D. Conte and C. De Boor, 'Elementary Numerical Analysis: An Algorithmic Approach', 3rd Edn., Mc Graw Hill, New York, **1980**.
4. J.B. Scarborough, 'Numerical Mathematical Analysis', Oxford & IBH Publishing Co., **2001**.

NUMERICAL ANALYSIS LAB

Subject Code: MMAT1-210

**L T P C
0 0 2 1**

Contact Hrs.: 60

The following programs of following methods are to be practiced:

1. To find a real root of an algebraic/ transcendental equation by using Bisection method.
2. To find a real root of an algebraic/ transcendental equation by using Regula-Falsi method.
3. To find a real root of an algebraic/ transcendental equation by using Newton-Raphson method.
4. To find a real root of an algebraic/ transcendental equation by using Iteration method.
5. Implementation of Gauss- Elimination method to solve a system of linear algebraic equations.
6. Implementation of Gauss Jordan method to solve a system of linear algebraic equations.
7. Implementation of Gauss-Seidel method to solve a system of linear algebraic equations.
8. Implementation of Newton's Forward interpolation formula to find tabulated values.
9. Implementation of LaGrange's interpolation formula to find tabulated values.
10. Implementation of Newton's Divided Difference formula to find tabulated values.
11. To evaluate double integrals by using Trapezoidal and Simpson method.
12. To compute the solution of ordinary differential equations by using Euler's method.
13. To compute the solution of ordinary differential equations by using Runge -Kutta methods.
14. To find differential equation using Picards method.
15. To compute the solution of ordinary differential equations by using Milne-Simpson method.

Recommended Books

1. E. Balagurusamy, 'Object Oriented Programming with C++', Tata McGraw Hill, New Delhi, **1999**.

2. J.N. Sharma, 'Numerical Methods for Engineers and Scientists', 2nd Edn., Narosa Publishing House, New Delhi/ Alpha Science International Ltd. Oxford UK, 2007.
3. Conte and de Boor, 'Numerical Analysis', McGraw Hill, New York, 1990.
4. John H. Mathews, 'Numerical Methods for Mathematics, Science and Engineering', 2nd Edn., Prentice Hall, New Delhi, 2000.

TOPOLOGY

Subject Code: MMAT1-311

L T P C

Contact Hrs.-45

4 0 0 4

UNIT-I (12 Hrs.)

Cardinal numbers and their arithmetic, Cantor's theorem and the continuum hypothesis, Zorn's Lemma, Well-ordering theorem, Topological spaces: Definition and examples, Euclidean spaces as topological spaces, Basis for a given topology, Sub-basis, Equivalent basis, Elementary concepts: Closure, Interior, Frontier and Dense sets, Topologizing with pre-assigned elementary operations, Relativization, Subspaces.

UNIT-II (11 Hrs.)

Continuous functions, Characterization of continuity, Open maps and Closed maps, Homeomorphisms and embeddings, Cartesian product topology, Elementary concepts in product spaces, Continuity of maps in product spaces and slices in Cartesian products.

UNIT-III (11 Hrs.)

Connected spaces, Connected subspaces of the real line, Components and path components, Local connectedness, Compact spaces, Sequentially compact spaces, Heine-Borel theorem, Compact subspaces of the real line, Local-compactness and one-point compactification.

UNIT-IV (11 Hrs.)

Countability axioms: Separable spaces, Lindelof spaces, Separation axioms: T_0 , T_1 and T_2 spaces, Regular space, Completely regular and Normal spaces, Urysohn lemma, Urysohn metrization theorem, Tietze extension theorem, Tychonoff theorem.

Recommended Books:

1. J.R. Munkres, 'Topology- A First Course', Prentice Hall of India, New Delhi, 1975.
2. James Dugundji, 'Topology', Allyn and Bacon, Boston, 1966.
3. K.D. Joshi, 'Introduction to General Topology', Wiley Eastern, Delhi, 1986.
4. S. Kumaresan, 'Topology of Metric Spaces', 2nd Edn., Narosa Publishing House, New Delhi, 2015.

OPERATIONS RESEARCH

Subject Code: MMAT1-312

L T P C

Contact Hrs.-45

4 0 0 4

UNIT –I (13 Hrs.)

Introduction, Definition of operation research, Models in operation research. Formulation of linear programming problem (LPP): Graphical method, Basic Feasible Solution, optimal solution of LPP using Simplex, Big-M and Two phase methods, Exceptional cases in LPP i.e. Infeasible, unbounded, alternate and degenerate solutions, Extreme Points, Convex set, Convex linear combination.

UNIT –II (10 Hrs.)

Duality in linear programming: General Primal-Dual pair, Formulating a dual problem, duality theorems, Complementary slackness theorem, Duality & simplex method, Dual simplex method, Sensitivity analysis: change in right hand side of constraints, change in the objective function and coefficient matrix addition and deletion of constraint and variables.

UNIT III (11 Hrs.)

Transportation Problem: Initial basic Feasible solution, Balanced and unbalanced transportation problems, Optimal solutions of transportation problem using U-V /MODI methods,

Assignment problems: Mathematical formulation of assignment problem, typical assignment problem, the traveling salesman problem, Test for optimality, degeneracy, Project management with critical path method.

UNIT –IV (11 Hrs.)

Concept of convexity and concavity, Maxima and minima of convex functions, Single and multivariate unconstrained problems, constrained programming problems, Kuhn-Tucker conditions for constrained programming problems, Quadratic programming, Wolfe's method.

Recommended Books:

1. H.A. Taha, 'Operations Research-An Introduction', PHI, **2007**.
2. Kanti Swarup, P.K. Gupta and Man Mohan, 'Operations Research', 9th Edn., Sultan Chand & Sons, **2002**.
3. Friderick S. Hillier and Gerald J. Lieberman, 'Operations Research', 2nd Edn., Holden-Day Inc, USA, **1974**.
4. M.S. Bazaraa, H.D. Sherali, C.M. Shetty, 'Nonlinear Programming: Theory and Algorithms', John Wiley and Sons, **1993**.
5. S. Chandra, Jayadeva, A. Mehra, 'Numerical Optimization and Applications', Narosa Publishing House, **2013**.

MATHEMATICAL STATISTICS

Subject Code: MMAT1-313

**L T P C
4 0 0 4**

Contact Hrs.-45

Learning Objectives

To introduce the concept of random variables, distribution functions, various probability distributions, and concepts in testing of statistical hypotheses.

UNIT-I (12 Hrs.)

Concept of random variables and probability distributions: Two dimensional random variables, Joint, Marginal and conditional distributions, Independence of random variables, Expectation, Conditional expectation, Moments, Product moments, Probability generating functions, Moment generating function and its properties, Moment inequalities, Techebyshey's, inequalities, Characteristic function and its elementary properties.

UNIT-II (13 Hrs.)

Study of various discrete and continuous distributions: Binomial, Poison, Negative binomial, Geometric, Hyper geometric, Rectangular, Normal, Exponential, Beta and gamma distributions.

UNIT–III (8 Hrs.)

Concept of sampling distribution and its standard error, Derivation of sampling distributions of Chi-square, t and F (null case only) distribution of sample mean and sample variance and their in random sampling from a normal distribution.

UNIT–IV (12 Hrs.)

Elementary concepts in testing of statistical hypotheses, Tests of significance: tests based on normal distribution, Chi-square, t and F statistic and transformation of correlation coefficient, tests for regression coefficients and partial and multiple correlation coefficients.

Analysis of variance: One-way classification, two-way classification with one observation per cell.

Recommended Books:

1. R.V. Hogg & Craige : 'Introduction to Mathematical Statistics', 7th Edn., **2005**
2. J.W. Mckean, and A.T. Craig, P. Mukhopadhyay, 'Mathematical Statistics', **2000**
3. S.C. Gupta, V.K. Kapoor, 'Fundamental of Mathematical Statistics', 7th Edn., S. Chand, **1990**
4. Goon, Gupta and Das Gupta, 'Fundamentals of Statistics', 5th Edn., World Press, **1975**.
5. V.K. Rohatgi, 'Introduction to probability theory & Mathematical Statistics', **2009**.

MATHEMATICAL METHODS

Subject Code: MMAT1-314

**L T P C
4 0 0 4**

Contact Hrs.-45

Learning Objectives

To introduce the concept of linear integral equations and their solutions, Different types of variational problems.

UNIT-I (11 Hrs.)

Linear integral equations of first and second kind, Abel's problem, Relation between linear differential equation and Volterra's equation, Nonlinear and Singular equations, Solution by successive substitutions, Volterra's equation, Iterated and reciprocal functions, Volterra's solution of Fredholm's equation.

UNIT-II (11 Hrs.)

Fredholm's equation as limit of finite system of linear equations, Hadamard's theorem, Convergence proof, Fredholm's two fundamental relations, Fredholm's solution of integral equation when $D(\lambda) \neq 0$, Fredholm's solution of Dirichlet's problem and Neumann's problem, Lemmas on iterations of symmetric kernel, Schwarz's inequality and its applications.

UNIT-III (12 Hrs.)

Simple variational problems, Necessary condition for an extremum, Euler's equation, End point problem, Variational derivative, Invariance of Euler's equation, Fixed end point problem for n-unknown functions, Variational problem in parametric form, Functional depending on higher order derivatives.

UNIT-IV (11 Hrs.)

Euler-Lagrange equation, First integral of Euler-Lagrange equation, Geodesics, The Brachistochrone, Minimum surface of revolution, Brachistochrone from a given curve to a fixed point, Snell's law, Fermat's principle and calculus of variations.

Recommended Books:

1. F.B. Hildebrand, 'Method of Applied Mathematics', 1st Edn., Prentice Hall, India, **1952**.
2. I.M. Gelfand & S.V. Fomin, 'Calculus of Variations', 1st Edn., Prentice Hall, India, **1963**.
3. W.W. Lovitt, 'Linear Integral Equations', 2nd Edn., Dover, India, **2005**.
4. Robert Weinstock, 'Calculus of Variations', 1st Edn., Dover, **1975**.
5. M.D. Raisinghania, 'Integral Equations and Boundary Value Problems', 6th Edn., S. Chand, **2015**.

SEMINAR-I

Subject Code: MMAT1-315

**L T P C
0 0 2 1**

1. Each of these Courses of Seminar will consist of 100 marks (internal only) having L T P C as 0 0 2 1.

- In the beginning of the semester, a teacher will be allocated maximum 30 students. The latter will guide/teach them how to prepare/present 15 minutes Power Point Presentation for the Seminar.
- If there are more than 30 students in the class, then class will be divided into two groups having equal students. Each group may be allocated to a different teacher.
- Each student will be allotted a topic by the teacher at least one week in advance for the presentation. The topic for presentation may be from the syllabus or relevant to the syllabus of the programme.
- During the presentation being given by a student, all the other students of his/her group will attend the Seminar. The assessment/evaluation will be done by the teacher. However, Head of Department and other faculty members may also attend the Seminar, ask questions and give their suggestions.
- This is a turn wise continuous process during the semester and a student will give minimum two presentations in a Semester.
- For the evaluation, the following criteria will be adopted,
 - Attendance in Seminar: 25 Marks
 - Knowledge of Subject along with Q/A handling during the Seminar: 25 Marks
 - Presentation and Communication Skills: 25 Marks
 - Contents of the Presentation: 25 Marks.

FOURIER ANALYSIS & APPLICATIONS

Subject Code: MMAT1-356

L T P C
4 0 0 4

Contact Hrs.-45

UNIT-I (8 Hrs)

Fourier series: Fourier series, Theorems, Dirichlet's conditions, Fourier series for even and odd functions, Half range Fourier series, Other forms of Fourier series.

UNIT-II (10 Hrs)

Convergence and Uniform convergence of Fourier series, Cesaro and Abel Summability of Fourier series, The Dirichlet Kernel, The Fejer kernel, L^2 -theory: Orthogonality, Completeness.

UNIT-III (15 Hrs)

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, Finite Fourier sine and cosine transform, Inversion formula for sine transform,

Application of Fourier transforms: Simultaneous ordinary differential equations, second order Partial differential equations (Heat, Wave and Laplace)

UNIT-IV (12 Hrs)

The Discrete Fourier Transform (DFT): Definition, Theorems, Properties: Periodic and Linear Convolution by DFT, The Fast Fourier Transform, FFT convolutions, Two dimensional FFT Analysis.

Recommended Books:

- Javier Duoandikoetxe, 'Fourier Analysis', University Press, 2012.
- Gerald B. Folland, 'Fourier Analysis and Its Applications', American Mathematical Society, 2010.

3. N.K. Bary, 'A Treatise on Trigonometric Series' Vol. 1, Pergamon, 2014.
4. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publisher, 2014.
5. Duraisamy Sundararajan, 'The Discrete Fourier Transform: Theory, Algorithms and Applications', World Scientific Publishing Co. Pte Ltd., 2001.

ADVANCED NUMERICAL ANALYSIS

Subject Code: MMAT1-357

**L T P C
4 0 0 4**

Contact Hrs.-45

Unit-I (12 Hrs.)

Iterative Methods for Linear Systems: The classical iterative methods (Jacobi, Gauss-seidel, Muller method and successive over relaxation (SOR) methods), Krylov subspace methods, Conjugate gradient, Bi-conjugate-gradient (BiCG), BiCG stability methods, Preconditioning techniques, parallel implementations.

Unit-II (11 Hrs.)

Finite Difference Methods: Explicit and implicit schemes, consistency, stability and convergence, Lax equivalence theorem, Numerical solutions to elliptic, parabolic and hyperbolic partial differential equations.

Unit-III (11 Hrs.)

Approximate Methods of Solution: Rayleigh-Ritz, collocation and Galerkin methods, properties of Galerkin approximations, Petrov-Galerkin method, Generalized Galerkin method, Spline (Quadratic, Cubic) Theory.

Unit-IV (11 Hrs.)

Finite Element Method (FEM): FEM for second order problems, one and two dimensional problems, the finite elements (elements with a triangular mesh and a rectangular mesh and three dimensional finite elements), Fourth-order problems, Hermite families of elements, iso-parametric elements, numerical integration.

Recommended Books:

1. M.K. Jain, S.R.K. Iyengar, and R.K. Jain, 'Numerical Methods for Scientific and Engineering Computation', 5th Edn., New Age international, 2008.
2. Joe D. Hoffman, 'Numerical methods for Engineers and Scientists', McGrow-Hill, 1993.
3. K.E Atkinson, 'An Introduction to Numerical Analysis', 2nd Edn., John Wiley, 2004.
4. R.S. Gupta, 'Elements of Numerical Analysis', McMillan India, 2009
5. P. Seshu, 'Textbook of Finite Element Analysis', Prentice Hall India, 2003.
- 6.

NUMBER THEORY

Subject Code: MMAT1-416

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT- I (15 Hrs.)

Arithmetical functions: Mobius function, Euler's totient function, Mangoldt function, Liouville's function, the divisor function, Relation connecting ϕ and μ Product formula for $\phi(n)$, Dirichlet product of arithmetical functions, Dirichlet inverse and Mobius inversion formula, Multiplicative function, Dirichlet multiplication, the inverse of a completely multiplicative function, Generalized convolutions.

UNIT -II (12 Hrs.)

Averages of arithmetical function: The Big oh notation, Asymptotic equality of functions, Euler's summation formula, Elementary asymptotic formulas, Average order of $d(n)$, $\phi(n)$, $\sigma_a(n)$, $\mu(n)$, $\Lambda(n)$, The partial sums of a Dirichlet product, application to $\mu(n)$ and $\Lambda(n)$, Legendre's identity.

UNIT- III (10 Hrs.)

Some elementary theorems on the Distribution of prime numbers Chebyshev's functions $\varphi(X)$ & $\theta(X)$, Relation Connecting $\theta(X)$ and $\pi(X)$, Abel's identity, equivalent forms of prime number theorem, Inequalities for $\pi(n)$ and P_n Shapiro's Tauberian theorem, Application of Shapiro's theorem, Asymptotic formula for partial sums $\sum_{p \leq x} \left(\frac{1}{p}\right)$.

UNIT- IV (8 Hrs.)

Elementary properties of groups, characters of finite abelian groups, The character group, Orthogonality relation for characters, Dirichlet character, Dirichlet theorem for prime of the form $4n-1$ and $4n+1$, Dirichlet theorem in primes on Arithmetical progression, Distribution of primes in arithmetical progression.

Recommended Books:

1. T.M. Apostol, 'Introduction to Analytic Number Theory', Springer.
2. Paul T. Bateman, 'Analytic Number Theory', World scientific.
3. 3.Murty M. Ram, 'Problems in Analytic Number Theory', Springer.
4. H. Rosen Kenneth, 'Elementary Number Theory', 6th Edn.
5. G.H. Hardy, 'An Introduction to the Theory of Numbers', 6th Edn.

FUNCTIONAL ANALYSIS

Subject Code: MMAT1-417

L T P C

Contact Hrs.-45

4 0 0 4

Unit-I (12 Hrs.)

Normed linear spaces, Banach spaces, Properties of normed spaces, Finite dimensional normed spaces and subspaces, Equivalent norms, Linear operator, Bounded and continuous linear operators, Linear functionals, Normed spaces of operators.

Unit-II (11 Hrs.)

Uniform boundedness theorem, Open mapping theorem, Closed graph theorem, Projections on Banach spaces, Projection theorem.

Unit-III (11 Hrs.)

Conjugate spaces, Reflexivity, Hahn-Banach theorems for real/complex vector spaces and normed spaces, Application to bounded linear functional on $C[a,b]$, Hilbert spaces.

Unit-IV (11 Hrs.)

Inner product spaces, Properties of inner product spaces, Orthogonal complements, Orthonormal sets, Riesz representation thm. Bessel's inequality, Hilbert – adjoint operator, Self-adjoint, Unitary and normal operators.

Recommended Books:

1. G.F. Simmons, 'Introduction to topology and modern Analysis', **2008**.
2. Walter Rudin, 'Functional Analysis: International Series in Pure and Applied Mathematics', McGraw-Hill, inc., **1991**.
3. Erwin Kreyszig, 'Introductory Functional Analysis with Applications', John Wiley and Sons(Asia), Pvt. Ltd., **2006**.
4. George Bachman and Lawrence Narici, 'Functional Analysis', Dover, **2000**.
5. John B. Conway, 'A course in Functional Analysis', second Edn., Springer-Verlag, **2006**.

PARTIAL DIFFERENTIAL EQUATIONS**Subject Code: MMAT1-418****L T P C****Contact Hrs.-45****4 0 0 4****UNIT-I (10 Hrs.)**

Non-linear PDE of first order: Complete Integrals, Envelopes, Characteristics, Hamilton-Jacobi equations, Hamilton's ODE, Legendre transform, Hopf – Lax formula, Cauchy's method of characteristic; Compatible system of first order PDE, Charpit's method of solution, Solutions satisfying given conditions, Jacobi's method of solution.

UNIT-II (10 Hrs.)

Second Order PDE: Partial Differential equations of 2nd and Higher order, Classification, Examples of PDE, Solutions of Elliptic, Hyperbolic and Parabolic equations, Canonical Form, Initial and Boundary Value Problems, Lagrange-Green's identity and uniqueness by energy methods, Stability theory, energy conservation and dispersion.

UNIT-III (10 Hrs.)

Method of Solution: Separation of variables in a PDE, Laplace equation: mean value property, Weak and strong maximum principle, Green's function, Poisson's formula, Dirichlet's principle, Existence of solution using Perron's method (without proof).

UNIT-IV (10 Hrs.)

Heat equation: Initial value problem, Fundamental solution, Weak and strong maximum principle and uniqueness results, Wave equation: uniqueness, D'Alembert's method, method of spherical means and Duhamel's principle.

Recommended Books:

1. I.N. Snedon, 'Elements of Partial Differential Equation,' 3rd Edn., McGraw Hill Book Company, **1998**.
2. E.T. Copson, 'Partial Differential Equations', 2nd Edn., Cambridge University Press, **1995**.
3. Walter A. Strauss, 'Partial Differential Equations-An Introduction', 2nd Edn., **2007**.
4. Robert C. McOwen, 'Partial Differential Equations methods and application', 2nd Edn., Pearson Education Inc., **2003**
5. Sankara Rao, 'Introduction to Partial Differential Equations', PHI, **2010**.

SEMINAR-II**Subject Code: MMAT1-419****L T P C****0 0 2 1**

1. Each of these Courses of Seminar will consist of 100 marks (internal only) having L T P C as 0 0 2 1.
2. In the beginning of the semester, a teacher will be allocated maximum 30 students. The latter will guide/teach them how to prepare/present 15 minutes Power Point Presentation for the Seminar.
3. If there are more than 30 students in the class, then class will be divided into two groups having equal students. Each group may be allocated to a different teacher.
4. Each student will be allotted a topic by the teacher at least one week in advance for the presentation. The topic for presentation may be from the syllabus or relevant to the syllabus of the programme.

5. During the presentation being given by a student, all the other students of his/her group will attend the Seminar. The assessment/evaluation will be done by the teacher. However, Head of Department and other faculty members may also attend the Seminar, ask questions and give their suggestions.
6. This is a turn wise continuous process during the semester and a student will give minimum two presentations in a Semester.
7. For the evaluation, the following criteria will be adopted,
 - (a) Attendance in Seminar: 25 Marks
 - (b) Knowledge of Subject along with Q/A handling during the Seminar: 25 Marks
 - (c) Presentation and Communication Skills: 25 Marks
 - (d) Contents of the Presentation: 25 Marks.

ADVANCE OPERATION RESEARCH

Subject Code: MMAT1-459

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT-I (12 Hrs.)

Queueing problems: Characteristics of queueing system, Distributions in queueing systems, Poisson arrivals and exponential service times, the M/M/I, M/M/S queueing systems, Steady state solutions and their measure of effectiveness.

UNIT-II (12 Hrs.)

Inventory problems, definition, the nature and structure of inventory system, Deterministic models and their solution, multi item inventory problems, stochastic inventory models.

UNIT-I (11 Hrs.)

Replacement and maintenance problems: replacement of capital equipment, discounting cost, replacement in anticipation of failure, preventive maintenance, the general renewal process.

UNIT-I (10 Hrs.)

Network Analysis: Introduction to Networks, Minimal spanning tree problem, Shortest path problem: Dijkstra's algorithm, Floyd's algorithm, Maximum flow problem, Project management: Critical path method, Critical path computations, Optimal scheduling by CPM, Review techniques (PERT).

Recommended Books

1. S.D. Sharma, 'Operation research', Kedar Nath and Co., Meerut.
2. Kanti Swarup, P.K. Gupta and Man Mohan, 'Operations Research', 9th Edn., Sultan Chand & Sons, 2002.
3. Friderick S. Hillier and Gerald J. Lieberman, 'Operations Research', 2nd Edn., Holden-Day Inc., USA, 1974.
4. M.S. Bazaraa, H.D. Sherali, C.M. Shetty, 'Nonlinear Programming: Theory and Algorithms', John Wiley and Sons, 1993.
5. S. Chandra, Jayadeva, A. Mehra, 'Numerical Optimization and Applications', Narosa Publishing House, 2013.

ADVANCE COMPLEX ANALYSIS

Subject Code: MMAT1-459

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT-I (11 Hrs.)

Fundamental theorems connected with zeros of analytic functions, the argument(counting) principle, Rouche's theorem, Fundamental theorem of algebra, Morera's theorem, Normal limits of analytic functions, Hurwitz's theorem, Normal limits of univalent functions, Open mapping theorem, Inverse function theorem.

UNIT-II (10 Hrs.)

Implicit function theorem, Analyticity of the explicit function, Riemann surfaces for multivalued functions, Direct and indirect analytic continuation, Lipschitz nature of the radius of convergence, Analytic continuation along paths via power series.

UNIT-III (12 Hrs.)

Monodromy theorem (first version and second version), The Mean value property, Harmonic functions, Maximum principle (with proof), Schwarz's lemma (with proof), Differential or infinitesimal schwarz's lemma.

UNIT-IV (12 Hrs.)

Pick's lemma, Hyperbolic geometry on the unit disc, Arzela-ascoli theorem (with proof), Montel's theorem (with proof), Riemann mapping theorem (with proof).

Recommended Books

1. L.V. Ahlfors, 'Complex Analysis', 2nd Edn., Mc Graw-Hill International Student Edn., **1990**.
2. E.T. Capson, 'An Introduction to the Theory of functions of a Complex Variable', Oxford University Press, **1995**.
3. Theodore Gamelin, 'Complex Analysis (UTM)', Springer, **2003**.
4. S. Ponnusamy & Herb Silverman, 'Complex Variables with Applications', Birkhaeuser, Boston, **2006**.

FRACTIONAL CALCULAS

Subject Code: MMAT1-461

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT-I (12 Hrs.)

Riemann liouville fractional integrals: Definition, some examples, law of exponents, Fractional integrals of some functions namely binomial function, Exponential, Hyperbolic and trigonometric functions, Bessel's functions, Hyper-geometric function and the fox's H-function, Dirichlet's formula.

UNIT-II (10 Hrs.)

Derivatives of the fractional integral and the fractional integral of derivatives, Laplace transform of the fractional integral, Leibniz's formula for fractional integrals, Derivatives, Leibniz's formula of fractional derivatives.

UNIT-III (10 Hrs.)

The Weyl fractional calculus – Definition of weyl fractional integral weyl Fractional derivatives, Leibniz formula for Weyl fractional integral and simple applications.

UNIT-IV (13 Hrs.)

Fractional differential equations: Introduction, Laplace transform, Linearly independent solutions, solutions of the homogeneous equations, Solution of the non-homogeneous

fractional Differential equations, Reduction of fractional differential equations to ordinary differential equations. Semi differential equations.

Recommended Books:

1. K.B. Oldham & J. Spanier, 'The Fractional Calculus: Theory and Applications of Differentiation and Integration to Arbitrary Order', Dover Publications Inc., **2006**.
2. 2.K.S. Miller & B. Ross, 'An Introduction to the Fractional Calculus and Fractional Differential Equations Hardcover', Wiley-Blackwell, **1993**.
3. 3.Sameko, Kilbas, and Mariche, 'Fractional integrals and Derivatives theory and applications', Gorden and Branch science publishers.

GRAPH THEORY

Subject Code: MMAT1-463

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT-I (12 Hrs.)

Fundamental concepts: Graph- Definitions an examples, graphs as models, Matrices and isomorphism, paths, Connected graphs, Bipartite graphs, Externality vertex degree, Pigeonhole principal, Turan's theorem, Degree sequences, Graphic sequences, Degree and digraphs

UNIT-II (10 Hrs.)

Tree and distances: Properties of tree, Distance in graphs, Stronger results, Disjoint spanning trees, Shortest paths, Tress in computer science, Eulerian circuits.

UNIT-III (12 Hrs.)

Matching and Factors: Matching in bipartite graphs, Maximum matching, Hall's matching conditions, mismatching in bipartite graphs, sets, applications and algorithms, maximum bipartite matching, weighted bipartite matching, in general graphs, Tutte's 1- factor theorem, f- factors of graphs.

UNIT-IV (11 Hrs.)

Connectivity and Paths: Cuts connectivity, Edge-connectivity, Blocks, 2-connected graphs, Connectivity of digraphs, k connected and k-edge connected graphs, Applications of merger's theorem, Network flow problems, Maximum network flow, Integral flows.

Edges and cycles: Line graph and edge coloring, Hamiltonian cycles: Necessary and sufficient conditions.

Recommended Books:

1. Douglas B. West, 'Introduction to Graph Theory', Prentice-Hall, New Delhi, **1999**.
2. F. Harary, 'Graph Theory', Nsrosa, New Delhi.
3. Narsing Deo, 'Graph Theory', Prentice Hall, India.

SAMPLING TECHNIQUES AND ESTIMATION THEORY

Subject Code: MMAT1-463

**L T P C
4 0 0 4**

Contact Hrs.-45

UNIT-I (10 Hrs.)

Fundamentals of sampling, Simple random sampling, Stratified sampling, Ratio method of estimation, Regression method of estimation, Varying probability sampling

UNIT-II (10 Hrs.)

Double sampling, Two stage sampling, Systematic sampling, Cluster sampling, Sampling in successive occasion, Non-sampling errors

UNIT-III (13 Hrs.)

Theory of estimation: Different types of estimators, Maximum likelyhood estimator and their properties, Other methods of estimation, Interval estimation, Sampling theory; Chi-square distribution, Fisher's theorem, Cochran theorem, distributing of non-control chi-square Testing of Homogeneity with the help of chi-square Bartlett's tests of homogeneity of variance and correlation coefficients, Behrens Fisher test for comparing the means of two normal populations,

UNIT-IV (12 Hrs.)

Distribution of non-central F. Student Newman Rules Test, Tests for linearity of regression, Multiple regression, Testing of hypothesis, Curvilinear regression Newman-pearsons test hypothesis, Multivariate analysis characteristic function, Distribution of quadratic forms, Distribution correlation coefficient in the non-null case, Distribution of partial correlation coefficient, Distribution of multiple correlation in the null case and non-null case, Distribution of Hotelling's T^2 and its uses, Distribution of Mohnopis D^2 .

Recommended Books:

1. Z. Govindrajalu, 'Elements of sampling theory and methods', Prentice Hall, 1999.
2. P. Mukhopadhyaya, 'Sampling', Prentice Hall of India, 1998.
3. W.G. Cochran, 'Sampling Techniques', Wiley.
4. W. Feller, 'Mathematical statistics', vol 1 and 2.
5. Kendall, M.G., 'The advance theory of statistics'.

FUZZY SET THEORY AND ITS APPLICATIONS

Subject Code: MMAT1-464

L T P C
4 0 0 4

Contact Hrs.-45

Learning Objectives:

To introduce the concept of fuzzy sets, operations on fuzzy sets, their relations and logic of fuzzy sets.

UNIT-I (12 Hrs.)

Classical and Fuzzy Sets: Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations, Membership Function, α -cuts, Properties of α -cuts, Decomposition Theorems, Extension Principle.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Operations on $[0,1]$ – Fuzzy negation, triangular norms, Combinations of operations, Aggregation Operations.

UNIT-II (11 Hrs.)

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals and Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Relations: Crisp and Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility and Ordering Relations, Morphisms, Fuzzy Relation Equations.

UNIT-III (11 Hrs.)

Possibility Theory: Fuzzy Measures, Evidence Theory, Necessity and Belief Measures, Probability Measures vs. Possibility Measures.

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges, Fuzzy If Then Rule Base, Inference Engine, Takagi-Sugeno Fuzzy Systems, Function Approximation

UNIT-IV (11 Hrs.)

Uncertainty based Information: Information and Uncertainty, Non specificity of Fuzzy and Crisp sets, Fuzziness of Fuzzy Sets. Applications of Fuzzy Logic.

Recommended Books:

1. G.J. Klir and B. Yuan, 'Fuzzy sets and Fuzzy logic: Theory and Applications', PHI, **1995**.
2. H.J. Zimmermann, 'Fuzzy Set Theory and its Applications', Allied Publishers, **1991**.
3. Kevin M. Passino and Stephen Yurkovich, 'Fuzzy Control', Addison Wesley Longman, **1998**.
4. Michal Baczynski and Balasubramaniam Jayaram, 'Fuzzy Implications', Springer Verlag, Heidelberg.

MRSPTU

MRSPTU MCA SYLLABUS 2016 BATCH ONWARDS

MASTERS IN COMPUTER APPLICATIONS

Total Contact Hours = 28

Total Marks = 800

Total Credits = 23

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-101	Introduction to Information Technology	3	1	-	40	60	100	4
MCAP1-102	Problem Solving and Programming using C	3	1	-	40	60	100	4
MCAP1-103	Digital Electronics	3	1	-	40	60	100	4
MCAP1-104	Mathematical Foundations of Computer Science	3	1	-	40	60	100	4
MHUM0-104	Business Communication - I	2	-	2	40	60	100	3
MCAP1-105	Software Lab-I (Introduction to Information Technology based on MCAP1-101)	-	-	2	60	40	100	1
MCAP1-106	Software Lab-II (Problem Solving and Programming using C based on MCAP1-102)	-	-	4	60	40	100	2
MHUM0-102	Business Communication Lab – I	-	-	2	60	40	100	1
Total	Theory = 5 Labs = 4	14	4	10	380	420	800	23

Total Contact Hours = 26

Total Marks = 700

Total Credits = 21

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-207	Computer Architecture & Organization	3	1	-	40	60	100	4
MCAP1-208	Relational Database Management System	3	1	-	40	60	100	4
MCAP1-209	Data and File Structures	3	1	-	40	60	100	4
MCAP1-210	Software Lab-III(Relational Database Management System based on MCAP1-208)	-	-	4	60	40	100	2
MCAP1-211	Software Lab-IV(Data and File Structures based on MCAP1-209)	-	-	4	60	40	100	2
MHUM0 - 103	Soft Skills - I	-	-	2	60	40	100	1
Departmental Elective – I								
MCAP1-256	Software Engineering and Project Management	3	1	-	40	60	100	4
MCAP1-257	System Analysis and Design							
MCAP1-258	Software Design Methodologies							
Total	Theory = 4 Labs = 3	12	4	10	340	360	700	21

MRSPTU MCA SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 26

Total Marks = 800

Total Credits = 22

SEMESTER 3 rd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-312	Computer Networks	3	1	-	40	60	100	4
MCAP1-313	Operating Systems	3	1	-	40	60	100	4
MCAP1-314	Object Oriented Programming using C++	3	-	-	40	60	100	3
MCAP1-315	Software Lab-V (Based on LINUX)	-	-	2	60	40	100	1
MCAP1-316	Software Lab-VI (Object Oriented Programming using C++ based on MCAP1-314)	-	-	4	60	40	100	2
MHUM0 - 105	Soft Skills - II	-	-	2	60	40	100	1
Departmental Elective – II (Select any one)								
MCAP1-359	Embedded Systems	3	1	-	40	60	100	4
MCAP1-360	Multimedia Technologies							
MCAP1-361	Parallel and Distributed Computing							
Open Elective - I (Select any one)		3	-	-	40	60	100	3
Total	Theory = 5 Labs = 3	15	3	8	380	420	800	22

Total Contact Hours = 30

Total Marks = 800

Total Credits = 24

SEMESTER 4 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-417	Computer Graphics	3	1	-	40	60	100	4
MCAP1-418	Programming in Java	3	1	-	40	60	100	4
MCAP1-419	Internet Concepts & Web Technologies	3	1	-	40	60	100	4
MCAP1-420	Software Lab-VII (Computer Graphics based on MCAP1-417)	-	-	4	60	40	100	2
MCAP1-421	Software Lab-VIII (Programming in Java based on MCAP1- 418)	-	-	4	60	40	100	2
MCAP1-422	Software Lab-IX (Internet Concepts & Web Technologies based on MCAP1- 419)	-	-	4	60	40	100	2
Departmental Elective – III (Select any one)								
MCAP1-462	Data Warehousing and Data Mining	3	-	-	40	60	100	3
MCAP1-463	Business Intelligence & Digital Marketing							
MCAP1-464	Software Testing and Quality Assurance							
Open Elective - II (Select any one)		3	-	-	40	60	100	3
Total	Theory = 5 Labs = 3	15	3	12	380	420	800	24

MRSPTU MCA SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 31

Total Marks = 800

Total Credits = 26

SEMESTER 5 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-523	System Programming	3	-	-	40	60	100	3
MCAP1-524	Artificial Intelligence	3	1	-	40	60	100	4
MCAP1-525	Project(Planning & Design)	-	-	6	60	40	100	3
MCAP1-526	Theory of Computation	3	1	-	40	60	100	4
MCAP1-527	Information and Network Security	3	-	-	40	60	100	3
Departmental Elective – IV (Select any one)								
MCAP1-565	LAMP Technologies	3	1	-	40	60	100	4
MCAP1-566	Database Administration							
MCAP1-567	Network Administration							
MCAP1-568	Software Lab-X(LAMP Technologies based on MCAP1-565)	-	-	4	60	40	100	2
MCAP1-569	Software Lab-XI(Database Administration based on MCAP1-566)							
MCAP1-570	Software Lab-XII (Network Administration based on MCAP1-567)							
Open Elective - III (Select any one)		3	-	-	40	60	100	3
Total	Theory = 4 Labs = 2	18	3	10	360	440	800	26

**Note: Students have to select a combination of subjects in Departmental Elective –I as below:*

- i) MCAP1-565 and MCAP1-568
- ii) MCAP1-566 and MCAP1-569
- iii) MCAP1-567 and MCAP1-570

MRSPTU MCA SYLLABUS 2016 BATCH ONWARDS

Total Contact Hours = 26

Total Marks = 500

Total Credits = 19

SEMESTER 6 th		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MCAP1-628	Current Trends and Technologies	3	1	-	40	60	100	4
MCAP1-629	Project (Implementation & Execution)	-	-	10	60	40	100	5
Departmental Elective – V (Select any one)								
MCAP1-671	Big Data	3	1	-	40	60	100	4
MCAP1-672	Cloud Computing							
MCAP1-673	Dot Net Framework							
MCAP1-674	Mobile Computing & Android							
MCAP1-675	Soft Computing							
MCAP1-676	Software Lab-XIII (Big Data based on MCAP1-671)	-	-	4	60	40	100	2
MCAP1-677	Software Lab-XIV (Cloud Computing based on MCAP1-672)							
MCAP1-678	Software Lab-XV (Dot Net Framework based on MCAP1-673)							
MCAP1-679	Software Lab-XVI(Mobile Computing & Android based on MCAP1-674)							
MCAP1-680	Software Lab-XVII(Soft Computing based on MCAP1-675)							
Open Elective - IV (Select any one)		3	1	-	40	60	100	4
Total	Theory = 3 Labs = 2	9	3	14	240	260	500	19

Note: Students have to select a combination of subjects in Departmental Elective -II as below:

- i) MCAP1-671 and MCAP1-676
- ii) MCAP1-672 and MCAP1-677
- iii) MCAP1-673 and MCAP1-678
- iv) MCAP1-674 and MCAP1-679
- v) MCAP1-675 and MCAP1-680

Overall

Semester	Marks	Credits
1 st	800	23
2 nd	700	21
3 rd	800	22
4 th	800	24
5 th	800	26
6 th	500	19
Total	4400	135

INTRODUCTION TO INFORMATION TECHNOLOGY

Subject Code: MCAP1-101

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objectives

1. This course will enable the student to gain and understanding of the core concepts and technologies which constitute Information Technology.
2. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology and Office Tools.

UNIT-I (10 Hrs)

Computer Fundamentals - Block structure of a computer, Characteristics of computers, Problem solving with computers, Generations of computers, Classification of computers on the basis of capacity, Purpose and Generation, Input devices, Output devices, Memories.

Number System - Bit, Byte, Binary, Decimal, Hexadecimal and Octal systems, Conversion from one system to the other.

Representation of Information - Integer and Floating point representation, Complement schemes, and Binary codes.

UNIT-II (11 Hrs.)

Operating system - Batch, Multi-programming, Time sharing, Network operating system, On-line and Real time operating system, Distributed operating system, Multi-processor, Multi-tasking

Windows - Installing windows with set-up, Starting and Quitting windows, Basic elements of windows, working with menus dialogue boxes, Window applications, Program manager, File manager, Print manager, Control panel, Write, Paint brush, Accessories including Calculator, Calendar, Clock, Card file, Note pad, Recorder etc.

UNIT- III (12 Hrs.)

Word Processing - Editing features, formatting features, Saving, Printing, Table handling, Page settings, Spell-checking, Macros, Mail-merge, and Equation editors.

Spreadsheet - Workbook, Worksheets, Data types, Operators, Cell formats, Freeze panes, Editing Features, formatting features, creating formulas, Using formulas, Cell References.

Presentation Graphics Software - Templates, Views, formatting slide, Slides with graphs, Animation, using special features, presenting slide shows.

UNIT- IV (12 Hrs.)

Computer Network and Communication - Network types, Network topologies, Network Communication devices, Physical communication media.

Internet and its Applications - E-mail, TELNET, FTP, World Wide Web, Internet chatting, Intranet, Extranet, Gopher, Mosaic, WAIS.

Security management tools - PC tools, Norton Utilities, Virus, Worms, Threats, Virus detection, Prevention and Cure utilities, Firewalls, Proxy servers.

Recommended Books

1. V. Rajaraman, 'Fundamentals of Computers', 3rd Edn., PHI.
2. Satish Jain, 'Information Technology Concepts', 4th Edn., BPB Publications.
3. P.K Sinha, 'Computer Fundamentals', 5th Edn., BPB Publications.
4. Turban, Mclean and Wetherbe, 'Information Technology for Management', 3rd Edn., John Wiley & Sons.
5. G. Courter, 'Mastering MS Office 2000 Professional', 4th Edn., BPB Publication.
6. Steve Sagman, 'MS- Office 2000 for Windows', 5th Edn., Addison Wesley.

Learning Outcomes

After completion of this course, the students would be able to:

1. Identify and understand the working of key components of a computer system and representation of numbers, alphabets and other characters.
2. Identify and understand the working of different operating systems and to install windows.
3. Become proficient in using the features of word processing in Word processing.
4. Students will be able to create technical and complex spreadsheets for data analysis using spreadsheet tools.
5. Students will become proficient to develop effective and professional business presentations using Power Point tools.
6. The students will learn about types of Communication networks, use of internet applications and security within the context of Information Technology.

PROBLEM SOLVING AND PROGRAMMING USING C

Subject Code: MCAPI-102

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objective

This course is designed to provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable, and portable code. The nature of C language is emphasized in the wide variety of examples and applications.

UNIT-I (11 Hrs.)

Programming Process - Problem definition, Algorithms, Flow Charts, C Character set, Identifiers and Keywords, Constant and Variables, Data types, Declarations, Statements and Symbolic Constants.

Operators and Expressions - Arithmetic, Relational, Logical, Unary operators.

Bitwise Operators - AND, OR, Complement precedence and Associating bitwise shift operators

Input-Output - Standard, Console and String functions.

Coding Standards -Inline documentation, Indentation of code

Naming conventions -Variables, Global variables, Functions, Structures

Debugging - Tracking defects, Debugging by code inspection, Debugging by logs, Debugging using step-by-step execution, using break points.

UNIT-II (13 Hrs.)

Control Statements - Branching, Looping using for, While and Do-while Statements, Nested control structures, Switch, Break, Continue statements.

Arrays - Definition, Access of Elements, Initialization, Multidimensional arrays, Character arrays.

Pointers - Address and Dereferencing Operators, Declaration, Assignment, Initialization, Arithmetic, Precedence of address and Dereferencing operators, Pointer comparison, Conversion, Pointer Arrays and Pointers to Pointers. Pointers and Strings, Void Pointers, Dynamic Memory Management

UNIT-III (10 Hrs.)

Functions - Definition, Call, Prototypes, Formal and Actual Parameters, Passing Arguments to Functions, call by Value and Call by Address, Passing Array Elements as Arguments and Passing arrays as arguments, Recursion, Recursion v/s Iteration.

Program Structure - Storage Classes, Automatic, External and Static variables.

Pre-processor Directives - #include, #define, #undef, #if, #ifdef, #ifndef, #else, #elif, #endif, #error, #pragma, Predefine macros.

UNIT- IV (11 Hrs.)

Structure - Variable, Initialization, accessing members, Assignment, Size of structure, Scope of a structure, Nested structures, Pointer to structures, Scope of a structure, Type definition, Structure as function arguments, Arrays of structures, Structures containing arrays, Self-referential structures, Bit fields, Union, Enumerated data type.

File Processing - Opening and Closing, Data files, Creation, Processing & Unformatted data files, Random file access, Command line arguments.

Recommended Books

1. Shubhnanandan Jamwal, 'Programming in C', 3rd Edn., Pearsons.
2. E. Balagurusamy, 'Programming in ANSI C', 3rd Edn., Tata McGraw Hill.
3. Brian Kernighan and Dennis Ritchie, 'C Programming Language', 2nd Edn., PHI.
4. Byron Gottfried, 'Programming with C', 2nd Edn., Tata McGraw Hill.
5. ISRD Group, 'Programming and Problem Solving Using C', 3rd Edn., Tata McGraw Hill.
6. Yashvant P. Kanetkar, 'Let us C', 4th Edn., BPB Publications, New Delhi.
7. R.S. Salaria, 'Application Programming in C', 2nd Edn., Khanna Book Publishing.

Learning Outcomes

After completion of this course, the students would be able to:

1. Understand the basic terminology used in computer programming. Students will be able to write, compile and debug programs in C language and use different data types in a computer program.
2. Design programs involving decision structures, loops, breaking control statements.
3. Design programs using arrays and understand the dynamics of memory by the use of pointers.
4. Design programs involving functions and learn to understand and analyse the use of storage classes and pre-processor directives.
5. Provide students with the means of writing efficient code using structures and learn file handling.

DIGITAL ELECTRONICS

Subject Code: MCAP1-103

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objective

Digital circuits which are the basic building blocks of a computer are introduced in this module to let the students know what activities it does behind the computing environment. This course portrays excellent ideas of the logic gates available and data processing to make students understand the concept better with the analogue and digital signals while computing.

UNIT-I (11 Hrs.)

Number System - Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Signed and Unsigned number, Conversion from One Number System to another. Arithmetic Operation without Changing the Base, Floating Point Representation

Binary Codes - Weighted Binary Codes, Non Weighted Codes, Reflective Codes, Sequential Codes, Alphanumeric Codes, BCD Code, Code Conversions, BCD Arithmetic

Logic Gates - Introduction to Logic gates, Universal Gates, Logic Gates Applications.

UNIT-II (13 Hrs.)

Boolean Algebra - Introduction, Boolean Laws-Commutative Law, Associative Law, Distributive Law, AND Laws, OR Laws, Inversion Laws, Principle of Duality, Duality Theorem, De-Morgan's Theorem. Simplification of Boolean Expression using Boolean

algebra, Sum of Products (SOP) & Product of Sums (POS) Forms, Realization of Boolean Expression using Gates, K-Maps, Simplification of Boolean Expression using K-Maps

Combinational Logic Circuits - Half Adder & Half Subtractor, Full Adder & Full Subtractor, Parallel Binary Adder, Binary Adder/Subtractor, BCD Adder, BCD Subtractor. Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer, Encoders & Decoder

UNIT-III (11 Hrs.)

Sequential Logic Circuits - Latch, Flip Flops- R-S Flip-Flop, J-K Flip-Flop, Master-Slave J-K Flip-Flop, Race Condition, Removing Race Condition, D Flip-Flop, T Flip-Flop, Applications of Flip-Flops, Registers.

Counters - Design of Asynchronous Counters, Design of Synchronous Counters

Logic Families - RTL, DCTL, DTL, TTL, ECL and its various Types, Comparison of Logic Families.

UNIT-IV (10 Hrs.)

Memory Devices - Classification of memories, RAM organization, Write operation, Read operation, Memory cycle. Static RAM Cell-Bipolar, RAM cell, MOSFET RAM cell, Dynamic RAM cell. ROM Organization, PROM, EPROM, EEPROM, Field Programmable Gate Arrays (FPGA).

Signal Conversions - Analog & Digital signals, A/D and D/A conversion.

VLSI Design - Introduction, Process & Applications.

Recommended Books

1. T.C. Bartee, 'Digital and Electronic Circuits', 3rd Edn., McGraw Hill.
2. R.P. Jain, 'Modern Digital Electronics', 4th Edn., Tata McGraw Hill.
3. M. Morris Mano, 'Digital Logic and Computer Design', 4th Edn., Pearson.
4. William H. Gothmann, 'Digital Electronics: An Introduction to Theory and Practice', 2nd Edn, Prentice Hall.
5. Albert Malvino, 'Digital Computer Electronics', 2nd Edn., Tata McGraw-Hill.

Learning Outcomes

After completion of this course, the students would be able to:

1. Acquired knowledge about basics of digital electronics and solving problems related to number systems.
2. Acquired knowledge about Boolean algebra.
3. Ability to identify, analyse and design combinational circuits.
4. Ability to design various synchronous and asynchronous sequential circuits.
5. Ability to understand Logic families.
6. Acquired knowledge about memory devices and signal Conversions.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code: MCAP1-104

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (10 Hrs.)

Mathematical Logic - Statements, logical operations, tautologies, contradictions, logical implications and equivalence, normal forms, theory and Inference for statement calculus, predicate calculus, Inference theory for predicate calculus.

UNIT- II (12 Hrs.)

Relations and Functions - Binary relations, computer representation of relations and diagraph, Equivalence relations, applications of congruence, Composition of relations, Transitive Closure, partially ordered sets, Hasse diagrams, lexicographic ordering,

topological sorting, Lattices and special types of lattices, Types of functions, functions for computer sciences, growth of function and binary operations.

UNIT-3 (11 Hrs)

Permutations and Combinations - Basic concepts; Rules of counting; combinatorial distribution of distinct and non-distinct objects; generating functions for permutation and combinatorial enumeration.

Recursion and Recurrence Relation - Primitive recursive function, Polynomials and their recursion, Iteration, Sequence and discrete functions, Recurrence relations, Generating function.

UNIT-4 (12 Hrs)

Lattice and Algebraic System, Basic Properties of Algebraic Systems, Special Types of Lattices, Distributed, Complemented Lattices, Boolean Algebra, Boolean Expressions, Normal Form of Boolean Expressions, Boolean Function, Basic Circuits and Theorems, Logical Gates and Relations of Boolean Function, Introduction to Graphs, Graph Terminology, Graph Isomorphism, Directed and Undirected Graphs and Their Representations; Paths, Reach Ability and Connectedness; Basic Concepts of Trees And Spanning Tree.

Recommended Books

1. J.P. Tremblay and R. Manohar, 'Discrete Mathematical Structures with Applications to Computer Science', 2nd Edn., Tata McGraw Hill.
2. Kenneth H. Rosen, 'Discrete Mathematics and its Applications with Combinatorics and Graph Theory', 6th Edn., Tata McGraw – Hill Education Private Ltd.
3. R.P. Grimaldi and B.V. Ramana, 'Discrete and Combinatorial Mathematics – An Applied Introduction', 2nd Edn., Pearson Education.
4. Doerr Alan., 'Applied Discrete Structures for Computer Science', 2nd Edn., Galgotia Publications.
5. C.L. Liu, 'Elements of Discrete Mathematics', 2nd Edn., Tata McGraw Hill.

BUSINESS COMMUNICATION

Subject Code: MHUM0-104

**L T P C
2 0 0 2**

Duration: 28 Hrs.

Learning Objective: This course is designed to give students a comprehensive view of communication, its scope and importance in business, the role of communication in establishing a favorable image of the organization. The aim is to develop students' ability to communicate correctly and effectively on matters having relevance to day-to-day business operations. This course will make student conversant with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform their communication abilities.

UNIT- I (7 Hrs.)

Introduction to Communication: Meaning, Process, Importance of Communication in Business, Types of Information, Formal and Informal Communication, Internal and External Communication. Approaches to Effective Communication, Essentials of Effective Business Communication (7Cs model)

Written Communication: Advantages and Disadvantages, Covering letter, Need, Functions and Kinds, Layout of Letter Writing, Types of Letter Writing: Persuasive Letters, Request Letters, Sales Letters, Complaints and Adjustments

UNIT –II (7 Hrs.)

Developing Reading Skills: Identify the Purpose of Reading, Factors Effecting Reading, Learning How to Think and Read, Developing Effective Reading Habits, Reading Tactics and Strategies: Training Eye and Training Mind (SQ3R)

Developing Listening Skills: Importance, Purpose of Listening, Art of Listening, Factors Affecting Listening, Components of Effective Listening, Process of Listening, Principles and Barriers to Listening, Activities to Improve Listening

UNIT- III (7 Hrs.)

Oral Communication: Advantages and Disadvantages, Conversation as Communication, Art of Public Speaking, Group Communication Through Committees, Preparing and Holding Meetings, Overcoming Stage Fright, Ambiguity Avoidance.

Departmental Communication: Meaning, Need and Types: Interview Letters, Promotion Letters, Resignation Letters, Newsletters, Circulars, Agenda, Notice, Office Memorandums, Office Orders, Press Release

Report Writing: Structure, Types, Formats, Drafting of Various Types of Report. Nonverbal – Features, Understanding of Body Language, Posture, Gestures. Influences on Communication: Social Influences, Culture and Communication, Few Guidelines for Better Multicultural Communication, Business Etiquettes and Communication.

UNIT- IV (7 Hrs)

Group Discussion: Nature, Uses and Importance, Guidelines for GD Presentations: How To Make Effective Presentations, Four P“ S of Presentation, Structuring, Rehearsing and Delivery Methods.

Resume Writing: Planning, Organizing Contents, Layout, Guidelines for Good Resume. Interviews: Preparation Techniques, Frequently Asked Questions about How to Face an Interview Board, Proper Body Posture, Projecting a Positive Image, Steps To Succeed In Interviews, Practice Mock Interview in Classrooms.

The Case Method of Learning: Dimensions of a Case, Case Discussion, Usefulness of The Case Method, Training of Managers, Use The Case Method. Report Writing: Structure, Types, Formats, Preparations and Presentation.

Course Outcome: After studying this course the students will enable to:

- Know the dynamics of communication in the business world
- Practice the different tools of communication
- Enable them to speak effectively suited to the situation
- Improve their competence in English

Recommended Books

1. Lesikar, Petit & Flatley, ‘Lesikar’s Basic Business Communication’, Tata McGraw Hill.
2. Raman Meenakshi, ‘Prakash Singh, Business Communication’, Oxford University Press.
3. Rizvi Ashraf,’ Effective Technical Communication’, Tata McGraw Hill.
4. Krizan, Buddy, ‘Merrier, Effective Business Communication’, Cengage Learning.
5. Diwan & Aggarwal, ‘Business Communication’, Excel.
6. Baugh, Frayer & Thomas, ‘How to write first class Business Correspondence, Viva Book.
7. Taylor, English Conversion Practice’, Tata McGraw Hill.
8. Devaraj, ‘Executive Communication’, Tata McGraw Hill.
9. Ober, ‘Effective Bossiness Communication’, Cengage Learning.

SOFTWARE LAB – I
(INFORMATION TECH. & OFFICE AUTOMATION BASED ON MCAP1-101)

Subject Code: MCAP1-105

L T P C

0 0 2 1

Learning Objectives

1. This course will enable the student to gain and understanding of the core concepts and technologies which constitute Information Technology.
2. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology and Office Tools.

Windows Operating System - Installing WINDOWS with set-up, Starting and Quitting WINDOWS, Basic Elements of WINDOWS, working with menus dialogue boxes, Window Applications, Windows Explorer, My Computer, Recycle bin, Programs, Favorites, My Documents.

Settings - Control Panel, Printers, Taskbar and Start menu, Folder Options, Active Desktop, Find, Help, Run.

Accessories – Entertainment, Games, System tools, Internet Tools, Calculator, Calendar, Clock, Card file, Note pad, Write pad, Recorder etc.

Word Processing & Presentation Tool - Salient Features of Word, Installation of Word, Starting and Quitting of Word, File, Edit, View, Insert, Format, Tools, Tables, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Word Processors and Software Packages. Salient Features of Power Point, Installation, Starting and Quitting, File, Edit, View, Insert, Format, Tools, Slide Show, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Presentation Tool and Software Packages.

Spreadsheet Tool - Spread Sheet, Getting started with Excel worksheet, entering data into Work Sheet, editing cell addressing, Ranges and range names, Commands, Menus, Copying and Moving cell contents, Inserting and Deleting rows and columns, Column width control, Cell protection, Printing reports, Creating and Displaying Graphs, Statistical functions.

Internet and its Applications - E-mail, TELNET, FTP, World Wide Web, Internet chatting, Intranet, Extranet, Gopher, Mosaic, WAIS.

Learning Outcomes:

After completion of this course, the students would be able to:

1. Familiarize with PC and WINDOWS commands, File creation, Editing, Directory creation.
2. Become proficient in using the features of word processing in Word.
3. Become proficient in using spreadsheet software and be able to create technical and complex spreadsheets for data analysis using spreadsheet tools.
4. Understand the use of Internet and its applications

SOFTWARE LAB – II
(PROBLEM SOLVING AND PROGRAMMING USING C BASED ON MCAP1-102)

Subject Code: MCAP1-106

L T P C

0 0 4 2

This laboratory course will mainly comprise of exercises on what is learnt under paper: MCAP1-102 (Computer Programming Using C).

Note: Program should be fully documented with simple I/O data. Flow charts should be developed wherever necessary.

Implement the following Concepts in C Programming:

Input-output statements: Formatted and Non-Formatted statements

Operators: Arithmetic, Logical, Conditional, Assignment, Bitwise, Increment/Decrement operators

Decision Making: Switch, if-else, nested if, else-if ladder, Break, Continue, Go to

Loops: While, Do-while, For

Functions: Definition, Declaration, Variable Scope, Parameterized Functions, return statement, call by value, Call by reference, Recursive functions

Pre-processor Directives: Pre-processor directives like INCLUDE, IFDEF, DEFINE, etc

Header Files: STDIO.H, MATH.H, STRING.H, PROCESS.H etc

Arrays: Array declarations, Single and Multi-dimensional, Memory limits, Strings and String functions

Pointers: Pointer declarations, Pointer to Function, Pointer to Array/String

Files: Creation and Editing of various types of files, closing a file (using functions and without functions).

Learning Outcomes

After completion of this course, the students would be able to:

1. Apply and practice logical ability to solve the problems.
2. Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment.
3. Analysing the complexity of problems, modularize the problems into small modules and then convert them into programs
4. Understand and apply the in-built functions and customized functions for solving the problems.
5. Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6. Document and present the algorithms, flowcharts and programs in form of user-manuals

BUSINESS COMMUNICATION LAB - I

Subject Code – MHUM0-102

L T P C

0 0 2 1

The students will have to perform the practicals in lab related to the syllabus of the subject 'Business Communication'.

COMPUTER ARCHITECTURE & ORGANIZATION

Subject Code: MCAP1-206

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objective:

The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system and to introduce students to the design and organization of modern digital computers & basic assembly language.

UNIT-I (12 Hrs.)

Basic Computer Organization and Design - Common Bus System, Registers, Instruction codes, computer Instructions, Timing and Control, Instruction Cycle, Arithmetic, Logic &

Shift micro operations instructions, Memory Reference Instructions, Design of Basic Computer and it's working.

Programming & Controlling Basic Computer - Machine & Assembly Language, Programming Arithmetic and Logic Operations, Hardwired & Micro programmed control, Address Sequencing, Design of a control unit.

UNIT-II (10 Hrs.)

CPU Architecture - General register & stack organization, Instruction formats, Addressing Modes, Data Transfer and Manipulation, Program Control, ALU & Control Unit Architecture
I/O Organization - Peripheral Devices, input-output interface, Asynchronous Data Transfer, Modes of data transfer-programmed & interrupt initiated I/O, Priority Interrupt, DMA, I/O Processors.

UNIT-III (12 Hrs.)

Memory Organization - Main Memory-Memory Address Map, Memory connection to CPU, Associative Memory-Hardware organization, Cache Memory-Levels of Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping.

Parallel & Multiprocessing Environment - Introduction to parallel processing, Pipelining, RISC Architecture, Vector & array processing, multiprocessing concepts, memory & resource Sharing, Inter processor communication & Synchronization.

UNIT- IV (11 Hrs.)

Overview of Assembly Language Programming - Architecture of a typical 8-bit processor (8085 microprocessor) - Registers, Instruction Set-Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Machine Control Instructions.

Use of an Assembly Language for Specific Programs - Simple numeric manipulations, sorting of a list and use of I/O instructions

Recommended Books

1. M. Morris Mano, 'Computer System Architecture', PHI.
2. William Stallings, 'Computer Organization and Architecture', 8th Edn., Pearson.
3. P.V.S. Rao, 'Computer System Architecture', 2nd Edn., PHI.
4. J.P. Hayes, 'Computer Architecture & Organization', 3rd Edn., McGraw Hill.
5. Stone, 'Introduction to Computer Architecture', 2nd Edn., Galgotia.
6. Tanenbaum, 'Structured Computer Organization', 3rd Edn., PHI.

Learning Outcomes

After Completion of the course students will be able to:

1. Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
2. Understand the principles and the implementation of computer arithmetic.
3. Understand the Basic architecture of CPU and I/O Organization.
4. Understand the operation of modern CPUs including pipelining, memory systems and buses and multiprocessor systems and parallel programming.
5. To Understand the Overview of Assembly Language Programming and to create an assembly language program to program a microprocessor system.

RELATIONAL DATABASE MANAGEMENT SYSTEM

Subject Code: MCAPI-207

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objective

The course aims at providing the students through insight on few DBMS principles and practices. Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL.

UNIT- I (12 Hrs.)

Introduction to DBMS - Overview of DBMS, Basic DBMS terminology, Data independence. Architecture of a DBMS, Introduction to data models: Entity relationship model, Hierarchical model, Network model, Relational model.

Relational Design - Relation scheme, Codd's Rule for RDBMS, Anomalies in a database, Functional Dependency: Dependencies and Logical implications, Closure set, testing if FD is in closure, Covers, Non redundant and Minimum cover, Canonical cover, Functional dependencies and Keys.

Normal Forms - 1NF, 2NF, 3NF, BCNF, Multi valued dependencies and Joined dependencies, 4NF, 5NF.

UNIT-II (12 Hrs.)

Structured Query Language - Introduction to SQL, Oracle server and Oracle database, Oracle data types, Starting SQL*Plus, querying database tables, Conditional retrieval of rows, working with null values, matching a pattern from a table, Ordering the result of a query, Aggregate Functions, Grouping the result of a query.

Querying multiple Tables - Equi Joins, Cartesian Joins, Outer Joins, Self Joins; SET Operators: Union, Intersect, Minus.

Functions - Arithmetic functions, Character functions, Date functions, and Group functions.

UNIT-3 (10 Hrs.)

Data Manipulation and Control - Data Definition Language (DDL), Creating Tables, creating a Table with data from another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, dropping a Column; VIEW: Manipulating the Base table, Rules of DML Statements on Join Views, Dropping a VIEW, Inline Views.

Database security and privileges - GRANT command, REVOKE command, COMMIT and ROLLBACK.

UNIT- IV (11 Hrs.)

PL/SQL - Introduction to PL/SQL, The Advantage of PL/SQL, PL/SQL Architecture, Fundamentals of PL/SQL, PL/SQL Data types, variables and constants, Assignments and expressions, Operator precedence, referencing Non-PL/SQL variables, built in functions, conditional and iterative control, SQL within PL/SQL, writing PL/SQL code. Cursor management in PL/SQL, Cursor manipulation, Triggers, Stored procedures, Exception handling in PL/SQL, Predefined exceptions, User defined exceptions, Triggers, Stored procedures.

Recommended Books

1. B.C. Desai, 'An Introduction to Database Systems', 3rd Edn., Galgotia Publ. Private Ltd.
2. Ivan Bayross, 'PL/SQL The Programming Language of ORACLE', 2nd Edn., BPB Publication.
3. Henry F. Korth, Abraham, 'Database System Concepts', 3rd Edn., McGraw Hill Inc.

4. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 3rd Edn., Pearson.
5. Johannes Gehrke, Raghuram Ramakrishnan, 'Database Management Systems', 4th Edn., McGraw Hill Education.
6. C.J. Date, 'Data Base Systems', Vols. I & II, 3rd Edn., Narosa Publications.
7. Mark L. Gillenson, 'Fundamentals of Database Management Systems', 2nd Edn., John Wiley and Sons.

Learning Outcomes

Students who complete this course would be able to perform the following tasks:

1. Master the basic concepts and appreciate the applications of database systems.
2. Be familiar with the relational database design.
3. Master sound design principles for logical design of databases, including the E-R method and normalization approach.
4. Formulate data retrieval queries in SQL and the Relational Algebra and functions.
5. Understand analyse and apply Data Manipulation and Control and Database security and privileges.
6. Understand, analyse, and apply PL/SQL blocks using Cursors and Triggers.

DATA AND FILE STRUCTURES

Subject Code: MCAP1-208

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objective:

A study of advanced programming topics focused on logical structures of data, their physical representation, design and analysis of algorithms operating on the structures, and techniques for program development and debugging. Emphasis is placed on the appropriate use and choice of standard data structures.

UNIT-I (12 Hrs.)

Introduction to Data Structure - Concept of data, Problem analysis, Data structures and Data structure operations, Notations, Mathematical notation and Functions, Algorithmic Complexity, Big-O Notation and time space trade off.

Arrays - Overview of Arrays, Recursion, Pointers, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers, Static and Dynamic Memory Management, Garbage Collection. Understanding and Implementation of Various Data Structures with Applications.

Stack - Operations like Push, Pop and Various Applications like Conversion from Infix to postfix and prefix expressions, Evaluation of postfix expression using stacks.

Queues - Operations like Enqueue, Dequeue on Simple, Circular and Priority Queues.

Linked Lists - Operations like Creations, Insertion, Deletion, Retrieval and Traversal on Single, Circular and doubly linked list.

UNIT-II (11 Hrs.)

Trees - Definitions and Concepts: Root Node, Leaf Node, Level, Degree, Height and Tree representation using linked List and array.

Tree Operations - Creation, Insertion, Deletion and Traversals (Preorder, In-order, Post ordered) and searching on various types of trees. Types of Trees: Binary trees, Binary search tree, Height balanced (AVL) tree, B trees, B+ Tree.

Heap - Definition, Structure, Algorithms and applications.

UNIT-III (10 Hrs.)

Graphs - Graph definitions and Concepts: Edge, Vertices, and Graph representation using Adjacency matrix, Adjacency lists. Types of graphs: Weighted, Unweighted, Directed,

Undirected Graphs. Graph Operations: Creation, Insertion, Deletion, Traversals and Searching (Depth first, Breadth-first) of various types of graphs and Dijkstra's algorithm for shortest distance calculation.

UNIT- IV (12 Hrs.)

Sorting - Concepts, Order, Stability and Efficiency of various algorithms (Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort and Radix Sort).

Searching - Concept and Efficiency of linear and binary search algorithms.

Hashing - Definition, Implementation and Applications.

Recommended Books

1. Lipschutz, Seymour, 'Theory & Problems of Data Structures', 2nd Edn., Schaum Series.
2. E. Horwitz, and S. Sahni, 'Fundamentals of Data Structures, Computer Science', 2nd Edn., Press.
3. Tremblay, 'An introduction to Data Structures with Applications', 3rd Edn., Tata McGraw.
4. A.V. Aho, Hopcroft, J.E. Ullman, 'Data Structures and Algorithms', 3rd Edn., Addison Wesley.
5. A.M. Tanenbaum and M.J. Augenstein, 'Data Structures using C', 2nd Edn., Prentice Hall International.
6. A. Berman, Michael, 'Data Structure via C++', 2nd Edn., Oxford University Press.

Learning Outcomes

After completion of this course, the students would be able to:

1. Design and apply appropriate data structure using simple algorithms for modelling and solving given computing problems
2. Understand, analyse and Develop algorithms to implement different data structures such as: arrays, linked lists, stacks, queues and Linked Lists
3. Understand, analyse and Develop algorithms to implement linear data structures such as trees.
4. Understand, analyse and Develop algorithms to implement graphs.
5. Identify, understand and determine the usage of sorting, searching and Hashing operations and their associated algorithms.

SOFTWARE LAB – III

(RELATIONAL DATABASE MANAGEMENT SYSTEM BASED ON MCAP1-207)

Subject Code: MCAP1-209

L T P C

Duration: 60 Hrs.

0 0 4 2

Learning Objectives

Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL

Implement the Following Concepts

1. Comparative study of various Database Management Systems
2. Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL)
3. How to apply Constraints at various levels?
4. View data in the required form using Operators, Functions and Joins.
5. Creating different types of Views for tailored presentation of data.
6. How to apply Conditional Controls in PL/SQL.
7. Error Handling using Internal Exceptions and External Exceptions.
8. Using various types of Cursors.
9. How to run Stored Procedures and Functions.

10. Creating Packages and applying Triggers.

11. Creating Arrays and Nested Tables.

Learning Outcomes

Students who complete this course would be able to perform the following tasks:

1. Understand, Appreciate and Effectively Explain the Underlying Concepts of Database Technologies.
2. Design & Implement a Database Schema for Given Problem Domain.
3. Populate & Query a Database Using SQL DML/DDDL Commands.
4. Normalize a Database.
5. Programming PL/SQL Including Stored Procedures, Stored Functions, Cursors, Packages.

SOFTWARE LAB – IV (DATA AND FILE STRUCTURES BASED ON MCAP1-208)

Subject Code: MCAP1-209

L T P C

0 0 4 2

List of practical exercises, to be implemented using object-oriented approach in C++ Language:

Array: Insert an element at end as well as at a given position, delete an element from a given position, find the location of a given element using linear search and display the elements of the linear array.

Linked List: Insert an element, delete an existing element, and Display all the elements

Stack: To implement PUSH& POP operation on stack.

Queue: Insert and Delete operation on circular queue represented using a linear array.

Bubble Sort: To sort an array of integers in ascending order using Bubble sort.

Selection Sort: To sort an array of integers in ascending order using Selection sort.

Insertion Sort: To sort an array of integers in ascending order using bubble sort.

Merge Sort: To sort an array of integers in ascending order using merge sort.

Quick Sort: To sort an array of integers in ascending order using Quick sort.

Binary Search Tree: To demonstrate the use of binary search algorithm to search a given element in a Sorted array in ascending order. To insert, delete and display operations on a binary search tree.

Breadth-First Search: To illustrate the traversal of graph using breadth-first search.

Depth-first Search: To illustrate the traversal of graph using depth-first search.

Learning Outcomes

Students who complete this course will be able to:

1. Designing and applying appropriate data structure using simple algorithms for modelling and solving given computing problems.
2. Understand and implement the both array based and linked-list based data structures, including singly, doubly, and circular linked-lists.
3. Understand and implement the Stack data structure and stack operations.
4. Understand and implement the both array based circular queue and linked-list based queue implementations.
5. Understand and implement general tree data structures, including binary tree, both array based and reference based implementations;
6. Understand and implement binary search trees.
7. Understand and implement heaps using an array based tree data structure.
8. Understand and implement graph data structures.

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Subject Code: MCA1-256

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Objectives

To help students to develop skills that will enable them to construct software of high quality software that is reliable, and that is reasonably easy to understand, modify and maintain.

UNIT-I (12 Hrs.)

Software Engineering - Evolution of Software Engineering, Goals of software engineering, Software Development vs. Software Engineering.

Software Process - Software Process, Waterfall, Spiral, Prototyping, Selection of appropriate process model Fourth Generation Techniques.

Software Requirements Analysis - Analysis Principles, SRS, Components of SRS, Requirement Elicitation Techniques- FAST and QFD

UNIT-II (11 Hrs.)

Software Design - Design Objectives, Principles, Design Concepts, Design Process, Design Strategies and Methods, Architectural Design-Architectural Styles, Modular Design, Object oriented design, User-interface design. Principles of structured Analysis and Design Tools i.e. DFD, DD, Decision Tables and Decision Trees

Software Project Management - Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models-Activity Networks- PERT/CPM, COCOMO-I, COCOMO-II Model.

UNIT- III (11 Hrs.)

Software Testing - Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, Testing Techniques-White Box, Black-Box Testing & its Technique: Equivalence Class Partitioning, Boundary Value Analysis, White-Box Testing & its Techniques: Basis Path Testing, Structural Testing, Logic Based Testing, Fault Based Testing.

Software Testing Strategies - Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing, Alpha and Beta Testing, Regression Testing.

UNIT-IV (11 Hrs.)

Quality Assurance - Overview of Software Quality, Software Quality Attributes, Factors Affecting Software Quality, Building, Software Quality Assurance Plan, Quality management Principles, Capability Maturity Model, Risk Assessment.

Software Maintenance - Types of software maintenance, Reverse Engineering, and Software maintenance process models.

System Configuration Management (SCM) - SCM principle, Change Management, Version and Release Management.

Recommended Books

1. R.S. Pressman, 'Software Engineering: A Practitioner's Approach', 6th Edn., McGraw-Hill.
2. P. Jalote, 'An Integrated Approach to Software Engineering', 3rd Edn., Narosa Publishing House.
3. Mall, Rajiv, 'Fundamentals of Software Engineering', 4th Edn., McGraw Hill.
4. K.K. Aggarwal and Y. Singh, 'Software Engineering', 2nd Edn., New Age International Publishers.
5. Deutsch, Willis, 'Software Quality Engineering: A Total Technical and Management Approach', 3rd Edn., Prentice Hall.
6. T.G. Lewis, 'Software Engineering', 3rd Edn., McGraw Hill.

7. P.G. Hibbard, 'Constructing Quality Software', 4th Edn., North Holland Publication.

Learning Outcomes

1. Ability to understand Goals of software Engineering, Software Process models and Software Requirement analysis.
2. Ability to understand Software Design in detail.
3. Ability to understand software project Management
4. Ability to identify, Analyse and understand software testing.
5. Students will be proficient to understand software Quality Assurance.
6. Ability to understand Software maintenance.

SYSTEM ANALYSIS AND DESIGN

Subject Code: MCAP1-257

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objectives

To teach the analysis and practicality of various systems on which software System can be developed. After completing this course student will be able to design and develop systems.

UNIT-I (11 Hrs.)

System Development Life Cycle - System Definition, Characteristics, Elements & Types of system, Phases of SDLC, Information gathering tools, Structured Analysis tools, Role of System Analyst.

Software Requirements Analysis - Analysis Principles, SRS, Components of SRS, Requirement Elicitation Techniques- FAST and QFD

UNIT-II (12 Hrs.)

System Design - Process and Stages of systems design, Input/output and File design, Documentation (User Manual, Design Documentation, Training Manual), Design objectives, Principles, Design Concepts, Design Process, Design Strategies and Methods, Architectural Design-Architectural Styles, Modular Design, Object oriented design, User-interface design. Principles of structured Analysis and Design Tools i.e. DFD, DD, decision tables and decision trees, Case Studies techniques in System Design.

UNIT-III (12 Hrs.)

Software Testing - Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, Testing Techniques-White Box, Black-Box Testing & its Technique: Equivalence Class Partitioning, Boundary Value Analysis, White-Box Testing & its Techniques: Basis Path Testing, Structural Testing, Logic Based Testing, Fault Based Testing.

Software Testing Strategies - Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing, Alpha and Beta Testing, Regression Testing.

UNIT- IV (10 Hrs.)

System Implementation - System Implementation Process, Implementation Methods

Software Maintenance - Types of Software Maintenance, Reverse Engineering, and Software Maintenance Process Models.

Recommended Books

1. Elias N. Awad, 'System Analysis and Design', 2nd Edn., Galgotia Publications.
2. James A. Sen, 'Analysis and Design of Information System', 2nd Edn., Tata McGraw Hill.
3. Harry J. Rosenblatt, Shelly, 'Systems Analysis and Design', 3rd Edn., Cashman Series.
4. Scott Tilley, Harry J. Rosenblatt, 'System Analysis and Design', 3rd Edn., Wiley.

Learning Outcomes

1. Ability to understand characteristics of system, Software Process models and Software Requirement analysis.
2. Ability to understand Software Design.
3. Ability to identify, Analyse and understand software testing strategies.
4. Students will be proficient to understand implementation of software.
5. Ability to understand Software maintenance.

SOFTWARE DESIGN METHODOLOGIES

Subject Code: MCAPI-257

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objectives

This course provides attendees with in-depth coverage of the concepts needed to effectively design and analyze software architecture. After attending this course, participants will have a better understanding of the essential considerations in any architectural design process, methods for eliciting critical quality attributes, the role of architecture evaluation, using the methods within a software development life cycle.

UNIT-I (12 Hrs.)

Basic concepts of Design - Introduction, Characteristics of design activities, Essential Elements of Designs.

Design Principles - Basic Rules of Software Design: Causes of difficulties, Vehicles to overcome difficulties, Basic Rules of Software Design.

Design processes - The Context of design in software Development process, Generic Design Process: Descriptive Models, Structure of Software Design Methods.

Design Quality - Software quality models: Hierarchical models, Relational models, The effect of design on software quality: efficiency, Correctness and reliability, Portability, Maintainability, Reusability, Interoperability.

UNIT- II (9 Hrs.)

Software Architecture - The Notion of Architecture: Architecture in The Discipline of Buildings, Architecture in The Discipline of Computer Hardware, The General Notion of Architecture: The Notion of Software Architecture: Prescriptive Models, Descriptive Models, Multiple View Models, The Roles of Architecture in Software Design, Software Architectural Style: Introductory Examples, The Notion of Software Architectural Style. Typical Architectural Styles: Data Flow: The General Data Flow Styles, Pipe and Filter Sub-Style, Batch Sequential Processing Sub-Style.

UNIT – III (12 Hrs.)

Using Styles in Design - Choices of Styles, Combinations of Styles, Hierarchical Heterogeneous Styles, Simultaneously Heterogeneous Styles, Locationally Heterogeneous Styles, Case Study: Keyword Frequency Vector: Specification of The Problem, Designs in Various Styles, Analysis and Comparison.

Architectural Design Space - Theory of Design Spaces: Structure of Design Spaces, Solving Design Synthesis and Analysis Problems, Design Space of Architectural Elements: Behavior Features, Static Features.

UNIT-IV (11 Hrs)

Analysis and Evaluation - The Concept of Scenario, Scenarios for Evaluating Modifiability: Scenarios for Evaluating Reusability, Specification of Operational Profiles, Evaluation and Analysis of Performance, Scenarios for Evaluating Reusability: Analysis and Evaluation of

Modifiability: The SAAM Method: The Input and Output, The Process (Activities in SAAM Analysis).

Model-Based Analysis - The HASARD Method: Representation of Quality Models, Construction of Quality Models, Hazard Identification, Cause- Consequence Analysis, Assembling Graphic Model, Identification of Quality Concerns.

Quality Trade- Off Analysis - The ATAM Method: ATAM analysis process, ATAM analysis activities

Recommended Books

1. Hong zhu, 'Software Design Methodology: From Principles to Architectural Styles', 2nd Edn., Elsevier.
2. J. Bosch, ACM Press, 'Design and Use of Software Architectures-Adopting and Evolving a Product – Line Approach', 3rd Edn., Addison Wesley.
3. Nick Rozanski, Eoin Woods, 'Software Systems Architecture: Working With Stakeholders Using Viewpoints and Perspectives', 2nd Edn., Pearson.

Learning Outcomes

1. Ability to understand basic concepts, principles, processes and quality attributes of design.
2. Ability to identify, Analyse and understand architecture of software.
3. Students will be proficient in using Styles in design.
4. Ability to identify, Analyse and understand architectural Design space.
5. Students will be proficient in analysis and evaluation of software.

COMPUTER NETWORKS

Subject Code: MCAP1-312

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Objectives

After completion of this course, the students would be able to:

1. Independently understand basic computer network technology, data communication system and its components.
2. Identify the different types of network topologies, protocols, layers of the OSI model and TCP/IP.
3. Identify the different types of network devices and their functions within a network.
4. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

UNIT-I (12 Hrs.)

Introduction to Computer Networks - Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model.

Physical Layer - Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits: Nyquist formula, Shannon Formula, Multiplexing: Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media : Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching, Packet Switching & their comparisons.

UNIT-II (12 Hrs.)

Data Link Layer - Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window

Protocols: Stop & Wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP.

Medium Access Sub-Layer - Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm.

UNIT-III (10 Hrs.)

Network Layer - Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms

UNIT-IV (11 Hrs.)

Transport Layer - Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison.

Application Layer - World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), Introduction to Network security.

Recommended Books

1. Andrew S. Tanenbaum, 'Computer Networks', 5th Edn., Pearson Education, **2010**.
2. Behrouz A. Forouzan, 'Data Communications & Networking', 5th Edn., Tata McGraw Hill, **2012**.
3. James F. Kurose and Keith W. Ross, 'Computer Networking', 6th Edn., Pearson Education, **2013**.
4. Douglas E. Comer, 'Internetworking with TCP/IP, Volume-I', 6th Edn., Prentice Hall India, **2013**.

OPERATING SYSTEMS

Subject Code: MCA1-313

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objectives

After completion of this course, the students would be able to:

1. Understand functions, Role, different structures and views of Operating system.
2. Understand Process management in operating system.
3. Understand Memory Management in operating system.
4. Understand Device Management in operating system.

UNIT-I (11 Hrs.)

Introduction - Introduction to Operating system, Role of Operating System as resource manager, function of kernel and shell, operating system structures, views of an operating system.

UNIT-II (11 Hrs.)

Process management - CPU scheduling, Scheduling Algorithms, PCB, Process synchronization, Deadlocks, Prevention, Detection and Recovery

UNIT-III (11 Hrs.)

Memory Management - Overlays, Memory management policies, Fragmentation and its types, Portioned memory managements, Paging, Segmentation, Need of Virtual memories, Page replacement Algorithms, Concept of Thrashing

UNIT-IV (12 Hrs.)

Device Management - I/O system and secondary storage structure, Device management policies, Role of I/O traffic controller, scheduler, File Management: File System Architecture, Layered Architecture, Physical and Logical File Systems, Protection and Security, Brief study to multiprocessor and distributed operating systems. Case Studies: LINUX / UNIX Operating System and Windows based operating systems. Recent trends in operating system.

Recommended Books

1. A. Silberschatz and Peter B. Galvin, 'Operating System Concepts', 2nd Edn., Wiley, 2013.
2. Dhananjay M. Dhamdhere, 'Operating Systems', 1st Edn., McGraw-Hill, 2008.
3. Gary Nutt, 'Operating Systems Concepts', 2nd Edn., McGraw-Hill, 2001.
4. Stuart E. Madnick and John J. Donovan, 'Operating Systems', 1st Edn., McGraw-Hill, 1974.
5. William Stallings, 'Operating Systems: Internals and Design Principles', 6th Edn., Prentice Hall, 2008.

OBJECT ORIENTED PROGRAMMING USING C++

Subject Code: MCAP1-314

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Objectives

After completion of this course, the students would be:

1. Able to learn basics and programming skills of high level language C++.
2. Able to learn how to manage the memory by using dynamic memory management.
3. Able to learn how to use reusability concept by using inheritance and templates.
4. Able to learn the skills of handing modular approach and exceptions.

UNIT-I (11 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 member functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

UNIT-II (12 Hrs.)

Classes and Objects - Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

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 n pointer assignment, memory leak and allocation failures.

UNIT-III (11 Hrs.)

Constructors and Destructors - Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initialize lists.

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-IV (11 Hrs.)

Inheritance - Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Virtual functions & Polymorphism - Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

Exception Handling - Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, re-throwing an exception, specifying exceptions.

Templates and Generic Programming - Template concepts, Function templates, class templates, illustrative examples.

Files - File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

Recommended Books

1. Robert Lafore, 'Object Oriented Programming in C++', 4th Edn., Waite Group, 2001.
2. E. Balagurusamy, 'Object Oriented Programming with C++', 6th Edn., Tata McGraw Hill, 2013.
3. R.S. Salaria, 'Object-Oriented Programming using C++', 4th Edn., Khanna Book Publishing, 2009.
4. Bjarne Stroustrup, 'The C++ Programming Language', 3rd Edn., Addison Wesley, 1997.
5. Herbert Schildt, 'C++: The Complete Reference', 4th Edn., McGraw Hill, 2009.

**SOFTWARE LAB – V
(OPERATING SYSTEMS BASED ON LINUX)**

Subject Code: MCAP1-315 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-313. Students are required to do at least 8 assignments based on the paper.

**SOFTWARE LAB – VI
(OBJECT ORIENTED PROGRAMMING USING C++)**

Subject Code: MCAP1-316 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-314. Students are required to do at least 8 assignments based on the paper.

EMBEDDED SYSTEMS

Subject Code: MCAP1-359 **L T P C** **Duration: 35 Hrs.**
3 1 0 4

Learning Objectives

1. Describe the recent trends and design issues in embedded systems.
2. Design real time embedded system using the PIC microcontroller 16F877A.

3. Analyse assembly language programming in PIC Microcontroller 16F877A.
4. Understand the different applications of embedded systems.

UNIT-I (9 Hrs.)

Introduction to Embedded Systems - Overview of embedded systems, Features, Requirements and applications of embedded systems, Recent trends in the embedded system design, Common architectures for the ES design, Embedded software design issues, Introduction to development and testing tools.

UNIT-II (9 Hrs.)

Embedded System Architecture - Basics of PIC16F877A microcontroller, Pin Diagram, Architecture, Memory organization, Special Function Registers, GPIO, Timer Comparator, A/D Convertor, Bus Architecture, Data operations, Addressing modes, Timers and Counters.

UNIT-III (9 Hrs.)

Assembly language programming - Memory-Mapped I/O, Interrupt handling, PIC16F877A Instruction Set, Assembler Directives, Programming of PIC Microcontrollers.

UNIT-IV (8 Hrs.)

Applications of Embedded Systems - Industrial and control applications, Networking and telecom applications, Digital Signal Processing and multimedia applications, Applications in the area of consumer appliances.

Recommended Books

1. Steve Heath, 'Embedded Systems Design', 2nd Edn., Newnes, 2002.
2. Jane W.S. Liu, 'Real-Time Systems', 1st Edn, Prentice Hall, 2000.
3. John B. Peatman, 'Design with PIC Microcontrollers', 1st Edn., Pearson, 1997.
4. PIC 16F877A Manual.

MULTIMEDIA TECHNOLOGIES

Subject Code: MCAP1-360

**L T P C
3 1 0 4**

Duration: 35 Hrs.

Learning Objectives

1. To acquire fundamental principles of multimedia, including digitization and data compression for non-textual information.
2. To understand core multimedia technologies and standards.
3. To gain hands-on experience in image, sound and video editing.
4. To design, capture, store and integrate sound, images and video to deliver multi-modal information.

UNIT-I (9 Hrs.)

Introduction - Overview of multimedia computing, Definitions, terms, terminologies, characteristics and requirements of different media, Components of multimedia systems.

Human's visual and audio system - Characteristics of human visual system, Light and visible light, Human retina structure and functions, Non-perceptual uniform color models and perceptual uniform color models, Characteristics of human's audio system, Frequency response and Magnitude range.

UNIT-II (9 Hrs.)

Multimedia data representation and analysis - Representation of sound/audio, image and video, Speech Generation, Analysis and software, Image analysis, Display and Printing.

UNIT-III (9 Hrs.)

Multimedia coding and compression - Coding requirements, Compression principles, Entropy and hybrid coding, Compression standards: JPEG and MPEG.

UNIT-IV (8 Hrs.)

Multimedia technology development - Multimedia history, Technology development, Challenging problem, Research difficulty, Multimedia industry.

Recommended Books

1. John F. Koegel Buford, 'Multimedia Systems', 1st Edn., Pearson, **2002**.
2. Ralf Steinmetz and Klara Nahrstedt, 'Multimedia: Computing, Communications and Applications', 1st Edn., Pearson, **2002**.
3. Judith Jeffcoate, 'Multimedia in Practice: Technology and Applications', 1st Edn., Prentice Hall, **1995**.

PARALLEL AND DISTRIBUTED COMPUTING

Subject Code: MCAP1-361

**L T P C
3 1 0 4**

Duration: 35 Hrs.

Learning Objectives

1. Recall the fundamental concepts, scope, design and model the parallelism.
2. To study performance matrices used for performance analysis and understand various parallel computing architectures.
3. To understand the scheduling process of the parallel computing.
4. To outline the fundamentals of parallel programming models.

UNIT-I (9 Hrs.)

Introduction - Parallel computing, Scope of parallel computing, Paradigms of parallel computing: Synchronous- Vector/Array, SIMD, Systolic, Asynchronous- MIMD, reduction paradigm.

Hardware taxonomy - Flynn's classifications, Handler's classifications.

Software taxonomy - Kung's taxonomy, SPMD.

UNIT II (9 Hrs.)

Abstract parallel computational models - Combinational circuits, Sorting network, PRAM models, Interconnection RAMs.

Parallelism approaches - Data parallelism, Control parallelism.

Parallel programming models - Shared memory programming, Distributed memory programming, Object oriented programming, Data parallel programming, Functional and dataflow programming.

UNIT III (9 Hrs.)

System Architectures - Taxonomy and topology – shared memory multiprocessors: UMA-Uniform Memory Architecture, NUMA-Non Uniform Memory Architecture, SMP distributed memory networks, Cache coherence protocols, CC-NUMA architectures, Consistency protocols, Data pre-fetching, CC-NUMA memory management, Message processing multiprocessors, Processor organization - Static and dynamic interconnections.

UNIT IV (8 Hrs.)

Scheduling and Parallelization - Scheduling, Types of scheduling algorithms, Load scheduling, Loop scheduling, Parallelization of sequential programs, Parallel programming support environments.

Recommended Books

1. Gregory R Andrews, 'Foundations of Multithreaded, Parallel, and Distributed Programming', Addison-Wesley Professional, **1999**.
2. Michael J. Quinn, 'Parallel Computing: Theory and Practice', 2nd Edn., McGraw Hill, **2002**.

3. Vipin Kumar, Ananth Grama, Anshul Gupta and George Karypis, 'Introduction to Parallel Computing', 2nd Edn., Pearson, 2003.

COMPUTER GRAPHICS

Subject Code: MCAP1-417

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes: At the end of the course, the students should be able to:

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.

UNIT-I (11 Hrs.)

Computer Graphics- Introduction, Applications of computer graphics, Components of Computer Graphics System.

Input & Output Devices- Keyboard, Touch panel, Light pens, Graphic tablets, Joysticks, Trackball, Data glove, Digitizer, Image scanner, Mouse, Voice Systems, Impact and non-impact printers.

Video Display Devices- CRT systems, Random and Raster scan Systems, Direct view storage tube. Flat panel displays – Emissive vs Non-Emissive displays, LCD displays, Plasma Panel displays, 3-D viewing devices, Virtual Reality.

UNIT-II (12 Hrs.)

Scan conversion- DDA and Bresenham line algorithms, Midpoint circle algorithm, Midpoint ellipse algorithm, Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), character generation, limitations of scan conversion.

2-dimensional Graphics- 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, two dimensional viewing transformation and clipping (Cohen –Sutherland, Sutherland-Hodge man algorithms).

UNIT-III (11 Hrs.)

3-dimensional Graphics- 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection), Composite transformations. Mathematics of Projections – Perspective Projections, Anomalies of perspective projections, Parallel Projections, Introduction to 3D viewing pipeline and clipping.

UNIT-IV (11 Hrs.)

Hidden line and surface elimination algorithms- Z-buffer, scan-line, Painter's algorithm.

Illumination Models- Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Half toning, Dithering.

Recommended Books:

1. D. Hearn and M.P. Baker, 'Computer Graphics', 2nd Edn., Pearson, 2002.
2. Andries van Dam, F. Hughes John, James D. Foley; Steven K. Feiner, 'Computer Graphics Principles and Practice in C', 2nd Edn., Pearson, 2002.
3. Roy A. Plastock, 'Computer Graphics', 2nd Edn., McGraw Hill, 2000.
4. F.S. Hill, 'Computer Graphics using OpenGL', 3rd Edn., PHI, 2009.
5. Jeffrey McConnell, 'Computer Graphics: Theory into Practice', 1st Edn., Jones and Bartlett Publishers, 2005.

6. William M. Newman, 'Principles of Interactive Computer Graphics', 2nd Edn., McGraw Hill, 2001.

PROGRAMMING IN JAVA

Subject Code: MCAP1-418

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes: At the end of the course, the students should be able to:

1. Use the Java programming language in the development of small application programs that demonstrate professionally acceptable coding and performance standards.
2. Understanding of the basic principles of the object oriented development process and apply this understanding to the analysis and design of solutions for small scale problems.
3. Work with the JDBC technology and learn Java Generics and the development of Projects.

UNIT-I (11 Hrs.)

Introduction- Object Oriented Concept, Features and Applications of Java, Differences between Java and C++, Structure of Java Program, Literals, Tokens, Keywords, Constants, Variables & Data types, Scope of variables, Operators, Expressions, Flow control statements. Arrays, Vectors, Type Conversion, Command Line Arguments, Access specifiers, Constructors, Inheritance, Static Classes, Abstract Classes, Final Classes, Wrapper Classes, Garbage Collection & Finalize method, Handling String and String Buffer classes, Method Overloading and Overriding.

UNIT-II (11 Hrs.)

Interfaces & Packages- Introduction, implementing multiple inheritance through Interfaces, Packages, Multithreaded Programming.

Exception Handling- Introduction, Handling System defined Exceptions, Creating and handling user defined exceptions.

Managing I/O- Introduction to streams, Handling and using various Stream Classes.

UNIT-III (11 Hrs.)

Applets- Introduction to Applets, Types of Applets, Using Applet Applications, Passing Parameters to Applets.

Introduction to Graphic Programming- Applying 2-D transformations on Objects, Event Handling, Layouts, Frames, Panels, JDBC.

UNIT-IV (12 Hrs.)

Advanced Programming- Servlet Programming (Servlet Life Cycle, Generic Servlet, HttpServlet, HttpServletRequest, HttpServletResponse, Service method, doGet method, doPost method, Servlet Exception).

Recommended Books:

1. Y. Daniel Liang, 'Introduction to Java Programming', 9th Edn., Pearson, 2011.
2. Herbert Schildt, 'Java 2: The Complete Reference', 5th Edn., McGraw Hill, 2002.
3. Gary Cornell and Cay S. Horstmann, 'Core Java, Volume 2- Advanced Features', 8th Edn., Pearson, 2008.
4. Ed Roman, Rima Patel and Gerald Brose, 'Mastering Enterprise Java Beans', 3rd Edn., John Wiley & Sons Inc., 2004.

SYSTEM PROGRAMMING

Subject Code: MCAP1-419

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes:

1. The objective of this course is to understand the execution process of HLL programs and understand the working of scanners and parsers.
2. This will help the students to understand the basic design of various system software

UNIT-I (11 Hrs.)

Introduction to System Software - Definition, Features of system programming, system programming vs. application programming.

Scanning and Parsing - Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatical Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing.

UNIT-II (13 Hrs.)

Assembler - Single pass assembler, Two-pass assembler, Algorithm of Two Pass Assembler and General Design Procedure of an Assembler.

UNIT-III (10 Hrs.)

Compilers - Overview of compilation process, Lexical analysis, Syntax analysis, Semantic analysis, Intermediate code generation and Code optimisation techniques, Compiler vs. Interpreter.

Loaders - Loading, Schemes, Design of absolute loader, Design of direct linking loader and MS-DOS Linker, Text Editors, Line Editor, Steam Editors, Screen Editor, Word processors, Structure Editors.

UNIT-IV (11 Hrs.)

Operating System - Basic concepts, Operating System as Resource Manager, Concepts of Processor, Memory, I/O and File Managements. Introduction to Device Drivers, USB and Plug and Play systems.

Recommended Books

1. John. J. Donovan, 'Systems Programming', 1st Edn., McGraw-Hill, **2001**.
2. A.V. Aho, Ullman Sethi R., I.D. 'Compilers: Principles, Techniques and Tools', 2nd Edn., Addison-Wesley, **1999**.
3. D.M. Dhamdhare, 'Systems Programming and Operating System', Tata McGraw Hill, 3rd Edn., **2002**.

**SOFTWARE LAB – VII
(COMPUTER GRAPHICS)**

Subject Code: MCAP1-420

**L T P C
0 0 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-417. Students are required to do at least 8 assignments based on the paper.

**SOFTWARE LAB – VIII
(PROGRAMMING IN JAVA)**

Subject Code: MCAP1-421

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-418. Students are required to do at least 8 assignments based on the paper.

DATA WAREHOUSING AND DATA MINING

Subject Code: MCAP1-462

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes: After completion of this course, the students would be able to:

1. Understand operational database, data ware housing, need of database to meet industrial needs.
2. Identify the components in typical data warehouse Architecture and understand the multidimensional schemas for data warehouse.
3. Understand the knowledge about data mining, decision tree, generic algorithms and Fuzzy set approach.

UNIT – I (10 Hrs.)

Review of Data Warehouse- Need for strategic information, Decision support system, Knowledge discovery & decision making, need for data warehouse, Data warehousing and data mining, common characteristics of Data warehouse, Data Marts, Metadata, Operational versus analytical databases, trends and planning of Data warehousing.

UNIT - II (11 Hrs.)

Schemas and Architecture of Data warehouse- Multidimensional data model, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations. Data warehouse process & architecture, OLTP vs. OLAP, ROLAP vs. MOLAP, types of OLAP servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

UNIT – III (12 Hrs.)

Introduction to Data Mining- Data mining definition & task, KDD versus Data mining, Techniques, Tools and Applications of Data mining. Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification.

Data mining techniques- Association rules, Clustering techniques, Decision tree knowledge discovery through neural.

UNIT – IV (12 Hrs.)

Data mining Classification- Networks & Genetic Algorithms, Rough Sets, Support Vector Machines and Fuzzy techniques. Mining Complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data, mining Text Data bases and mining Word Wide Web.

Recommended Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, 'Data Mining: Concepts and Techniques', 3rd Edn., Morgan Kaufmann, 2011.
2. George M. Marakas, 'Modern Data Warehousing, Mining, and Visualization', 1st Edn., Prentice Hall, 2001.

3. Elzbieta Malinowski and Esteban Zimanyi, 'Advanced Data Warehouse Design: from Conventional to Spatial and Temporal Applications (Data-Centric Systems and Applications)', 1st Edn., Springer, **2008**.
4. Matteo Golfarelli and Stefano Rizzi, 'Data Warehouse Design: Modern Principles and Methodologies', 1st Edn., McGraw-Hill Education, **2009**.
5. Alex Berson and Stephen J. Smith, 'Data Warehousing, Data Mining, & OLAP', 1st Edn., Tata McGraw Hill, **1997**.

BUSINESS INTELLIGENCE AND DIGITAL MARKETING

Subject Code: MCAPI-463

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to:

1. Understand the role of business intelligence and digital marketing within an organization.
2. Use decision-making tools/Operations Research techniques and manage business processes using analytical and management tools.
3. Analyse and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

UNIT – I (12 Hrs.)

Introducing the Technical Architecture- The value of architecture, Technical Architecture overview, Back room Architecture, Presentation Server Architecture, Front room Architecture, Infrastructure, Metadata, and Security.

Introducing Dimensional Modeling- Making the Case for Dimensional Modeling, Dimensional Modeling primer, Enterprise Data Warehouse Bus Architecture, More on Dimensions & Facts.

UNIT – II (10 Hrs.)

Designing the Dimensional Modeling- Modeling Process overview, Getting Organized, Four Step Modeling Process, Design the Dimensional Model.

UNIT – III (11 Hrs.)

Introducing Extract, Transformation & Load- Round up the requirements, the 34 subsystems of ETL, Extracting Data, Cleaning & Conforming data.

Introducing Business Intelligence Applications- Importance of B.I., Applications, Analytical cycle for B.I., Types of B.I. Applications, Navigating Applications via the B.I. portal.

UNIT – IV (12 Hrs.)

Designing & Developing B.I. Applications- B.I. Application resource planning, B.I. Application Specification, B.I. Application Development, B.I. Application maintenance.

Recommended Books:

1. Sam Anahory and Dennis Murray, 'Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems', 1st Edn., Addison Wesley Longman Ltd., **1997**.
2. Ralph Kimball and Margy Ross, 'The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling', 3rd Edn, Wiley, **2013**.
3. Jiawei Han, Micheline Kamber, Jian Pei, 'Data Mining: Concepts and Techniques', 3rd Edn., Morgan Kaufmann, **2011**.
4. R.N. Prasad and Seema Acharya, 'Fundamentals of Business Analytics', 1st Edn., Wiley, **2011**.

SOFTWARE TESTING AND QUALITY ASSURANCE

Subject Code: MCA1-464

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to:

1. Analyse different approaches to software testing and quality assurance, and select optimal solutions for different situations and projects;
2. Conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice;
3. Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

UNIT-I (10 Hrs.)

Testing Principles- Need of testing, Basic concepts – errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing, functional testing, performance testing, white box testing, black box testing, verification and validation.

UNIT-II (12 Hrs.)

Test Management- Testing Life Cycle – Roles and activities, Test Planning, Develop test plan review, Test Cases design strategies. Black box approach: random testing, equivalence class partitioning and boundary value analysis. White box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.

UNIT-III (12 Hrs.)

Software Metrics- Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure – GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point.
Quality Assurance- Quality concepts – quality, quality control, quality assurance, cost of quality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa's Seven Basic Tools.

UNIT-IV (11 Hrs.)

Quality Standards- Basic concept of – ISO 9000 & 9001, CMM, six sigmas.

Development of CMM- CMM – Following KPAs: requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), process change management.

Recommended Books:

1. Kshirasagar Naik and Priyadarshi Tripathy, 'Software Testing and Quality Assurance: Theory and Practice', 1st Edn., Wiley, 2008.
2. Jeff Tian, 'Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement', 1st Edn., Wiley, 2005.
3. William E. Perry, 'Effective Methods for Software Testing: Includes Complete Guidelines, and Checklists', 3rd Edn., Wiley, 2006.
4. Glenford J. Myers, 'The Art of Software Testing', 3rd Edn., Wiley, 2015.

ARTIFICIAL INTELLIGENCE

Subject Code: MCAP1-522

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes: After completion of this course the student will be able to understand the:

1. different types of AI agents.
2. various AI search algorithms.
3. the fundamentals of knowledge representation.

UNIT-I (11 Hrs.)

Basics of AI - What is Artificial Intelligence, what is an AI technique, Criteria for success, Problems, Problem spaces and search, Production system, Problem characteristics, Hill-climbing, Best-First search, AO algorithm, Constraint satisfaction.

UNIT-II (12 Hrs.)

Natural Language Processing - Introduction, Overview of linguistics, Grammars and language, Basic Parsing techniques, Semantic analysis and representation, Structure, Natural Language generation, Natural Language systems.

UNIT-III (11 Hrs.)

Knowledge Representation - Issues, Approaches to knowledge Representation, Representing simple facts in logic, Computable functions and predicates, Procedural vs declarative knowledge, Forward vs Backward Reasoning matching, Control knowledge.

UNIT-IV (11 Hrs.)

Expert Systems - Rule-Based system architecture, Non-production system Architecture, Dealing with uncertainty, Knowledge acquisition and validation, Knowledge system Building tools.

Recommended Books

1. Elaine Rich and Kevin Knight, 'Artificial Intelligence', Tata McGraw Hill, 5th Edn., **2014**.
2. Dan. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall India, 1st Edn., **2015**.
3. Eugene Charniak and Drew McDermott, 'Introduction to Artificial Intelligence', Pearson Education, 1st Edn., **2002**.

PROJECT (PLANNING AND DESIGN)

Subject Code: MCAP1-523

**L T P C
0 0 8 4**

Students are encouraging for the Project Planning & Design which covers the schematic design phase of a project. They are also learning to building the layout design, review building codes and regulations, coordinate schematics etc.

THEORY OF COMPUTATION

Subject Code: MCAP1-524

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to:

1. Design a finite automaton to recognize a given regular language and transform a language into regular expression or finite automaton or transition graph.
2. Define deterministic and nondeterministic finite automata and prove properties of regular languages and their classification.

3. Build a context-free grammar for pushdown automata.
4. Design Turing machine and Post machine for a given language.

UNIT-I (10 Hrs.)

Finite Automata - Formal language, need for formal computational models, Non computational models, Deterministic finite Automata, Non deterministic finite Automata, Equivalence of NFA and DFA, 2-Way Finite Automata, Crossing sequences, Moore and Mealy Machine, Application of finite automata i.e. Lexical Analyzers, text editors.

UNIT-II (10 Hrs.)

Regular Expression and Languages - Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between regular expressions and finite Automata, Application of Regular Expressions, Lexical analysis, Finding pattern in text.

UNIT-III (12 Hrs)

Regular Languages and Regular sets - Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of regular language, The Myhill-Nerode Theorem, Minimization of finite Automata.

Pushdown Automata - Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context free grammar.

UNIT-IV (13 Hrs.)

Context free Grammar and Languages - Context Free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, parsing techniques for parsing of general CFG's, Properties of Context Free Languages, Normal forms for context free grammars, The Pumping Lemma for context free Languages, Closure properties of context free languages.

Turing Machine (TM) - One Tape, multi-tape, The notions of time and space complexity in terms of T.M. Construction of simple problems, Computational complexity.

Recommended Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 'Introduction to Automata Theory, Languages and Computation', 3rd Edn., Pearson, 2006.
2. Daniel I.A. Cohen, 'Introduction to Computer Theory', 2nd Edn., Wiley, 2011.
3. Adesh K. Pandey, 'Theory of Automata and Computation', S.K. Kataria & Sons, 2013.
4. K.L.P. Mishra, 'Theory of Computer Science: Automata, Languages and Computation', Prentice Hall India Learning Private Limited, 3rd Edn., 2006.

INFORMATION AND NETWORK SECURITY

Subject Code: MCA1-525

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to:

1. Identify common network security vulnerabilities and attacks and explain the foundations of Cryptography and network security.
2. Impart knowledge on Encryption techniques, Design Principles and Modes of operation.
3. Be familiar with Firewall Design Principles and network security designs using available secure solutions.

UNIT-I (10 Hrs.)

Introduction - Security Attacks (Passive & Active Attacks), Security Services, Security Mechanisms, Model for Internetwork Security, Man in the middle attack, Conventional Encryption Principles, Monoalphabetic ciphers, Playfair Ciphers, Transposition Ciphers, Cipher block chaining mode, Approaches of message authentication.

UNIT-II (11 Hrs.)

Public Key Cryptography - Public Key Cryptography Principles, RSA algorithm, Digital Signatures, Digital Certificates, Certificate Authority and Key management Kerberos, X.509 Directory Authentication Service.

UNIT-III (12 Hrs.)

IP Security - Security Problems of IP, Security Objectives, IP Security Protocol Modes, Authentication Header, Security Payload. Firewall Characteristics, Types of Firewalls and their practical use, NAT.

UNIT-IV (12 Hrs.)

Email and Web Security - PGP, S/MIME, Security Socket Layer, Transport Layer Security, Secure Electronic Transaction.

Recommended Books:

1. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, 'Handbook of Applied Cryptography', Jaypee Medical, 1996.
2. Bart Preneel, Christof Paar and Jan Pelzl, 'Understanding Cryptography', 1st Edn., Springer, 2010.
3. Bernard Menezes, 'Network Security and Cryptography', 1st Edn., Cengage, 2010.
4. William Stallings, 'Network Security Essentials Applications and Standards', 5th Edn., Pearson, 2013.

LAMP TECHNOLOGIES

Subject Code: MCAP1-565

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes: After completion of this course, the students would be able to;

1. Understand brief introduction to the open source technologies.
2. Understand interactive sessions enabling students to enhance their skills in contributing and implementing their technical knowledge.

UNIT-I (10 Hrs.)

Introduction - Open Source definition, Free Software vs. Open Source Software, Public Domain Software, Open Source history, Initiatives, Principle and Methodologies, Open Standards.

Open Source Development Model Licenses and Patents - What Is a License, Important FOSS Licenses (Apache, BSD, GPL, LGPL), Copyrights and Copy lefts, Patents Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization.

UNIT-II (12 Hrs.)

Programming on PHP and JavaScript - JavaScript: JavaScript variables, control structures, functions, arrays and objects. Cascading Style Sheets, Client Side Scripting - Java Script, PHP: Form processing and business logic, stream processing and regular expressions, viewing client/server environment variables, connecting to database and handling of cookies. SQL, Accessing databases with PHP.

UNIT-III (11 Hrs.)

Open Source Web Technologies - Two Tier and Three Tier Web based Application Architecture. Apache, Web server conceptual working, Installation and Configuration, httpd.conf file, Logging, Security, Running a website, MySQL, ER diagram, Relational database, Installation, Configuration, Administration, Common SQL queries, PHP, Dynamic content, Server side scripting, Installation, Configuration, Administration, Language syntax, Built-in functions, PHP and MySQL connectivity.

UNIT- IV (12 Hrs.)

Open Source Ethics -Open source vs. closed source Open source government, Open source ethics. Social and Financial impacts of open source technology, shared software, Shared source.

Programming on XHTML and XML - Editing XHTML, W3C XHTML validation services, designing XHTML by using XHTML tables, frames, forms and other elements. CSS and its types. XML, XML namespaces, DTD, XML schema, XML vocabularies, DOM and its methods, SOAP.

Recommended Books

1. B. Ware, B. Lee J., 'Open Source Development with Lamp: Using Linux, Apache, MySQL, Perl, and PHP', 1st Edn., Addison-Wesley Professional, **2003**.
2. Rosebrock E., Filson E., 'Setting Up LAMP – Getting Linux, Apache, MySQL, and PHP Working Together', SYBEX Inc., 1st Edn., **2004**.
3. Deitel, 'Internet and World wide web, How to Program', 4th Edn., Prentice Hall, **2008**.

DATABASE ADMINISTRATION

Subject Code: MCAP1-566

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes:

After completion of this course, the students would be able to:

1. Learn install and configure various database packages. The student will also learn various database objects like tables, views and indexes.
2. Learn various database tasks like data migration, Importing and Exporting data.
3. Learn to create user accounts, grant privileges and implement database encryption.
4. Learn Database backup and recovery and perform database tuning and optimization.

UNIT-I (12 Hrs.)

Introduction - Understanding role and responsibilities of DBA, Database Environment management (network, CPU, disk and RAM), Installing and upgrading various database packages (MS SQL Server, Oracle, MySQL), Comparing various database packages, configuring various services and components, Understanding the client/server model, Communication protocols, Database instance management, Creating and managing various database objects (tables, views, indexes).

UNIT-II (12 Hrs.)

Managing Database Servers - Understating client tools for administrative tasks, Task Automation, implementing migration, consolidation and upgrade strategy, Hardware resource allocation, Business policy implementation, Monitoring and trouble-shooting, implementing database compression, Database Replication and multiple servers, Exporting and Importing data, Managing Data integrity.

UNIT-III (10 Hrs.)

Security and Availability - Understanding User Access and Security, Creating and modifying user accounts, Creating, Modifying and Using roles, Granting and Revoking Privileges, querying role information, Database backup, restoration and recovery, Types of failure, defining a backup and recovery strategy, Testing the backup and recovery plan, RAID implementation.

UNIT-IV (11 Hrs.)

Performance Tuning - Introduction to performance tuning and its requirement, performance tuning methodology, Monitoring status variables that affect performance, General Table Optimizations, using indexes to improve performance, Monitoring and optimizing the

performance of the database, identifying full-table scans, Re-writing SQL queries, tuning sub-queries, Database mirroring, clustering.

Recommended Books:

1. Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla and Aaron Nelson, 'Microsoft SQL Server 2012 Bible', Wiley India Pvt Ltd., **2012**.
2. Ken Simmons and Sylvester Carstarphen, 'Pro SQL Server 2012 Administration', 2nd Edn., Dreamtech Press, **2012**.
3. Sam R. Alapati, 'Expert Oracle Database 11g Administration', Dreamtech Press, **2009**.
4. Sheeri K. Cabral and Keith Murphy, 'MySQL Administrator's Bible', John Wiley & Sons, **2009**.

SOFTWARE LAB-IX (LAMP TECHNOLOGIES)

Subject Code: MCAP1-567

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-565. Students are required to do at least 8 assignments based on the paper.

SOFTWARE LAB-X (DATABASE ADMINISTRATION)

Subject Code: MCAP1-568

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-566. Students are required to do at least 8 assignments based on the paper.

CURRENT TRENDS AND TECHNOLOGY

Subject Code: MCAP1-626

L T P C

3 1 0 4

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to

1. Recognise the concepts of emerging technologies.
2. Analyse the components of cloud computing.
3. Critically analyse case studies to derive the best practice model to apply when developing and deploying parallel, distributed, cloud and IoT based applications.

UNIT-I (10 Hrs.)

Introduction to Computing-Emerging Trends in Computing like Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, High Performance Computing, Autonomic Computing.

UNIT-II (11 Hrs.)

Cloud Computing-Introduction, Cloud Types, Uses of Cloud, Components of Cloud Computing - Software as a Service, Platform as a Service, Infrastructure as a Service, Virtualization in Cloud Computing, Concept of Green Clouds.

UNIT-III (12 Hrs.)

Soft Computing-Soft Computing VS Hard Computing; Introduction to Neural Networks – Intelligence, Neurons, Artificial Neural Networks, Application Scope of Neural Network, Brain VS Computer.

UNIT-IV (12 Hrs.)

IoT and Fog Computing-Topologies, Edge Routers, Client-Server Architecture, P2P, M2M, Introduction to Fog Computing, Benefits of Fog Computing.

Recommended Books

1. Joshy Joseph, Craig Fellenstein, ‘Grid Computing’, Prentice Hall Professional, 1st Edn., **2004**.
2. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, ‘Cloud Computing Principles Paradigms’. 1st Edn., Wiley, **2011**.
3. Tettamanzi, Andrea, Tomassini and Macro, ‘Soft Computing’, Springer, **2001**.
4. Rajkumar Buyaa, Vecchiola, Selvi, ‘Mastering Cloud Computing’, McGraw Hill, 1st Edn., **2013**.
5. Arshdeep Bahga, Vijay Madiseti, 'Internet of Things (A Hands -on- Approach)', VPT, 1st Edn., **2014**.

PROJECT (IMPLEMENTAION AND EXECUTION)

Subject Code: MCAP1-627

L T P C
0 0 20 10

Duration: 45 Hrs.

The Implementation of the Project is based on concepts build in **MCAP1-523 Project Planning & designing** and will help to put the project into an action. The Implementation phase consists of four sub phases: Execution, Monitoring & Control, and Move to Production. Project implementation where *visions* and plans become reality.

BIG DATA

Subject Code: MCAP1-669

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes: After completion of this course, the students would be able to:

1. Model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. Analyze methods and algorithms, to compare and evaluate them with respect to time and space requirements, and make appropriate design choices when solving real-world problems.
3. Apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.

UNIT-I (10 Hrs.)

Introduction to Big Data-Introduction – distributed file system – Big Data and Its Importance, Four Vs, Drivers for Big Data, Big Data Applications, Algorithms using Map Reduce, Matrix-Vector Multiplication by Map Reduce, Clustering

UNIT-II (10 Hrs.)

Big Data Technology Landscape-Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.

UNIT-III (10 Hrs.)

Big Data Analytics-Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.

UNIT-IV (15 Hrs.)

Big Data Implementation-Big Data Workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a Business Scenario, Security and Governance for Big Data, Big Data on Cloud,

Best Practices in Big Data Implementation, Latest Trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations.

Recommended Books:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, 'Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses', Wiley, 1st Edn., **2013**.
2. White T., 'Hadoop: The Definitive Guide', O' Reilly Media, 3rd Edn., **2012**.

CLOUD COMPUTING

Subject Code: MCA1-670

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. To understand the basic concepts Cloud Computing.
2. To understand the taxonomy and types of Cloud Computing.
3. To understand different hypervisors of Clouds for the Virtualization.

UNIT-I (10 Hrs.)

Evolution of Cloud Computing - Vision of Cloud Computing, Definition, Deployment models, Reference models, Benefits and Challenges to Cloud Computing, already using Cloud Computing; Electronic Faxing, Voice in the Cloud, Commerce in the Cloud, Distributed Hosting in the Cloud, Accounting and Online Banking in the Cloud, Cloud Computing Applications.

UNIT-II (10 Hrs.)

Cloud Service Providers and Cloud Vendor's - IaaS Providers, PaaS Providers, SaaS Providers, Specialized Cloud Software Providers. Cloud Vendor's IBM, Amazon AWS, HP, Oracle.

UNIT-III (13 Hrs.)

Securing the Cloud- Reliability, Availability and Security: FUDD Factor, DoS Attack, Trust, Standard and Vendor Selection, SAS70 and Cloud Computing, Cloud Security Alliance, SysTrust Certification, Cloud Audit.

UNIT-IV (12 Hrs.)

Demystifying the Cloud- A Case Study using Amazon's Cloud Service, Using Amazon's S3 Functionality, moving a Simple Application to the Cloud; Step1, Move Static Content to S3, Step2; Move Web Servers and Backend, Moving the database, Eucalyptus, Nimbus.

Recommended Books

1. Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms' Wiley, 1st Edn., **2011**.
2. David E.Y. Sarna, 'Implementing and Developing Cloud Computing Applications', CRC Press, 1st Edn., **2011**.
3. Chris Wolf, Erick M. Halter, 'Virtualization: From the Desktop to the Enterprise', A Press, 1st Edn., **2005**.
4. George Reese, 'Cloud Application Architectures: Building Applications and Infrastructure in the Cloud', O'Reilly Publishers, 1st Edn., **2009**.

DOT NET FRAMEWORK

Subject Code: MCA1-671

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Outcomes

1. To know about basic goals of the .NET Framework.

2. A working knowledge of the C# programming language.
3. An understanding of how to use forms to develop GUI programs under .NET.
4. Knowledge of some of the tools available in the .NET Framework class library.

UNIT-I (10 Hrs.)

The .Net framework - Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In -Time Compilation, Framework Base Classes.

UNIT-II (10 Hrs.)

C - Sharp Language (C#) - Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events, Type conversion.

UNIT-III (13 Hrs.)

C# Using Libraries - Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

UNIT-IV (12 Hrs.)

Advanced Features Using C# - Web Services, Window Services, ASP.NET Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

Recommended Books

1. E. Balagurusamy, 'Programming in C#', 3rd Edn., Tata McGraw Hill, 2010.
2. Mark Michaelis, 'Essential C# 3.0: For .NET Framework 3.5', Addison Wesley, 2nd Edn., 2008.
3. Kogent Learning Solutions Inc, 'C# 2012 Programming Black Book Covers .NET 4.5', Dreamtech Press, 1st Edn., 2012.

MOBILE COMPUTING & ANDROID

Subject Code: MCAP1-672

L T P C
3 1 0 4

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Introduction to Android - Installing Android Studio, Layouts, Views and Resources, Scrolling Views, Working with TextView Elements.

Activities and Intents - Create and Start Activities, Lifecycle and State Callbacks, Testing and Debugging, and Backwards Compatibility: Debugging and Testing app, Support libraries.

UNIT-II (9 Hrs.)

User Interaction and Navigation - User Input Controls: Use Keyboards, Input Controls, Alerts, and Pickers, Menus and Radio Buttons, Screen Navigation.

Themes and Styles: Theme, Custom Styles, Drawables, adapt layouts for multiple devices and orientations, Using Espresso to test UI

UNIT-III (13 Hrs.)

Connect to the Internet -Google APIs Explorer, JSON, Books API, Use AsyncTaskLoader Triggering, Scheduling, and Optimizing, Background Tasks: Alarm Manager, Job Scheduler, Firebase Job Dispatcher.

UNIT- IV (11 Hrs.)

Data Saving, Retrieving, Loading - Storing Data using SQLite, Sharing Data: Implement a Content Provider, Loading Data using Loaders, publishing app: Permissions and Libraries, monetizing your app, Making and publishing APKs.

Windows Phone 7- Windows Phone 7 Project, Building an App in Windows Phone 7, Distribution.

1. Jeff Mcwherter, Scott Gowell, 'Professional Mobile Application Development', Wrox Publisher, 1st Edn., **2012**.
2. Lauren Darcy and Shane Conder 'Teach Yourself Android Application Development in 24 Hrs', Sams Publications, 1stEdn., **2009**.
3. Himanshu Dwivedi, Chris Clark, David Thiel, 'Mobile Application Security', Tata McGraw Hill, 1st Edn., **2010**.

SOFT COMPUTING

Subject Code: MCAP1-673

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Outcomes

1. To know about the basics of soft computing techniques and also their use in some real life situations
2. To learn the key aspects of Soft computing
3. To understand the features of neural network and its applications

UNIT-I (11 Hrs.)

Introduction - Introduction to Soft Computing, Introduction to biological and artificial neural network, Introduction to fuzzy sets and fuzzy logic systems, Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

UNIT-II (11 Hrs.)

Artificial Neural Networks - Different artificial neural network models, Learning in artificial neural networks, Neural network applications in control systems, Neural Nets and applications of Neural Network.

UNIT-III (12 Hrs.)

Fuzzy Systems - Fuzzy sets, Fuzzy reasoning, Fuzzy inference systems, Fuzzy control, Fuzzy clustering, Applications of fuzzy systems, Neuro-fuzzy systems, Neuro-fuzzy modeling, Neuro-fuzzy control.

UNIT-IV (11 Hrs.)

Applications - Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Recommended Books

1. S. Rajasekaran and G.A. Vijaylakshmi Pai, 'Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications', Prentice Hall India, 1st Edn., **2007**.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, 'Neuro-Fuzzy and Soft Computing', Pearson Education, 1st Edn., **2015**.
3. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley, 3rd Edn., **2011**.

SOFTWARE LAB - XI (BIG DATA)

Subject Code: MCAP1-674

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-669. Students are required to do at least 10 assignments based on the paper.

SOFTWARE LAB - XII (CLOUD COMPUTING)

Subject Code: MCAP1-675

L T P C
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-670. Students are required to do at least 10 assignments based on the paper.

SOFTWARE LAB - XIII (DOT NET FRAMEWORK)

Subject Code: MCAP1-676

L T P C
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-671. Students are required to do at least 10 assignments based on the paper.

SOFTWARE LAB - XV (MOBILE COMPUTING & ANDROID)

Subject Code: MCAP1-677

L T P C
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-672. Students are required to do at least 10 assignments based on the paper.

SOFTWARE LAB - XVII (SOFT COMPUTING)

Subject Code: MCAP1-678

L T P C
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP1-673. Students are required to do at least 10 assignments based on the paper.

ORGANIZATION BEHAVIOR

Subject Code: MBAD0-F95

L T P C
3 0 0 3

Duration: 40 Hrs.

Course Outcomes: The course aims to provide an understanding of basic concepts, theories and techniques in the field of human behavior at the individual, group and organizational levels in the changing global scenario. The course must be taught using case study method.

UNIT – I (10 Hrs.)

Organizational Behavior: Concepts and contributing disciplines to OB, Challenges and opportunities for OB. Foundations of Individual Behavior: biographical Characteristics, Learning, Theories of Learning, Attitudes, Personality: Determinants of Personality, Perception.

UNIT – II (10 Hrs.)

Motivation: Definition, Maslow, Herzberg, XY & Z theory and Victor Vroom's Expectancy theory.

Job Satisfaction: Nature & Significance of Job satisfaction, Leadership: Theories of Leadership; Nature & Significance of Leadership; Leadership traits & Skills.

UNIT – III (10 Hrs.)

Foundations of Group Behavior: Nature, Concept, Stages & Theories of Group Formation. Teams, Difference between Group & Team.

Group Decision Making: Meaning, Nature & process of group decision making process
Conflict Management: Definition of Conflict, transitions in Conflict thought; Functional Vs Dysfunctional Conflict.

Negotiations: Meaning, definition & Process; Issues in Negotiations.

UNIT – IV (10 Hrs.)

Organizational Change & Development: Definition, Change Agents & Resistance to Change. Power and Politics in Organization.

Stress Management: Meaning and Concept of stress, strategies to overcome the stress.

Recommended Books

1. Robbins, 'Organization Behaviour', Pearson Education.
2. Luthans, 'Organization Behaviour', Tata McGraw Hill.
3. Hersey, 'Management of Organizational Behaviour', Prentice Hall India.
4. Aswathappa, 'Organization Behaviour', Himalaya Publications.
5. L.M. Prasad, 'Organisation Behaviour', Sultan Chand.
6. Parikh, Gupta, 'Organisational Behaviour', Tata McGraw Hill.

MRSPTU

POST GRADUATE DIPLOMA IN COMPUTER APPLICATION

Total Contact Hours = 27

Total Marks = 700

Total Credits = 22

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
PCAP1-101	Information Technology and Office Automation	3	1	-	40	60	100	4
PCAP1 -102	Programming in C	3	1	-	40	60	100	4
PCAP1 -103	Computer Architecture and Organization	3	1	-	40	60	100	4
PCAP1-104	Software Engineering	3	-	-	40	60	100	3
PCAP1-105	Software Lab-I (Information Technology and Office Automation based on PCAP1-101)	-	-	4	60	40	100	2
PCAP1-106	Software Lab-II (Programming in C based on PCAP1-102)	-	-	4	60	40	100	2
MHUM0-104	Business Communication	2	-	2	40	60	100	3
Total	Theory = 5 Labs = 2	14	3	10	320	380	700	22

Total Contact Hours = 30

Total Marks = 700

Total Credits = 23

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
PCAP1-207	Database Management System	3	1	-	40	60	100	4
PCAP1-208	Computer Networks	3	1	-	40	60	100	4
PCAP1-209	Operating System	3	1	-	40	60	100	4
PCAP1-210	Seminar	-	-	6	40	60	100	3
PCAP1-211	Software Lab-III(Database Management System based on PCAP1-207)	-	-	4	60	40	100	2
Departmental Elective - I								
PCAP1-256	Programming in Java	3	1	-	40	60	100	4
PCAP1-257	Programming in PHP	3	1	-	40	60	100	4
PCAP1-258	Programming in ASP.Net	3	1	-	40	60	100	4
PCAP1-259	Software Lab-IV(Programming in Java based on PCAP1-256)	-	-	4	60	40	100	2
PCAP1-260	Software Lab-V(Programming in PHP based on PCAP1-257)	-	-	4	60	40	100	2
PCAP1-261	Software Lab-VI (Programming in ASP.Net based on PCAP1-258)	-	-	4	60	40	100	2
Total	Theory = 4 Lab = 2	12	4	14	320	380	700	23

*Note: Students have to select a combination of subjects in Departmental Elective –I as below:

- i) PCAP1-256 and PCAP1-259
- ii) PCAP1-257 and PCAP1-260
- iii) PCAP1-258 and PCAP1-261

Overall

Semester	Marks	Credits
1 st	700	22
2 nd	700	23
Total	1400	45

MRSPTU

FUNDAMENTALS OF INFORMATION TECHNOLOGY & OFFICE AUTOMATION

Subject Code: PCAP1-101

L T P C

Duration: 46 Hrs

3 1 0 4

Learning Objectives

1. This course will enable the student to gain an understanding of the core concepts and technologies which constitute Information Technology.
2. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology and Office Tools.

UNIT-I (13 Hrs)

Historical Evolution of Computer - Block Diagram of computer, Characterization of computers, Types of computers, Computer Generations.

Basic Anatomy of Computers - Memory unit, Input-output unit, Arithmetic logic unit, Control unit, Central processing unit, RAM, ROM, PROM, EPROM.

Input-Output Devices - Keyboard, Mouse, Joy stick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Voice Recognition Devices, Optical Recognition devices, Dot matrix, Character and Line printer, Desk Jet printer, Laser printer and Plotters.

UNIT-II (9 Hrs)

Number System - Non-positional and Positional number systems, Base conversion, Binary, Decimal, Hexadecimal and Octal systems, Conversion from one system to the other.

Binary Arithmetic - Addition, Subtraction and Multiplication

Computer Codes - Weighted and Non-weighted code, BCD, EBCDIC, ASCII, Unicode, XS-3, Grey Codes

UNIT-III (13 Hrs)

Computer Software - Introduction, Types of software.

Personal Productivity Software - Word processing: Editing features, Formatting features, Saving, Printing, Table handling, Page settings, Spell-checking, Macros, Mail-merge and Equation editors.

Spreadsheet - Workbook, Worksheets, Data Types, Operators, Cell Formats, Freeze Panes, Editing Features, Formatting Features, Creating Formulas, Using Formulas, Cell References.

Presentation Graphics Software - Templates, Views, Formatting Slide, Slides with Graphs, Animation, Using Special Features, Presenting Slide Shows

UNIT- IV (11 Hrs)

Computer Network and Communication - Network types, Network topologies, Network communication devices.

Internet and its Applications - E-mail, TELNET, FTP, World Wide Web, Internet chatting, Intranet, Extranet, Gopher, Mosaic, WAIS.

Security management Tools - PC tools, Norton Utilities, Virus, Worms, Threats, Virus Detection, Prevention and Cure Utilities, Firewalls, Proxy Servers.

Recommended Books

1. V. Rajaraman, 'Fundamental of Computers', 3rd Edn., PHI.
2. Satish Jain, 'Information Technology Concepts', 4th Edn., BPB Publications.
3. P.K. Sinha, 'Foundations of Computing', 1ST Edn., BPB.

4. Turban, Mclean and Wetherbe, 'Information Technology for Management', 2nd Edition", John Wiley & Sons.
5. Courter G, 'Mastering MS Office 2000 Professional', 2nd Edn., BPB Publication.
6. Steve Sagman, 'MS- Office 2000 for Windows', 1st Edn., Addison Wesley.

Learning Outcomes

After completion of this course, the students would be able to:

1. Identify and understand the working of key components of a computer system and representation of numbers, alphabets and other characters.
2. Identify and understand the working of different operating systems and to install windows.
3. Become proficient in using the features of word processing in Word processing.
4. Students will be able to create technical and complex spreadsheets for data analysis using spreadsheet tools.
5. Students will become proficient to develop effective and professional business presentations using Power Point tools.
6. The students will learn about types of Communication networks, use of internet applications and security within the context of Information Technology.

PROGRAMMING IN C

Subject Code: PCAP1-102

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objectives

1. The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming).
2. Students will learn to write algorithm for solutions to various real life problems and converting the algorithms into computer programs using C language.

UNIT-I (11 Hrs)

Programming Process - Problem definition, Algorithms, Flow Charts, C Character set, Identifiers and Keywords, Constant and Variables, Data types, Declarations, Statements and Symbolic Constants.

Operators and Expressions - Arithmetic, Relational, Logical, Unary operators.

Bitwise Operators - AND, OR, Complement precedence and Associating bitwise shift operators

Input-Output - Standard, Console and String functions.

Coding Standards - Inline documentation, Indentation of Code.

Naming Conventions - Variables, Global Variables, Functions, Structures.

Debugging - Tracking defects, Debugging by Code Inspection, Debugging by logs, Debugging using step-by-step execution, using break points.

UNIT-II (13 hrs)

Control Statements - Branching, Looping using for, While and Do-while Statements, Nested control structures, Switch, Break, Continue statements.

Arrays - Definition, Access of Elements, Initialization, Multidimensional arrays, Character arrays.

Pointers - Address and Dereferencing operators, Declaration, Assignment, Initialization, Arithmetic, Precedence of Address and Dereferencing Operators, Pointer Comparison, Conversion, Pointer arrays and Pointers to Pointers. Pointers and Strings, Void pointers, Dynamic Memory Management

UNIT-III (10 Hrs)

Functions - Definition, Call, Prototypes, Formal and Actual parameters, passing arguments to functions, Call by value and Call by address, Passing array elements as arguments and Passing arrays as arguments, Recursion, Recursion v/s Iteration.

Program Structure - Storage classes, Automatic, External and Static variables.

Pre-processor Directives - #include, #define, #undef, #if, #ifdef, #ifndef, #else, #elif, #endif, #error, #pragma, Predefine macros.

UNIT-IV (11 Hrs)

Structure - Variable, Initialization, Accessing members, Assignment, Size of structure, Scope of a structure, Nested structures, Pointer to structures, Scope of a structure, Type definition, Structure as function arguments, Arrays of structures, Structures containing arrays, Self-referential structures, Bit fields, Union, Enumerated data type.

File Processing - Opening and Closing, Data files, Creation, Processing & Unformatted data files, Random file access, Command line arguments.

Recommended Books

1. Shubhnandan Jamwal, 'Programming in C', 3rd Edn., Pearson.
2. E. Balagurusamy, 'Programming in ANSI C', 2nd Edn., Tata McGraw Hill.
1. Brian Kernighan and Dennis Ritchie, 'C Programming Language', 2nd Edn., PHI.
2. Byron Gottfried, 'Programming with C', 2nd Edn., Tata McGraw Hill.
3. ISRD Group, 'Programming and Problem Solving Using C, 3rd Edn., Tata McGraw Hill.
4. Yashvant P. Kanetkar, 'Let us C', 2nd Edn., BPB Publications, New Delhi.

Learning Outcomes

After completion of this course, the students would be able to:

1. Understand the basic terminology used in computer programming. Students will be able to write, compile and debug programs in C language and use different data types in a computer program.
2. Design programs involving decision structures, loops, breaking control statements.
3. Design programs using arrays and understand the dynamics of memory by the use of pointers.
4. Design programs involving functions and learn to understand and analyze the use of storage classes and pre-processor directives.
5. Provide students with the means of writing efficient code using structures and learn file handling.

COMPUTER ORGANIZATION AND ARCHITECTURE

Subject Code: PCAP1-103

L T P C

Duration: 45 Hrs.

3 1 0 4

Learning Objectives

1. To make students aware about the basic building blocks of computer system and how the different components are interfaced together.
2. Students will come to know about the basic functioning of various parts of computer system from hardware point of view and interfacing of various peripheral devices used with the system.

UNIT-I (15 Hrs)

Boolean Algebra - Boolean operations, Truth Tables, Boolean Laws, K-maps (2, 3 and 4 variable maps, don't care conditions).

Basic Gates, Combinational Logic Design - Half-adder, Full adder, Parallel adder.

Sequential Circuits - Concept, Flip-flops (D, RS, JK, T), Counters (Ripple, Asynchronous, Synchronous)

UNIT-II (9 Hrs)

Basic Computer Organization and Design - Common Bus System, Registers, Instruction codes, Computer Instructions, Timing and Control, Instruction Cycle, Arithmetic, Logic & Shift micro operations instructions, Memory Reference Instructions, Design of Basic Computer and it's working, Addressing modes.

UNIT-III (9 Hrs)

Programming & Controlling Basic Computer - Machine & Assembly Language, Programming Arithmetic and Logic Operations, Hardwired & Micro programmed control, Address Sequencing, Design of a control unit, Features of RISC and CISC.

UNIT- IV (12 Hrs)

Memory Organization - Main Memory-Memory Address Map, Memory connection to CPU, Associative Memory-Hardware organization, Cache Memory-Levels of Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory.

I/O organization - I/O interface, Modes of data transfer: Programmed I/O, Interrupt initiated I/O, DMA. , Block diagram depicting architecture of 8085 machine.

Recommended Books

1. M. Morris Mano, 'Computer System Architecture', 3rd Edn., PHI.
2. William Stallings, 'Computer Organization and Architecture', Pearson.
3. P.V.S. Rao, 'Computer System Architecture', 2nd Edn., PHI.
4. J.P. Hayes, 'Computer Architecture & Organization, 3rd Edn., McGraw Hill.
5. Stone, 'Introduction to Computer Architecture', 3rd Edn., Galgotia.
6. Tanenbaum, 'Structured Computer Organization', 3rd Edn., PHI.

Learning Outcomes

After Completion of the course students will be able to

1. Acquired knowledge about basic logic gates and Boolean algebra.
2. Ability to Identify, Analyze and Design Combinational Circuits and Synchronous and Asynchronous Sequential Circuits.

3. Acquired Knowledge about Basic Computer Organization and Design.
4. Ability to Understand Programming & Controlling the Basic Computer System.
5. Acquired Knowledge about Memory Organization and I/O Organization.

SOFTWARE ENGINEERING

Subject Code: PCAP1-104

L T P C

Duration: 45Hrs.

3 1 0 4

Learning Objective:

The objective of the course is to help the students to get conceptual knowledge required for various methods. Model used under software development process as well as new techniques.

UNIT-I (9 Hrs)

Software Engineering - Evolution of Software Engineering, Goals of software engineering, Software Development vs. Software Engineering.

Software Process - Software Process, Waterfall, Spiral, Prototyping, Selection of appropriate process model Fourth Generation Techniques, Role of Metrics & Measurements.

UNIT-II (11 Hrs)

S/W Project Planning - Objectives of Software Project Planning. Decomposition techniques: S/W Sizing, Problem-based estimation, Process based estimation.

Cost Estimation Models - COCOMO Model, the S/W Equation.

Software Requirements Analysis - Analysis Principles, SRS, Components of SRS, Requirement Elicitation Techniques- FAST and QFD

UNIT-III (11 Hrs)

Software Design - Design Objectives, Principles, Design Concepts, Design Process

Design Methodologies - Data Design, Architectural Design, and Procedural Design, Object oriented design, User- interface design.

Principles of structured Analysis and Design Tools - DFD, DD, Decision Tables and Decision Trees.

UNIT-IV (14 Hrs)

Software Testing - Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases

Testing Techniques - White Box, Black-Box Testing & its Technique: Equivalence Class Partitioning, Boundary Value Analysis, White-Box Testing & its Techniques: Basis Path Testing, Structural Testing, Logic Based Testing, Fault Based Testing.

Software Testing Strategies - Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing, Alpha and Beta Testing, Regression Testing.

Recommended Books

1. R.S. Pressman, 'Software Engineering: A Practitioner's Approach', 3rd Edn., McGraw Hill.
2. P. Jalote, 'An Integrated Approach to Software Engineering', 3rd Edn., Narosa Publishing House.
3. Rajib Mall, 'Fundamentals of Software Engineering', 2nd Edn., PHI.
4. Deutsch, Willis, 'Software Quality Engineering: A Total Technical and Management Approach', 2nd Edn., Prentice Hall.

5. T.G. Lewis, 'Software Engineering', 2nd Edn., McGraw Hill.
6. Shere, Kenneth, 'Software Engineering & Management', 2nd Edn., Prentice Hall.

Learning Outcomes

1. Understand the Process to be followed in SDLC
2. Knowledge about Project Planning and Cost Estimation Models.
3. Define Formulate and Analyze a Problem.
4. Ability to Understand Software Design in Detail.
5. Apply Testing Principles to Software Project Development.

SOFTWARE LAB – I

(INFORMATION TECHNOLOGY & OFFICE AUTOMATION BASED ON PCAP1-101)

Subject Code: PCAP1-105

L T P C
0 0 4 2

Duration: 60 Hrs.

Learning Objectives

1. This course will enable the student to gain and understanding of the core concepts and technologies which constitute Information Technology.
2. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology and Office Tools.

Windows Operating System - Installing WINDOWS with set-up, Starting and Quitting WINDOWS, Basic Elements of WINDOWS, Working with menus dialogue boxes, Window Applications, Windows Explorer, My Computer, Recycle bin, Programs, Favorites, My Documents.

Settings- Control Panel, Printers, Taskbar and Start menu, Folder Options, Active Desktop, Find, Help, Run.

Accessories – Entertainment, Games, System tools, Internet Tools, Calculator, Calendar, Clock, Card file, Note pad, Write pad, Recorder etc.

Word Processing & Presentation Tool - Salient Features of Word, Installation of Word, Starting and Quitting of Word, File, Edit, View, Insert, Format, Tools, Tables, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Word Processors and Software Packages.

Salient Features of Power Point, Installation, Starting and Quitting, File, Edit, View, Insert, Format, Tools, Slide Show, Window, Help options and all of their features, Options and Sub Options etc. Transfer of files between Presentation Tool and Software Packages.

Spreadsheet Tool - Spread Sheet, getting started with Excel worksheet, entering data into Work Sheet, editing cell addressing, Ranges and range names, Commands, Menus, Copying and Moving cell contents, Inserting and Deleting rows and columns, Column width control, Cell protection, Printing reports, Creating and Displaying Graphs, Statistical functions.

Learning Outcomes

After completion of this course, the students would be able to:

1. Familiarize with PC and WINDOWS commands, File creation, Editing, Directory creation.
2. Become proficient in using the features of word processing in Word.

3. Become proficient in using spreadsheet software and be able to create technical and complex spreadsheets for data analysis using spreadsheet tools.
4. Understand the use of Internet and its applications

SOFTWARE LAB – II

(PROGRAMMING IN C - BASED ON PCAP1-102)

Subject Code: PCAP1-106

L T P C

0 0 4 2

Note: Program should be fully documented with simple I/O data. Flow charts should be developed wherever necessary.

Implement the following Concepts in C Programming:

1. **Decision Making:** switch, if-else, nested if, else-if ladder, break, continue, goto
2. **Loops:** while, do-while, for statements.
3. **Functions:** Definition, Declaration, variable scope, parameterized functions, return statement, call by value, Call by reference, recursive functions.
4. **Pre-processor Directives:** Pre-processor directives like INCLUDE, IFDEF, DEFINE etc.
5. **Header Files:** STDIO.H, MATH.H, STRING.H, PROCESS.H etc
6. **Arrays:** Array declarations, Single and multi-dimensional, memory limits, strings and string functions
7. **Pointers:** Pointer declarations, pointer to function, pointer to array/string
8. **Files:** Creation and editing of various types of files, closing a file (using functions and without functions)

Learning Outcomes

After completion of this course, the students would be able to:

1. Apply and practice logical ability to solve the problems.
2. Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment.
3. Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs
4. Understand and apply the in-built functions and customized functions for solving the problems.
5. Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6. Document and present the algorithms, flowcharts and programs in form of user-manuals.

BUSINESS COMMUNICATIONS

Subject Code: MHUM0-104

L T P C

Duration: 28 Hrs

2 0 2 3

Learning Objective: This course is designed to give students a comprehensive view of communication, its scope and importance in business, the role of communication in establishing a favourable image of the organization. The aim is to develop students' ability to

communicate correctly and effectively on matters having relevance to day-to-day business operations. This course will make student conversant with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform their communication abilities.

UNIT- I (7 Hrs)

Introduction to Communication: Meaning, Process, Importance of Communication in Business, Types of Information, Formal and Informal Communication, Internal and External Communication. Approaches to Effective Communication, Essentials of Effective Business Communication (7Cs model)

Written Communication: Advantages and Disadvantages, Covering letter, Need, Functions and Kinds, Layout of Letter Writing, Types of Letter Writing: Persuasive Letters, Request Letters, Sales Letters, Complaints and Adjustments

UNIT –II (7 Hrs)

Developing Reading Skills: Identify the Purpose of Reading, Factors Effecting Reading, Learning How to Think and Read, Developing Effective Reading Habits, Reading Tactics and Strategies: Training Eye and Training Mind (SQ3R)

Developing Listening Skills: Importance, Purpose of Listening, Art of Listening, Factors Affecting Listening, Components of Effective Listening, Process of Listening, Principles and Barriers to Listening, Activities to Improve Listening

UNIT- III (7 Hrs)

Oral Communication: Advantages and Disadvantages, Conversation as Communication, Art of Public Speaking, Group Communication Through Committees, Preparing and Holding Meetings, Overcoming Stage Fright, Ambiguity Avoidance.

Departmental Communication: Meaning, Need and Types: Interview Letters, Promotion Letters, Resignation Letters, Newsletters, Circulars, Agenda, Notice, Office Memorandums, Office Orders, Press Release

Report Writing: Structure, Types, Formats, Drafting of Various Types of Report. Nonverbal – Features, Understanding of Body Language, Posture, Gestures. Influences on Communication: Social Influences, Culture and Communication, Few Guidelines for Better Multicultural Communication, Business Etiquettes and Communication.

UNIT- IV (7 Hrs)

Group Discussion: Nature, Uses And Importance, Guidelines for GD Presentations: How To Make Effective Presentations, Four P^s of Presentation, Structuring, Rehearsing and Delivery Methods.

Resume Writing: Planning, Organizing Contents, Layout, Guidelines for Good Resume. Interviews: Preparation Techniques, Frequently Asked Questions about How to Face an Interview Board, Proper Body Posture, Projecting a Positive Image, Steps To Succeed In Interviews, Practice Mock Interview in Classrooms.

The Case Method of Learning: Dimensions of a Case, Case Discussion, Usefulness of The Case Method, Training of Managers, Use The Case Method. Report Writing: Structure, Types, Formats, Preparations And Presentation.

Course Outcome: After studying this course the students will enable to:

- Know the dynamics of communication in the business world

- Practice the different tools of communication
- Enable them to speak effectively suited to the situation
- Improve their competence in English

Recommended Books

1. Lesikar, Petit & Flatley, 'Lesikar's Basic Business Communication', Tata McGraw Hill.
2. Raman Meenakshi 'Prakash Singh, Business Communication', Oxford University Press.
3. Rizvi Ashraf,' Effective Technical Communication', Tata McGraw Hill.
4. Krizan, Buddy, 'Merrier, Effective Business Communication', Cengage Learning.
5. Diwan & Aggarwal, 'Business Communication', Excel.
6. Baugh, Frayer & Thomas, 'How to Write First Class Business Correspondence', Viva Book.
7. Taylor, 'English Conversion Practice', Tata McGraw Hill.
8. Devaraj, 'Executive Communication', Tata McGraw Hill.
9. Ober, 'Effective Bossiness Communication', Cengage Learning.

DATABASE MANAGEMENT SYSTEM

Subject Code: PCAP1-207

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objective

The objective of this course is to help the students to get knowledge about databases its architecture various models.

UNIT-I (11 Hrs)

Traditional File Processing System - Characteristics, Limitations, Database: Definition, Composition.

Database Management System - Definition, Characteristics, Advantages over Traditional File Processing System, User of Database, DBA and its responsibilities, Database schema, Instance. DBMS architecture, Data independence, Three level Architecture of Database System: External Level, Conceptual Level and the internal level.

Database Languages - DDL, DML, DCL. Database utilities, Data Models, Keys: Super, Candidate, Primary, Unique and Foreign.

UNIT- II (11 Hrs)

Introduction to Data Models - Entity Relationship Model, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model

Entity Relationship Model - Concepts, Mapping cardinalities, Entity Relationship Diagram, Weak Entity Sets, Strong Entity Set, Aggregation, Generalization, Converting ER Diagrams to Table

Relational Data Model - Concepts, Constraints, Relational Algebra: Basic Operations, Additional Operations.

UNIT-III (14 Hrs)

Database Design - Functional Dependency, Decomposition, Problems Arising Out of Bad Database Design, Normalization, Multi-Valued Dependency, Database Design Process, Data Base Protection, Database Integrity.

Database Concurrency - Definition and Problems Arising Out of Concurrency

Database Security - Authentication, Authorization, Methods of Implementing Security.

UNIT- IV (9 Hrs)

MS-ACCESS - Introduction to MS-ACCESS, working with database and tables, queries in Access, Applying integrity constraints, Introduction to forms, sorting and filtering, Controls, Reports and Macro: creating reports, using Macros.

Recommended Books

1. C.J. Date, 'An Introduction to Data Base Systems', 3rd Edn., Narosa Publishers.
2. B.P. Desai, 'Database Management System', 3rd Edn., BPB Publications, New Delhi.
3. Henry F. Korth, S. Sudarshan, 'Database System Concepts', 3rd Edn., McGraw Hill.
4. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 5th Edn., Pearson.
5. Jeffrey D. Ullman, 'Principles of Database Systems', 2nd Edn., Galgotia Pub.
6. D. Kroenke., 'Database Processing', 2nd Edn., Galgotia Publications.
7. Naveen Prakash, 'Introduction to Database Management', 3rd Edn., TMH.
8. Joan Lambert, Joyce Cox, 'Microsoft Access 2013 Step by Step', 1st Edn., Kindle Publications.

Learning Outcomes

1. Describe fundamental elements of DBMS and database languages.
2. Explain the basic concepts of data models and relational database design.
3. Design E-R diagram to represent simple database applications scenarios.
4. Describe the concepts of Relational algebra and database language SQL.
5. Describe the concepts of design, concurrency and security.
6. The students will be able to use MS-ACCESS.

OPERATING SYSTEM

Subject Code: PCAP1-208

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Learning Objective

The objective of this course is to help the students to get detailed Knowledge of the various functions which are being performed by the operating system.

UNIT-I (13 Hrs)

Introduction to operating System - Operating system services, Introduction to various types of operating systems: Batch processing operating system, Multiprogramming operating system, Time Sharing operating system, Multi-tasking operating system, Distributed operating system, Network operating system, Real time operating system, Multi-processor system.

Process Management - Process concept, types of Process scheduling, Basic concept of CPU Scheduling, Scheduling criteria, and Scheduling algorithms: FCFS, SJF, Round Robin & Queue Algorithms, Deadlock definition and its characterization.

UNIT-II (11 Hrs)

Memory Management - Single Absolute Partition, Single reloadable partition, Multiprogramming and Multiple Partitions (Multiple Fixed Partitions, Multiple Variable Partitions (Partition Selection Algorithms), Paging, Segmentation

Virtual Memory - Demand Paging (Locality of Reference, Page Locking, Page Size, Page Replacement Algorithms, Algorithm Performance, Allocation Policies, Working Set).

UNIT- III (11 Hrs)

File System Management - Directories and Names (Partitions, Per-Process Root Directory, Directory Structure, and Directory Entries), Types of File System Objects, File System Functions, Information Types, File System Architecture (Access Methods, Access Control, File Locking, Blocking, Allocation, Free Space).

UNIT- IV (10 Hrs)

Device Management - Hardware I/O Organization (I/O Control, Port and Memory-Mapped I/O, Module Registers, Busy Wait I/O, Polled I/O, Interrupt I/O, Direct Memory Access (DMA)), Software Organization (Network I/O, Logical I/O, Buffering, Caching, Device Drivers), Devices (Graphics, Text-Based Displays, Storage Disks, Hard-Disk Performance, Hard-Disk Scheduling, Formatting, Raid, RAM Disks).

Recommended Books

1. Peter bears Galvin, 'Operating System Principle', 7th Edn., Wiley.
2. I.A Dhotre, 'Operating Systems', 3rd Edn., Technical Publications.
3. Madnick and Donovan, 'Operating System', 4th Edn., McGraw Hill.
4. P.B. Henson, 'Operating System Principles', 3rd Edn., Prentice Hall.
5. P.B. Henson, 'Architecture of Concurrent Programs', 4th Edn., Prentice Hall.
6. J.L. Peterson, A. Silberchatz, 'Operating System Concepts', 3rd Edn., Addison Wesley.
7. A.S. Tenenbaum, 'Operating System: Design and Implementation', 5th Edn., PHI.

COMPUTER NETWORKS

Subject Code: PCAP1-209

L T P C
3 1 0 4

Duration: 45 Hrs.

Learning Objective

The objective of the course is to help the students to get conceptual knowledge of all the networking basics along with various techniques used for communication between networks.

UNIT-I (11 Hrs)

Computer Networks - Introduction, Applications, Network hardware and Software (protocol hierarchies, Design Issues for Layers, Interfaces and Services: Connection Oriented and connection less), Network Structure and Architecture - Point to Point, Multicast, Broadcast, Classification of Networks-LAN, MAN and WAN. Reference Models - the OSI Reference Model.

Physical Layers - Circuit Switching, Packet Switching, Message Switching, Terminal Handling, Telephone System, Modems, Connections, Transmission Media

UNIT-II (12 Hrs)

Internet - Introduction, Relays, Repeaters, Bridges, Routers, Gateways

Internetworking - How Networks Differ, Concatenated Virtual Circuits, Connectionless Internetworking, Tunnelling, Internetwork Routing, fragmentation, Firewalls, Internet Architecture.

Data Link Layer - Design Issues, Elementary Data Link Protocols-Sliding Window Protocol, HDLC/SDLC, ALOHA, CSMA/CD, Token Passing, IEEE Standard 802 for LAN and WAN

UNIT-III (12 Hrs)

Network Layer - Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Flow Based Routing, Congestion Control Algorithms: Leaky

Bucket, Token Bucket, Internet Working, The Network Layer In The Internet IP Protocol, IP Address.

Transport layer - Design Issues, Elements of Transport Protocol, Addressing Establishing & Releasing a Connection, Flow Control & Buffering, TCP/IP Service Model, TCP Connection Management

UNIT- IV (10 Hrs)

Application Layer - The DNS Name Space, Electronic Mail, The World Wide Web, FTP: introduction, data transfer and distributed computation, Generalized File Transfer, The File Transfer Protocol.

Network Security - Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, One-Time Pads, Two Fundamental Cryptographic Principles

Recommended Books

1. Andrew S. Tanenbaum, 'Computer Networks', 4th Edn., PHI.
2. Behrouz A. Forouzan, 'Data Communications and Networking', 4th Edn., Tata McGraw Hill.
3. Douglas E. Comer, 'Internet Working with TCP/IP', Vol.1, 4th Edn., CPE.
4. Stallings, William, 'Data and Computer Communications', 8th Edn., PHI
5. Nance, Bary, 'Introduction to Networking', 4th Edn., PHI.
6. Larry L. Peterson, 'Computer Networks: A System Approach', 4th Edn., Elsevier Publication.

Learning Outcomes

1. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
2. Analyze the services and features of the Physical layer of OSI Reference model
3. Recognize the different internetworking devices and their functions and analyse the services and features of the data link layer of OSI Reference model.
4. Analyze the services and features of the data link layer of OSI Reference model.
5. Analyze the services and features of the Network layer of OSI Reference model.
6. Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure.
7. Analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP and network security.

SOFTWARE LAB-III

(DATABASE MANAGEMENT SYSTEM BASED ON PCAP1-207)

Subject Code: PCAP1-210

L T P C

0 0 4 2

Learning Objectives

The objective of this course is to help the students to get knowledge about databases and its Commands.

Implement the following SQL commands:

1. To create a table, alter and drop table.
2. To perform select, update, insert and delete operation in a table.

3. To make use of different clauses viz. where, group by, having, order by, union, intersection, set difference.
4. To study different constraints. [SQL FUNCTION]
5. To use oracle function viz. aggregate, numeric, conversion, string function.
6. To understand use and working with joins.
7. To understand use and working of sub-queries.
8. To make use of transaction control statement viz. rollback, commit and save point.
9. To make views of a table.
10. To make indexes of a table.
11. To inbuilt SQL function to create database. [PL/SQL]
12. Introduction to SQL & PL/SQL
13. To implement Cursor on a table.
14. To implement trigger on a table
15. Creating Procedures and Function.
16. To implement control structure.
17. To implement Packages.

Learning Outcomes

1. After the completion of this course:
2. Understand, appreciate and effectively explain the underlying concepts of database technologies.
3. Design& implement a database schema for given problem domain.
4. Populate & query a database using SQL DML/DDl commands.
5. Normalize a database.
6. Programming PL/SQL including stored procedures, stored functions, cursors, packages

MRSPTU

MRSPTU M.Sc. BIOTECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hrs. = 24

Total Marks = 700

Total Credits = 22

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MBOT1-101	Bio Molecules & Metabolism	4	0	0	40	60	100	4
MBOT1-102	Bio Statistics & Computer Applications	4	0	0	40	60	100	4
MBOT1-103	Bio Chemical & Biophysical Techniques	4	0	0	40	60	100	4
MBOT1-104	Immunology	4	0	0	40	60	100	4
MBOT1-105	Microbial Technology	4	0	0	40	60	100	4
MBOT1-106	Immunology Lab.	0	0	2	60	40	100	1
MBOT1-107	Biostatistics & Computer Applications Lab.	0	0	2	60	40	100	1
Total		20	0	4	320	380	700	22

Total Contact Hrs. = 22

Total Marks = 800

Total Credits= 20

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MBOT1-208	Bioprocess Engineering & Technology	3	0	0	40	60	100	3
MBOT1-209	Enzyme Technology	3	0	0	40	60	100	3
MBOT1-210	Molecular Biology	4	0	0	40	60	100	4
MBOT1-211	Environmental Biotechnology	3	0	0	40	60	100	3
MBOT1-212	Industrial Biotechnology	3	0	0	40	60	100	3
MBOT1-213	Intellectual Property Rights & Biosafety	2	0	0	40	60	100	2
MBOT1-214	Bioprocess Engineering & Technology Lab.	0	0	2	60	40	100	1
MBOT1-215	Enzyme Technology Lab.	0	0	2	60	40	100	1
Total		18	0	4	360	440	800	20

MRSPTU M.Sc. BIOTECHNOLOGY SYLLABUS 2016 BATCH ONWARDS

Total Contact Hrs. = 32

Total Marks = 800

Total Credits = 24

Semester 3 rd		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MBOT1-316	Proteomics and Genomics	4	0	0	40	60	100	4
MBOT1-317	Bioinformatics	4	0	0	40	60	100	4
MBOT1-318	Animal Biotechnology	4	0	0	40	60	100	4
MBOT1-319	Plant Biotechnology	4	0	0	40	60	100	4
MBOT1-320	Proteomics and Genomics Lab.	0	0	4	60	40	100	2
MBOT1-321	Bioinformatics Lab.	0	0	4	60	40	100	2
MBOT1-322	Animal Biotechnology Lab.	0	0	4	60	40	100	2
MBOT1-323	Plant Biotechnology Lab.	0	0	4	60	40	100	2
Total		16	0	16	400	400	800	24

Total Contact Hrs. = 24

Total Marks = 800

Total Credits = 24

Semester 4 th		Contact Hrs.- 24			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MBOT1-424	Industrial Training/ Project Work	24 Hrs./ Week			400	400	800	24

BIOMOLECULES AND METABOLISM

Subject Code: MBOT1-101

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

To introduce students regarding structure and functions of biomolecules and their metabolism

UNIT-I (9 Hrs.)

Introduction to Biomolecules & Water: Shape and Dimensions of Biomolecules, Supramolecular Assemblies and Cell Organelles. Structure of Atoms, Molecules and Chemical Bonds, Physical Properties and Structure of Water, Hydrogen Bonding, Solvent Properties of Water, Ionization of Water, Fitness of Aqueous Environment for Living Organisms

UNIT-II (11 Hrs.)

Carbohydrates & Lipids: Definition Importance and Functions, Families of Monosaccharides and Structure of Carbohydrates, Stereoisomerism and Mutarotation, Derivatives of Monosaccharides, Disaccharides, Trisaccharides and Polysaccharides (Starch, Glycogen, Cellulose, Dextrins). Classification of Lipids, Fatty Acids and Essential Fatty Acids, General Structure and Functions of Major Lipid Subclasses, Acylglycerols, Phosphoglycerides, Sphingolipids, Terpenes, Steroids, Eicosanoids.

UNIT-III (12 Hrs.)

Carbohydrates & Lipids Metabolism: Glycolysis (Key Structure and Reactions Formation of Pyruvate and Generation of ATP, Conversion of Pyruvate into Acetyl Co-A and Ethanol/Lactate), Pentose Phosphate and its Regulation (Generation of NADPH and its Interconnection with Glycolysis, Gluconeogenesis and its Regulation (Synthesis of Carbohydrates by Non-Carbohydrate Precursors, Synthesis of Glucose from Pyruvate). Oxidation of Saturated and Unsaturated and Odd Chain Fatty Acids, Ketone Bodies), Biosynthesis of Fatty Acids (Formation of Melonyl Co-A, Fatty Acid Synthase Complex, Citric Acid and Regulation of Fatty Acid Biosynthesis)

UNIT-IV (13 Hrs.)

Protein, Nucleic Acids & Their Metabolism: Structure and Functions, Amino Acids as Building Blocks of Proteins, Essential Amino Acids, Non-Protein Amino Acids, Structure of Peptide Bond, Organizational Levels of Protein Structure, Relationship Between Primary and Higher Order Structures, Supramolecular Assemblies of Proteins, Solubility, Denaturation, Functional Diversity and Species Specificity of Proteins, Protein Classification, Chemical Synthesis of Polypeptides. Biosynthesis of Amino Acids (Conversion of Nitrogen to Ammonia, Conversion of Ammonia into Amino Acids by Way of Glutamic and Glutamine, Conversion of Citric Acid Intermediates to Amino Acids, and Feedback Regulation of Amino Acid Biosynthesis), Purine and Pyrimidine Bases, Nucleotides and Nucleic Acids, Composition of DNA and RNA, Structural Features of Nucleic Acids.

Recommended Books

1. D.L. Nelson and M.M., 'Lehninger Principles of Biochemistry', 6th Edn., Macmillan Worth Publishers, New Delhi, 2013.
2. J.M. Berg, J.L. Tymoczko, G.J. Gatto and L. Stryer, 'Biochemistry', 8th Edn., W.H. Freeman & Co., New York, 2015.
3. D. Voet, J.G. Voet and C.W. Pratt, 'Fundamentals of Biochemistry', 5th Edn., John Wiley & Sons, New York, 2011.

BIostatISTICS AND COPUTER APPLICATIONS

Subject Code: MBOT1-102

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Students will understand the various aspects of biostat and its importance in the life sciences.

UNIT-I (12 Hrs.)

Introduction to statistics: Biological Data Types, Accuracy and Significant Figures, Frequency Distribution and its Graphical Representations, Sampling, Measures of Central Tendency, AM, GM, HM, QM, Median, Quartiles and Quantiles, Mode. Measures of Dispersion and Variability, Range, Quartile Deviation, Mean Deviation, Variance, Standard Deviation, Coefficient of Variation, Shannon-Wiener Diversity Index.

UNIT-II (9 Hrs.)

Probability and Distributions: Permutations, Combinations, Probability, Addition and Multiplication of Probabilities, Binomial Distribution, Poisson Distribution, Normal Distribution, Symmetry and Kurtosis of Normal Distribution Curve, Proportions of Normal Distribution.

UNIT-III (13 Hrs.)

Hypothesis Testing: Introduction to Statistical Hypothesis Testing, Significance Level and Critical Value, Type I and Type II Errors, Power of Statistical Test, One and Two Tailed Tests, Confidence Interval, Parametric and Non-Parametric Tests. One Sample, Two Sample and Paired Sample T-Tests, Mann Whitney Test and Wilcoxon Paired Sample Test, Variance Ratio Test, ANOVA, Tukey Test, Chi-Square Test, Simple Linear Regression, Coefficient of Correlation, Coefficient of Determination and Rank Correlation.

UNIT-IV (11 Hrs.)

Computer Application: Applications of Computers in Biostatistics, Introduction to Spreadsheets, MS-Excel, Major Functions in MS-Excel, Writing Formulae, Solving Statistical Problems and Plotting Graphs Using MS Excel, Graph pad Prism and Its Applications in Statistical Analysis, SPSS.

Recommended Books

1. J.H. Zar, 'Biostatistical Analysis', 5th Edn., Pearson Education.
2. K.V. Rao, 'Biostatistics-A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology', 2nd Edn., Jay Pee Brothers.

BIOCHEMICAL AND BIOPHYSICAL TECHNIQUES

Subject Code: MBOT1-103

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Students will learn the various techniques uses in the fields of biology and also learn their applications.

UNIT-I (11 Hrs.)

Chromatography: Basic Principles of Chromatography, Stationary and Mobile Phases, Distribution Coefficient, Parameters Influencing Chromatography, Retention Time, Capacity Factor, Selectivity Factor, Theoretical Plates, Plate Height and Resolution, Beak Broadening, Van Deemter Plot. Different Types of Equilibria, Adsorption, Partition, Ion-Exchange, Exclusion and Binding Equilibrium. TLC, HPTLC, Column Chromatography, Column Packing, Application of Sample, Analyte Development, Elution, Detection and Fraction Collector for Preparative Chromatography in LPLC, HPLC, FPLC, GC.

UNIT-II (12 Hrs.)

Electrophoresis: General Theory of Electrophoresis, Effect of Voltage, Current and Temperature on Electrophoretic Analysis, Generally Used Media, Agarose and Polyacrylamide, Gel Casting and Electrophoretic Apparatus for Various Types of Electrophoresis. Agarose Gel Electrophoresis for Analysis of Nucleic Acid Samples, PFGE and its Modifications for Separation of Very Large DNA Molecules, Polyacrylamide Gel Electrophoresis for Analysis of Nucleic Acids and Proteins, Native PAGE, SDS-PAGE for Separation of Proteins, Gradient Gels, Isoelectric Focusing and 2D Gel Electrophoresis, Urea PAGE, Capillary Electrophoresis, Visualization of Sample in Various Types of Electrophoreses.

UNIT-III (13 Hrs.)

Spectroscopy: Electromagnetic Waves and Their Interactions with Matter, UV and Visible Spectroscopy, Beer-Lambert Law, Relationship Between Transmittance and Absorption, Molar Extinction Coefficient, Quantitative Analysis, Wavelength Scan and Time Scan, Bathochromic and Hypsochromic Shifts, Application of UV and Visible Spectroscopy, Basic Understanding of Spectrophotometer, Spectrofluorometry, Circular Dichroism Spectroscopy and its Applications, Atomic Absorption Spectroscopy, Principle and Applications of IR Spectroscopy, ESR and NMR Basic Theory, Instrument and Application. X-Ray Diffraction Crystallography, Bragg's Law, Applications, XRD.

UNIT-IV (9 Hrs.)

Centrifugation & Radioactive isotopes: Principles of Sedimentation, Earth's Gravitational Force, Buoyant Force and Viscous Force Centrifugal Field and RCF, Sedimentation Coefficient. Types of Rotor, Safety Aspects Associated with Centrifugation. Differential Centrifugation, Pre-Formed (Sucrose) and Self-Establishing (CsCl) Density Gradient Centrifugation, Applications of Centrifugation in Biological Sciences, Ultracentrifugation, Analytical and Preparative Centrifugation, Stability of Radioactive Isotopes, Types of Radioactive Decay, Half-Life, Isotopes used Popularly in Biological Research, Energy and Penetration of Rations, Specific Activity, Detection by Geiger-Müller Counter, Solid and Liquid Scintillation Counting, Cerenkov Counting, Autoradiography. Safety Aspects Required While Using Radioactive Isotopes.

Recommended Books

1. K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', 6th Edn., Cambridge University Press.
2. A. Pingoud, A. Urbanke, C. Hoggett, J. and A. Jeltsch, 'Biochemical Methods', Wiley-VCH.
3. R. Glaser, 'Biophysics', Springer, 2004.

IMMUNOLOGY

Subject Code: MBOT1- 104

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

The objective of this course is to provide students with detail understanding of different cells of the immune system and their role in in pathogenesis of infectious diseases, cancer, autoimmune disease, AIDS as well as the application of immunological techniques.

UNIT-I (9 Hrs.)

Cells and Organs of the Immune System: Cells and Molecules Involved in Innate and Adaptive Immunity, Toll-Like Receptors, Lymphoid Cells, Heterogeneity of Lymphoid Cells, T-Cells, B-Cells, Null Cells, Monocytes, Polymorphs, Primary and Secondary Lymphoid Organs-Thymus, Bursa of Fabricius, Spleen, Lymph Nodes, Lymphatic System,

Mucosa Associated Lymphoid Tissue (MALT), Lymphocyte Traffic, Activation of B and T Cells and Their Differentiation.

UNIT-II (13 Hrs.)

Humoral & Cell mediated Immunity: Antigen-Antibody Interactions, Primary and Secondary Immune Modulation. Affinity and Avidity, High and Low Affinity Antibodies, Immunoglobulins, Classes and Structure, Complement Fixing Antibodies and Complement Cascade. T-Cell Subsets and Surface Markers, T-Dependent and T-Independent Antigens, Recognition of Antigens by T-Cells and Role of MHC in Antigen Processing and Presentation, Structure of T- Cell Antigen Receptors, TCR, BCR, Cell Mediated Effector Functions.

UNIT-III (12 Hrs.)

Immune Response to Disorders & Disease: Autoimmune Disorders, Their Underlying Molecular Mechanism, Etiology, Diagnostic, Prognostic and Prophylactic Aspects, Immune Deficiency Disorders: Congenital and Acquired, Immune Response during Bacterial (Tuberculosis), Parasitic (Malaria), and Viral (HIV) Infections, Tumour Immunity and Tumour Antigens.

UNIT-IV (11 Hrs.)

Immunological Techniques: Cross Reactivity, Precipitation and Agglutination Reaction, Coomb's Test, Immuno-Electrophoresis, RIA, ELISA, ELISPOT Assay, Western Blotting, Immunofluorescence and Flow Cytometry, Immunomagnetic and Immunodensity Method of Cell Isolation, Lymphocytes Cell Proliferation Assay, Immunological Database and Immuno Informatics Tool.

Recommended Books

1. J.A. Owen, J. Punt and S.A. Stranford, 'Kuby Immunology', 7th Edn., W.H. Freeman and Company, NY, 2013.
2. D. Male, J. Brostoff, I. Roitt and D. Roth, 'Immunology', W.B. Saunders Co. USA, 2012.
3. A.K. Abbas, H.H. Lichtman and S. Pillai, 'Cellular and Molecular Immunology' 8th Edn., Elsevier, 2015.

MICROBIAL TECHNOLOGY

Subject Code: MBOT1-105

L T P C

Duration: 45 Hrs.

4 0 0 4

Course Objectives

Students will understand the various aspects of biostat and its importance in the medical sciences.

UNIT-I (11 Hrs.)

Introduction to Microbiology and Microbial Diversity: Discovery of the Microbial World, Controversy over Spontaneous Generation. Bergey's Manual Classification (Bacteria, Archaea, Eukarya), Bacterial Cell Structure and Viruses, Viroids and Prions.

UNIT-II (13 Hrs.)

Microbial Growth, Nutrition and Physiology: Definition of Growth, Mathematical Expression of Growth, Growth Curve, Synchronous Culture, Continuous Culture, Factors Affecting the Growth. Metabolic Diversity (Aerobic, Anaerobic Respiration, Fermentation, Bacterial Photosynthesis).

UNIT-III (12 Hrs.)

Biogeochemical Cycling and Biotransformation: Nitrogen (Ammonification, Nitrification, Denitrification), Phosphorus, Sulphur and Iron Cycling. Industrially Important Primary and Secondary Metabolites (Alcohol, Amino Acids, Antibiotics and Steroids).

UNIT-IV (9 Hrs.)

Innovative Microbial Approaches in Remediation: Bio- Inoculants, Biobleaching Concepts and Application, Bioremediation and Application, Biofuels, Biogas, and Production of Bioethanol.

Recommended Books

1. Prescott, Harley & Klien, 'Microbiology', 7th Edn., McGraw Hill Higher Education.
2. R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd.
3. M.J. Jr. Pelczar, E.C.S. Chan and R. Krieg, 'Microbiology', McGraw Hill.
4. M.T. Madigan, J.M. Martinko, D.A., D.P. Clark, 'Brock Biology of Microorganisms', Benjamin Cummings.
5. A.N. Glazer, H. Nikaido, 'Microbial Biotechnology Fundamentals of Applied Microbiology', Cambridge University Press.
6. H.J. Peppler and D. Perlman, 'Microbial Technology Vol 1 & 2', Academic Press, New York.
7. R.P. Gupta, A. Kalia, S.K. Kapoor, 'Bioinoculants: A Step Towards Sustainable Agriculture', New India Publishers.

IMMUNOLOGY LAB.

Subject Code: MSBOT1-106

L T P C

0 0 2 1

1. Measurement of TLC and DLC
2. Blood group test
3. Agglutination test
4. ELISA: Dot/Antigen/antibody capture/sandwich
5. Single and Double Immuno- diffusion
6. Immuno Electrophoresis
7. Western Blotting
8. Separation of Immune cells; Identification and viability test by dye exclusion method.

Recommended Books

1. H. Hudson and F.C. Hay, 'Practical Immunology', 1st Edn., Blackwell Scientific Publications, Oxford, 1976.
2. G.P. Talwar, 'A Handbook of Practical Immunology', Vikas Publication House Pvt Ltd., New Delhi, 1983.
3. D.M. Wair, 'Handbook of Experimental Immunology', 3rd Edn., Blackwell Scientific Publications, Oxford, 1978.

BIOSTATISTICS AND COMPUTER APPLICATION LAB.

Subject Code: MBOT1-107

L T P C

0 0 2 1

1. Calculation of AM, GM, HM, QM of given raw data. Also plot frequency polygon and bar graph of the raw as well as classified data
2. Determine median, mode, range, quartile deviation, mean deviation, standard deviation and coefficient of variation for the give set of data
3. Determining Shannon-Wiener diversity index
4. Determine binomial and Poisson probability distributions
5. To plot normal density function
6. Hypothesis test problems based on normal distribution, two sample test and paired t-test

7. ANOVA based problems and extension into Tukey test problem
8. Non parametric test based problems
9. Problem based on test of goodness by chi square test
10. Correlation, regression and rank correlation based problems
11. Find the sum of reciprocal of first 50 natural numbers by using Microsoft Excel spreadsheet
12. Graphpad prism application in solving statistical problems

Recommended Books

1. J.H. Zar 'Biostatistical Analysis', 5th Edn., Pearson Education.
2. K.V. Rao, 'Biostatistics-A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology' 2nd Edn., Jay Pee Brothers.

BIOPROCESS ENGINEERING & TECHNOLOGY

Subject Code: MBOT1-208

L T P C

Duration: 38 Hrs.

3 0 0 3

Course Objectives

Students will understand the processing and use of biological materials in the design and operation of fermentation systems.

UNIT-I (9 Hrs.)

Bioreactor Designing & Sterilization

Study of Batch, CSTR (Continuous stirred tank fermenter), Plug flow reactor (PFR), Airlift bioreactors, deep jet fermenter, and cyclone column; designing of batch, continuous fermentation process, filter sterilization (media, air and exhaust air).

UNIT-II (10 Hrs.)

Aeration & Agitation

Oxygen requirement for industrial bioreactors, oxygen demand and supply and balance between them, volumetric oxygen transfer, determination of K_{La} values, sulphite oxidation techniques, gassing out techniques: static method and dynamic method, oxygen balance method. Fluid rheology: Bingham plastic, pseudo plastic, Dilatants, Casson body. Factors affecting K_{La} values in bioreactors, the effect of medium rheology on K_{La} values, scale up and scale down of aeration and agitation.

UNIT-III (11 Hrs.)

Cell Growth and Enzyme Kinetics

Cell number and Cell mass calculations, Media design for growth, Continuous and batch fermentation, Microbial growth kinetics, Kinetic models for cell growth, Substrate and product inhibited growth models, Factors affecting microbial growth, Cell and enzyme immobilization, Enzyme kinetics, Submerged and solid state fermentation.

UNIT-IV (8 Hrs.)

Downstream Processing

Product isolation and recovery, Disruption of microbial cells (Physical, chemical and enzymatic), Filtrations, Centrifugation, and Membrane process, Drying.

Recommended Books

1. M.L. Shuler and F. Kargi, 'Bioprocess Engineering: Basic Concepts', 2nd Edn., Prentice-Hall, 2001.
2. P.F. Stanbury, 'Principles of Fermentation Technology', 2nd Edn., Book News, Inc., 1992.
3. B. Atkinson, 'Biochemical Engineering and Biotechnology Hand Book', Mac Millan Press 2009.

ENZYME TECHNOLOGY

Subject Code: MBOT1-209

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Course Objectives

Enzyme technology helps students to understand the applications of enzymes as the tools of industry.

UNIT-I (9 Hrs.)

Structure, Function of Coenzymes and Enzyme Action

Pyridoxal phosphate, nicotinamide, flavin nucleotide, coenzyme A and biotin; mechanism of lysozyme, chymotrypsin, DNA polymerase, zymogens, ribozymes, catalytic antibodies.

UNIT-II (8 Hrs.)

Enzyme Inhibitions

Kinetics of competitive, non-competitive & uncompetitive inhibitions; nucleophilic & electrophilic attack; role of metal ions in enzyme catalysis.

UNIT-III (11 Hrs.)

Immobilized Enzymes

Principles & techniques of immobilization - commercial production of enzymes; amylases, proteases, cellulase, artificial enzymes; immobilized enzyme in industrial processes.

UNIT-IV (8 Hrs.)

Industrial Applications of Enzymes

Industrial utilization of enzymes in food, detergents, energy, waste treatment, pharmaceuticals and medicine.

Recommended Books

1. H.R. Mahier & E. Cordes, 'Biological Chemistry', **1986**.
2. Benjamin Lewin, 'Gene VII', Oxford University Press, 1994.
3. A.L. Lehinger, D.L. Nelson and M.M. Cox, 'Principles of Biochemistry', Worth Publishers, 1993.

MOLECULAR BIOLOGY

Subject Code: MBOT1-210

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

Students will understand the new discoveries and applications, as well as a firm grasp of the fundamental concepts on medical, agricultural, and social aspects that shape modern-day molecular biology.

UNIT-I (13 Hrs.)

Genetic Material and DNA Replication

Structure and properties of nucleic acids, DNA as genetic material, nucleosomes, chromosomal structure and organization, Semiconservative mode of DNA replication, linear and circular replicons, origin of replication in bacteria and yeast, DNA replication in bacteria, eukaryotes and phages, prokaryotic and eukaryotic DNA polymerases and their properties, semi-discontinuous mode of DNA synthesis, Okazaki fragments, other proteins in DNA replication such as helicase, sliding clamps, clamp loader, primase.

UNIT-II (12 Hrs.)

Repair and Recombination

DNA damage, structural distortions and mutations, pyrimidine dimers, DNA repair, photoreactivation, mismatch repair system, excision repair (BER and NER), recombination repair, error prone repair, SOS system. Genetic recombination, synapsis and homologous

recombination, site-specific recombination, mechanism involving breakage and reunion of DNA strands, Holliday structure.

UNIT-III (10 Hrs.)

Transcription

Transcription initiation, structure and properties of bacterial RNA polymerase, sigma factor, promoter structure and its recognition by RNA polymerase, transcription elongation and termination, rho dependent and rho-independent termination, operons, regulation of lac and trp operons, *cis*-elements and *trans*-factors. Structure and function of eukaryotic RNA polymerases and their respective promoters, transcription factors, TBP, regulatory elements, enhancers and insulators.

UNIT-IV (10 Hrs.)

Protein Expression

Post translational modifications, 5' capping, 3' polyadenylation and splicing of mRNA. mRNA, tRNA and rRNA, and their role in protein synthesis, structure of tRNAs, aminoacyl-tRNA, ribosome. Initiation, elongation and termination of protein synthesis, bacterial initiation factors, initiator tRNA, Shine-Dalgarno sequence. Initiation of translation in eukaryotes, eukaryotic initiation factors, elongation factors. Genetic code, degeneracy of codons, wobble hypothesis, initiation codon and termination codons.

Recommended Books

1. B. Lewin, 'Genes IX', Prentice Hall.
2. G.M. Malacinski, G.M. Freifelder's Essentials of Molecular Biology', 4th Edn., Narosa Publishing House.

ENVIRONMENTAL BIOTECHNOLOGY

Subject Code: MBOT1-211

L T P C
3 0 0 3

Duration: 36 Hrs.

Course Objectives

The course will help to understand the use of biotechnology to design cleaner manufacturing process and to solve the pollution problems.

UNIT-I (11 Hrs.)

Environmental Pollution Monitoring and Control

Air – Types, Sources & Effects, Transport and diffusing of pollutants, air quality standards, monitoring and control of SO_x, NO_x, CO_x, SPM, RPM, Pm10; Soil - Physicochemical and bacteriological analysis of soil, problems associated with soil alkali soils, acidic soils, and solid waste; Noise - Measurement of noise, noise control and abatement, impact on human health.

UNIT-II (8 Hrs.)

Microbiology of Waste Water Treatment

Aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors; Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

UNIT-III (8 Hrs.)

Bioremediation

Types of bioremediation, use of fungi, algae and bacteria in biosorption, cautions for using bioremediations, biodegradation of oilspills, TNT wastes, dye stuff wastes, pesticides and xenobiotics.

UNIT-IV (9 Hrs.)

Polymers and Plastic Degradation

Introduction, polymer synthesis, polymer degradation, photochemical degradation, biodegradation of naturally occurring polymeric substances, disposable synthetic polymers, polymer recycling, carry bags – a menace, role of microorganisms in degradation of polymers and plastic.

Recommended Books

1. M. Alexander, 'Biodegradation and Bioremediation', Academic Press, San Diego, 1999.
2. S.A. Abbasi and E. Ramasami, 'Biotechnological Methods of Pollution Control'. Universities Press, Hyderabad, 1999.
3. D.E. Rittmann, P.L. McCarty, 'Environmental Biotechnology: Principles and Applications', McGraw Hill, New York, 2001.
4. D. Allsopp, Kenneth J. Seal, Christine C. Gaylarde, 'Introduction to Biodeterioration', Cambridge University Press, 2004.

INDUSTRIAL BIOTECHNOLOGY

Subject Code: MBOT1-212

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Course Objectives

1. Course fundamental focus is on the use of microbes in the various biotechnology based industries.

UNIT-I (8 Hrs.)

Historical Development in Industrial Biotechnology

Isolation and screening of industrial important microbes (Primary and Secondary Screening), maintenance of industrial cultures.

UNIT-II (9 Hrs.)

Fermenter & Fermentation

Definition of fermentation, fermenter/bioreactor, design of CSTR fermenter, fermentation media, inoculum development.

UNIT-III (11 Hrs.)

Production of Primary & Secondary metabolites

Alcohols (Beer, Wine), acetone- butanol, SCP, amino acids (lysine and glutamic acid), citric acids, enzyme productions; Antibiotics (Penicillin, Tetracycline), alkaloids.

UNIT-IV (8 Hrs.)

Treatment of Wastes in Industry

Methods for the determination of organic Matter content in waste waters (DO, BOD, COD, TOC, TSS, VSS), Systems for the Treatment of industrial wastes aerobically and anaerobically.

Recommended Books

1. L.E. Casida, 'Industrial Microbiology', New Age International Publishers, 1996.
2. Prescott and Dunn, 'Industrial Microbiology', **1991.**
3. W. Crueger and A. Crueger, 'Biotechnology', 2nd Edn., Panima Publishers, 1992.
4. Peppler and Perlman, 'Microbial Technology', Vol. I and II, Academic Press, 1979.
5. Stansbury and Whittaker, 'Principles of Fermentation Technology', Pergamon Press, 2006.

INTELLECTUAL PROPERTY RIGHTS & BIOSAFETY

Subject Code: MBOT1-213

L T P C
2 0 0 2

Duration: 24 Hrs.

Course Objectives

This course has been designed to cover various aspects of IPR and Biosafety.

UNIT-I (4 Hrs.)

Fundamentals of IPR

Introduction of patent claims, ownership of tangible and intellectual property. Patents, copyrights, trademarks, trade secrets, geographical indications, industrial designs, protection of IC layout designs, WIPO, TRIPS agreement.

UNIT-II (6 Hrs.)

Biotechnology Patents

Disclosure requirements, collaborative research, competitive research, foreign patents, patenting of microorganisms and cells, patenting animals and plants, PPA, PVPA, PVPC, utility patents.

UNIT-III (8 Hrs.)

Patent Litigation

Substantive aspects of patent litigation, procedural aspects of patent litigation, recent development in patent system and patentability of biotechnology inventions, IPR issues of the Indian content, current patent laws, International Depository Authority (IDA), International agreements relevant to biological inventions: PCT, UPOV, Budapest Treaty, EPC, Pan-S Union Convention.

UNIT-IV (6 Hrs.)

Good Safety Practices & Biosafety Management

GLP standards, lab contaminants, GMPs, The Cartagena protocol on biosafety. Regulatory bodies- EPA, USDA, FDA, APHIS.

Recommended Books

1. 'New Developments in Biotechnology: Patenting Life-special Report (1990) Office of Technology Assessment (OTA), US Congress (Washington D.C. Dekker).
2. D.N. Choudhary, 'Evolution of Patent Laws: Developing Countries Perspective', Capital Law House, 2006.
3. M.K. Sateesh, 'Bioethcis and Biosafety', I.K. International Pvt. Ltd.

BIOPROCESS ENGINEERING & TECHNOLOGY LAB.

Subject Code: MBOT1-214

L T P C
0 0 2 1

1. Bioreactors assembling and dismantling.
2. Sterilization of fermenter and fermentation media.
3. Dissolve oxygen probe standardization.
4. Determinations of thermal death point (TDP) and thermal death time (TDT) of microorganisms for designing of sterilization.
5. Study the effect agitation on aeration and determination of KLa volumetric oxygen transfer rate in the bioreactor by dynamic gassing out technique.
6. Isolation screening and characterization of cellulase producing micro organisms
7. Isolation screening ad characterization of alkaline protease producing microorganisms.

Recommended Books

1. B. Atkinson, 'Biochemical Engineering and Biotechnology Hand Book', Mac Millan Press, 2009.

2. J.G. Cappuccino and N. Sherma, 'Microbiology: A Laboratory Manual', Pearson Benjamin Cummings, 2007.

ENZYME TECHNOLOGY LAB.

Subject Code: MBOT1-215

L T P C

0 0 2 1

1. Extraction and purification of enzymes.
2. Effect of pH on enzyme activity and stability.
3. Effect of temperature on enzyme activity and stability.
4. Effect of metal ions on enzyme activity.
5. Effect of substrate concentration on enzyme activity and demonstration of the K_m and V_{max} of the reaction.
6. Immobilization of enzymes.

Recommended Books

1. D.T. Plummer, 'An introduction to Practical Biochemistry', Tata McGraw Hill Publishers Co. Ltd., New Delhi, 2004.
2. Hans Bisswanger, 'Practical Enzymology', Wiley-VCH, Weinheim, 2004.
3. S.K. Sawhney, Randhir Singh, 'Introductory Practical Biochemistry', Alpha Science International, 2005.

PROTEOMICS AND GENOMICS

Subject Code: MBOT1-316

L T P C

4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. To teach about genomes, proteomes and their applications.

UNIT- I (12 Hrs.)

Introduction to genomics: Genome size and structural variation in different phyla, genome complexity and DNA sequence characteristics such as moderately repetitive (transposons), highly repetitive (satellite DNA) and unique (coding DNA) sequences, mapping genomes using various kind of markers such as RFLP, RAPD, STS, EST, SNP, AFLP, *in situ* hybridization, HAPPY mapping. Genome sequencing and the methods involved such as clone by clone method and whole genome shotgun sequencing, Human genome project and its implications.

UNIT- II (9 Hrs.)

Comparative Genomics: Concept of orthologs and paralogs and their role in gene evolution, protein evolution by exon shuffling, horizontal gene transfer and application of comparative genomics in these studies. Comparative genomics of bacteria, organelles and eukaryotes, application of comparative genomics.

UNIT- III (10 Hrs.)

Transcriptomics: Traditional methods for gene expression profiling, definition of transcriptome and its study based on EST sampling and SAGE methods, DNA microarrays and their role in transcriptomic analysis, spotted nylon arrays, DNA microarrays and oligonucleotide based arrays, their construction and use, application of transcriptomic analyses.

UNIT- IV (14 Hrs.)

Proteomics: Defining proteome, proteomic analysis for studying global gene expression profiling at protein level, comparison of proteomic analysis with transcriptomic analysis, methods of proteomic analysis such as 2D gel electrophoresis coupled with mass

spectrometry, multi-dimensional liquid chromatography coupled with mass spectrometry, protein arrays, structural proteomics, methods for protein structure determination and application of structural proteomics.

Recommended Books

1. S.B. Primrose and R.M. Twyman, 'Principles of Gene Manipulation and Genomics', 7th Edn., Blackwell Publishing, 2006.
2. A.M. Lesk, 'Introduction to Genomics', Oxford University Press, 2008.
3. A.M. Lesk, 'Introduction to Bioinformatics' Oxford University Press, 2011.
4. Z. Ghosh and B. Mallick, 'Bioinformatics Principles and Applications' Oxford University Press, 2008.

BIOINFORMATICS

Subject Code: MBOT1-317

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. This course lays emphasis on the role of computational tools in the field of biotechnology. The students will be exposed to various databases pertaining to DNA, RNA and protein sequences.

UNIT- I (12 Hrs.)

Introduction to Bioinformatics: Biological data and its analysis using computer application, branches and scope of bioinformatics, biological sequence file formats and molecular file formats, biological databases, their classification and retrieval systems. Biological sequence databases, gene expression databases, biological annotation and data curation. Examples of biological data bases such as EMBL, DDBJ, GEO, PIR, PDB, Swiss-Prot, CDD and MMDB. Introduction to NCBI tools.

UNIT- II (10 Hrs.)

Sequence Alignment: Concept of sequence alignment, scoring matrices such as PAM and BLOSUM and their importance in sequence alignment, pairwise sequence alignment, alignment algorithms for local and global alignment, application of dynamic programming and heuristic methods in sequence alignment, concept and different forms of BLAST, multiple sequence alignment, gene prediction methods.

UNIT- III (9 Hrs.)

Molecular Phylogeny: Representation of phylogeny using phylogenetic tree, types and features of phylogenetic trees, molecular clock and methods of phylogenetic tree construction such as UPGMA, NJ and Fitch-Margoliash methods, softwares for phylogenetic analyses.

UNIT- IV (14 Hrs.)

Protein Structure Prediction and Molecular Viewers: Protein structure prediction, prediction of protein secondary structures using Chou-Fasman method and GOR method, Homology modeling of proteins, fold recognition method and *ab initio* method for prediction of 3D structure of proteins. Molecular viewers and their application, examples of molecular viewers such as RasMol and Cn3D.

Recommended Books

1. Z. Ghosh and B. Mallick 'Bioinformatics – Principles and Applications', Oxford University Press, 2008.
2. J. Xiong, 'Essential Bioinformatics', Cambridge University Press, 2006.
3. D.W. Mount, 'Bioinformatics - Sequence and Genome Analysis', Cold Spring Harbour Laboratory Press, 2001.
4. A.M. Lesk, 'Introduction to Bioinformatics', Oxford University Press, 2011.

ANIMAL BIOTECHNOLOGY

Subject Code: MBOT1-318

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. The objective of this course is to introduce students to develop skills for vertebrate cell culture, maintenance of cell lines and their applications.

UNIT- I (12 Hrs.)

Introduction to Animal Cell Culture Technology: Structure an organization of animal cell; equipments and materials for animal cell culture technology; primary and established cell line cultures; balanced salt solutions and simple growth medium; role of carbon dioxide, serum and other supplements; serum and protein free media and their application.

UNIT- II (10 Hrs.)

Cell Culturing: Techniques of mammalian cell culture in vitro; desegregation of tissue and primary culture; maintenance of cell culture; cell separation; scaling- up of animal cell culture; cloning, micromanipulation, transformation and applications of cell animal cell culture.

UNIT- III (14 Hrs.)

Stem Cell Technology: Stem Cells: Basic, embryonic and adult stem cells; trans differentiation, applications, ethical issues; cell culture based vaccines; organ culture; three dimensional culture.

UNIT- IV (9 Hrs.)

Applications of Animal Biotechnology: Transgenic animal and their applications; role in pest control, aquaculture and sericulture; role in biodiversity conservation.

Recommended Books

1. R.R. Spier and J.B. Griffiths, 'Animal Cell Biotechnology', Academic Press, London 1990.
2. E.J. Gareth, 'Human Cell Culture Protocols', Humana Press, 1996.
3. E. Julio, 'Cell Biology-A Laboratory Hand Book', Vol. I-IV, 2nd Edn., Academic Press, New York, 1998.
4. M. Butler, 'Animal Cell Technology', 2nd Edn, BIOS Scientific Publishers, U.K., 2004.
5. R.T. Freshney, 'Culture of Animal Cells', 5th Edn., John Wiley and Sons, New York, 2006.

PLANT BIOTECHNOLOGY

Subject Code: MBOT1-319

L T P C
4 0 0 4

Duration: 45 Hrs.

Course Objectives

1. The course will enable the students to acquire knowledge about various techniques to produce genetically modified plants with novel characters.

UNIT- I (14 Hrs.)

Introduction to Plant Cell and Tissue Culture: Tissue culture technique to produce novel plants and hybrids, tissue culture media (composition and preparation) Initiation and maintenance of callus and suspension cultures; Single cell clones; Somatic embryogenesis; Transfer and establishment of whole plants in soil. Shoot tip culture; Rapid clonal propagation. Embryo culture and embryo rescue; Protoplast isolation, culture and fusion, selection of hybrid cell and regeneration of hybrid plants, symmetric and asymmetric hybrids, cybrids, Cryopreservation, slow growth and DNA banking for germplasm conservation.

UNIT- II (10 Hrs.)

Plant Transformation Technology: Basis of tumor formation, hairy root, features of Ti and Ri plasmids, mechanism of DNA transfer, role of virulence genes, viral vectors, genetic markers and reporter genes; Methods of nuclear transformation, multiple gene transfer, vectorless or direct DNA transfer (particle bombardment, electroporation, microinjection), transformation of monocots, transgene stability and gene silencing.

UNIT- III (12 Hrs.)

Application of Plant Transformation for Productivity and Performance: Herbicide resistance, (phosphinothricin, glyphosphate, sulfonyl urea, atrazine), insect resistance (Bt genes, non-Bt like protease inhibitors, alpha amylase inhibitor), virus resistance (coat protein mediated, nucleocapsid gene), disease resistance (chitinase, 1-3 beta glucanase, RIP, antifungal proteins, thionins, PR proteins) & Nematode resistance. Abiotic stress, post-harvest losses, use of ACC synthase (polygalactouranase, ACC oxidase), male sterile lines, bar and barnase system. Biosafety and ethical issues associated with transgenic plants.

UNIT- IV (9 Hrs.)

Molecular Farming: Production of therapeutics: proteins, edible vaccines; purification strategies. Plant secondary, metabolites.

Recommended Books

1. S.S. Bhojwani and M.K. Razdan, 'Plant Tissue Culture. Theory and Practice', Elsevier, 1996.
2. Fu Tong-Jen, Fu, Gurmeet Singh & Wayne R. Curtis, 'Plant Cell & Tissue Culture for the Production of Food Ingredients'. Kluwer Acad, N.Y.
3. K.G. Ramawat and J.M. Merillon, 'Biotechnology: Secondary Metabolites', Science Publishers, U.S., 1999.
4. S.S. Purohit, 'Biotechnology Fundamentals & Application'. 3rd Edn., Agrobios (India), New Delhi, 2000.

PROTEOMICS AND GENOMICS LAB.

Subject Code: MBOT1- 320

**L T P C
0 0 4 2**

1. Genome size comparison of organisms belonging to different phyla.
2. Comparison of size and number of introns in eukaryotic genes from different phyla.
3. Search of CpG islands, ORFs, SNPs and ESTs in a given genomic sequence.
4. Search for orthologs and paralogs,.
5. Data retrieval and analysis from gene expression databases.
6. Prediction of molecular mass.
7. Isoelectric point of given polypeptide sequence.
8. Determining molecular size of peptides produced by proteolytic cleavage in an *in silico* experiment.

Recommended Books

1. S.B. Primrose and R. M. Twyman, 'Principles of Gene Manipulation and Genomics', 7th Edn. Blackwell Publishing, 2006.
2. A.M. Lesk, 'Introduction to Genomics', Oxford University Press, 2008.

BIOINFORMATICS LAB.

Subject Code: MBOT1-321

**L T P C
0 0 4 2**

1. Downloading a given DNA, genomic DNA, protein sequence in different file formats.

2. Finding ORF in a given sequence, pairwise sequence alignment of DNA and protein sequences, multiple sequence alignment of given DNA and protein sequences.
3. Construct phylogenetic tree for given orthologous sequences, BLAST given protein and DNA sequences.
4. Determine protein structure based on polypeptide sequence using homology modeling.
5. Visualize 3D structure of protein using molecular viewer.

Recommended Books

1. Z Ghosh and B Mallick, 'Bioinformatics – Principles and Applications', Oxford University Press, 2008.
2. J. Xiong, 'Essential Bioinformatics', Cambridge University Press, 2006.

ANIMAL BIOTECHNOLOGY LAB.

Subject Code: MBOT1-322

L T P C

0 0 4 2

1. Laboratory Design & Instrumentation in ATC.
2. Preparation of animal cell culture media.
3. Growth and maintenance of cell line(s).
4. Trypsinization method for recovery of cells from monolayer.
5. Doubling time of a given cell line and cell cycle analysis.
6. Cytotoxic assay method for a given cell line and testing by trypan blue dye exclusion method.

Recommended Books

1. R. Ian Freshney, 'Culture of Animal Cells: A Manual of Basic Technique', 4th Edn., **2000.**
2. M.M. Ranga, 'Animal Biotechnology', Agrobios, 2007.
3. J.R.W. Masters, 'Animal Cell Culture', Oxford University Press, 2000.
4. L. Marshak, 'Stem Cell Biology', Cold Spring Harbor Publication, 2001.

PLANT BIOTECHNOLOGY LAB.

Subject Code: MBOT1-323

L T P C

0 0 4 2

1. Laboratory design setup for PTC unit.
2. Preparation, sterilization of media (Liquid & solid).
3. Surface sterilization, sealing of cultures, sources of contamination and their check measures.
4. Callus induction, propagation and differentiation.
5. Protoplast isolation and culture.
6. Agrobacterium mediated transformation of plant cell

Recommended Books

1. A. Slater and N. W. Scott, 'Plant Biotechnology', Oxford University Press 2008
2. S.B. Primrose and R. M. Twyman, 'Principles of Gene Manipulation and Genomics', 7th Edn. Blackwell Publishing 2006
3. D. Balasubramanian, C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman, 'Concepts in Biotechnology', Universities Press, 1999.
4. U. Satyanarayana, 'Yeast Biotechnology: Diversity and Applications', Springer, 2009.

**MRSPTU POST GRADUATE OPEN ELECTIVES-I 2016 BATCH ONWARDS
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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	
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	
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

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		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	

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**MRSPTU POST GRADUATE OPEN ELECTIVES-I 2016 BATCH ONWARDS
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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 learning.

CO4: Able to design feedback Artificial Neural Networks (ANN) and implement various methods of unsupervised learning

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.

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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. 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, Kohonen 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, Algorithm. & 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 Learning, 2008.

BIG DATA ANALYTICS AND CONCEPTS

Subject Code: CSE0-F92

**L T P C
3 0 0 3**

Duration – 45 hrs

COURSE OBJECTIVE

COURSE OUTCOMES

COURSE CONTENT

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.

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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 Iubinsky, 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 Hadoop”, 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

LEARNING 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.

LEARNING OUTCOMES

CO1 Students would be able to understand the usage of MIS in organizations and the constituents of the MIS.

CO2 Effectively using and administering 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

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COURSE CONTENT

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 internet networked 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**.

**MRSPTU POST GRADUATE OPEN ELECTIVES-I 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

ADVANCED DATA STRUCTURES AND ALGORITHMS

Subject Code-MCSE0-F94

**L T P C
3 0 0 3**

Duration – 45 Hrs.

LEARNING 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.

LEARNING 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.

COURSE CONTENT:

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.

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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 learning – 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
3 0 0 3

Duration: 40 Hrs.

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, 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 Wehrich, Cannice & Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Wehrich, 'Essentials of Management: An international Perspective', Tata McGraw Hill.

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3. Stephen Robbins & Mary coulter, 'Management', Pearson Education
4. VSP Rao & VH Krishna, 'Management', Excel Books
5. P. Subba Rao, 'Principles of Management', Himalaya Publishing

TOTAL QUALITY MANAGEMENT

Subject Code: MBAD0-F92

L T P C
3 0 0 3

Duration: 40 Hrs.

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
3 0 0 3

Duration: 45 Hrs.

Learning 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

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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.

Learning 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 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. Chhabra, '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
3 0 0 3

Duration: 40 Hrs.

Learning 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

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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 Learning.
5. Kotler & Armstrong, 'Principles of Marketing', Prentice Hall.
6. Biplab S. Bose, 'Marketing Management', Himalaya Publications.
7. Subhash c. Jain, 'Marketing Management', Cengage Learning.
8. Rajan Saxena, 'Marketing Management', Tata McGraw Hill.

PROJECT MANAGEMENT

Subject Code: MBAD0- F95

L T P C
3 0 0 3

Duration: 40 Hrs.

Learning 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

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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 Learnings.
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
3 0 0 3

Contact Hrs.-40

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.

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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: MCAPO-F91

L T P C
3 0 0 3

Contact Hrs.-40

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.

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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.

Learning Outcomes: Students will be 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 Learning.
4. Joseph Brady & Ellen F Monk, 'Problem Solving Cases in Microsoft, Excel Thomson Learning'.
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
3 0 0 3**

Contact Hrs.-48

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.

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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

L T P C
3 0 0 3

Contact Hrs.-36

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'.

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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
3 0 0 3**

Contact Hrs.-45

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'.

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SUPPLY CHAIN MANAGEMENT

Course Code: MMEE0-F92

**L T P C
3 0 0 3**

Contact Hrs. 42

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.

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ENVIRONMENT MANAGEMENT

Subject Code: MCIE0-F91

**L T P C
3 0 0 3**

Duration – 45 Hrs.

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. Gilbert 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.

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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, hydroxyl, R-M and Polenske value, peroxide value of oil, Elaiden test.

Books Recommended:

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', Second 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
3 0 0 3

Duration: 48 Hrs.

Learning Objectives

This course provides an In-depth knowledge on computer networks and provides a good background for advanced studies in communication networks.

Learning 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,

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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
3 0 0 3

Duration: 48 Hrs.

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. Oppenheim & Schaffer, '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. Ifeachor, B.W. Jervis, 'Digital Signal Processing', Addison Wesley.

SENSORS AND TRANSDUCERS

Subject Code: MECE0-F93

L T P C
3 0 0 3

Duration: 48 Hrs.

Learning 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.

Learning 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, Magneto-resistive 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.

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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.

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DIGITAL CIRCUITS AND LOGIC DESIGN

Subject Code: MECE0-F95

**L T P C
3 0 0 3**

Duration: 48 Hrs.

Learning 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.

Learning 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

Learning Objectives:

- To give a systematic approach for modeling and analysis of all rotating machines under both transient and steady state conditions.

Learning Outcomes:

- The students will be able to model all types of rotation machines including special machines.
- 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**.

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LOAD FORECASTING AND LOAD MANAGEMENT

Subject Code: MELE0-F92

L T P C

3 0 0 3

Learning Objectives:

- To give a systematic approach for load management and forecasting.
- To analysis of all trend coming related to recent case studies conditions.

Learning Outcomes:

- The students will acquire skills of load related energy management and tariff structure.
- 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

Learning Objectives:

- To apply artificial neural networks in various electrical and electronics engineering applications.
- To expose students to fuzzy methods of analyzing problems which involve incomplete or vague criteria rather than crisp values.
- To investigate requirements analysis, logical design, and technical design of components for fuzzy systems development.

Learning Outcomes:

- The students acquire the skills required to innovate and build, smart and intelligent applications in electrical and electronics engineering.
- 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.
- 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, multilayer feed forward network, recurrent network, knowledge representation.

UNIT-III

Learning Processes: Memory Based Learning Hebbian Learning, Competitive Learning, Boltzmann Learning, learning with a teacher, learning 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. Elaine 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**

Learning 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.

Learning Outcomes:

- After learning 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.

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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	
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	

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
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NETWORK SECURITY AND ETHICAL HACKING

Course Code: MITE0-F92

L T P C

Contact Hrs.

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 Learning, **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:

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
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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

COURSE CONTENT

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 Niranjana 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**.

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

ENTERPRISE RESOURCE PLANNING

Course Code: MCSE0-F96

**L T P C
3 0 0 3**

Contact Hrs. 45

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

COURSE CONTENT

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 Fernandez, 'The SAP R /3 Handbook', Tata McGraw Hill, **1998**.
5. Biao Fu, 'SAP BW: A Step-by-Step Guide', 1st Ed, Pearson Education, **2003**.

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

ADVANCED COMPUTER NETWORKS

Subject Code-MCSE0-F97

**L T P C
3 0 0 3**

Duration – 45 hrs

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.

COURSE OUTCOME

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.

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(UPDATED ON 23.4.2017)**

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
3 0 0 3**

Contact Hrs. 45

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.

COURSE CONTENT:

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.

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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 wavelets 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, Learning, 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
3 0 0 3**

Duration – 45 hrs

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

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(UPDATED ON 23.4.2017)**

COURSE CONTENT

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

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

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 Learning
2. Brealy & Myres, 'Principles of Corporate Finance', Tata McGraw Hill
3. Ambrish Gupta. "Financial Accounting For Maanagement" Pearson Education, 2nd Edition.
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
3 0 0 3**

Duration: 40 Hrs

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 S ector

UNIT-III (10 Hrs)

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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 Transformation 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

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.

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(UPDATED ON 23.4.2017)**

BASIC ACCOUNTING

Subject Code: MBAD0-F99

**L T P C
3 0 0 3**

Duration: 40 Hrs

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
UNIT-I (12hrs.)**

Contact 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 (8hrs.)

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(UPDATED ON 23.4.2017)**

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 SO_3^{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 SO_3 , 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
3 0 0 3**

Contact Hrs.42

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.

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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. Elanchezian, 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: MPH0-F92

**L T P C
3 0 0 3**

Duration:

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**.

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(UPDATED ON 23.4.2017)**

4. Chandra, 'Photoelectrochemical Solar Cells', 1st Edn., New Age, New Delhi.

FUNDAMENTALS OF ELECTRONIC COMMUNICATIONS

Subject Code: MECE0-F96

**L T P C
3 0 0 3**

Duration: 45 Hrs.

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 (11hrs)

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
3 0 0 3**

Duration: 45 Hrs.

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS
(UPDATED ON 23.4.2017)**

Learning 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 (11Hrs)

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 (12Hrs)

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.

Learning 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.

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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
3 0 0 3**

Duration: 45 Hrs.

Learning 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.

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4. Distefano, Joseph J. Stubberud, R. Allen, Williams, J. Ivan, 'Feedback and Control Systems', Schaums Series, TMH.

ORDINARY DIFFERENTIAL EQUATIONS

Subject Code: MMAT0-F92

L T 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, New York, 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

L T 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

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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
4 0 0 4**

Contact Hrs.-36

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. Doebelin, '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
4 0 0 4**

Contact Hrs.-36

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.

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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
4 0 0 4**

Contact Hrs.-36

Learning 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

Learning 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 MOSFETand IGBT: Basic structure, I-V Characteristic, Physics of device operation, switching characteristics, operating limitation and safe operating area.

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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

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Total Contact Hours = 27

Total Marks = 700

Total Credits = 23

SEMESTER 1 st		Contact Hrs..			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MITE1-101	Object Oriented Programming	3	1	0	40	60	100	4
MITE1-102	Internet and Web Technology	3	1	0	40	60	100	4
MITE1-103	Advance Database systems	3	1	0	40	60	100	4
MITE1- 104	OOPS Lab	0	0	4	60	40	100	2
MITE1-105	Database Lab	0	0	4	60	40	100	2
Departmental Elective – I (Select any one)		3	1	0	40	60	100	4
MITE1- 156	Ethical Hacking							
MITE1-157	Intrusion Detection System							
MITE1-158	Adhoc and Sensor Networks							
Open Elective – I		3	0	0	40	60	100	3
Total		15	4	8	320	380	700	23

Total Contact Hours = 26

Total Marks = 700

Total Credits = 23

SEMESTER 2 nd		Contact Hrs..			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MITE1-206	Advance Software Engineering	3	1	0	40	60	100	4
MITE1-207	Relational Database Management System	3	1	0	40	60	100	4
MITE1-208	Object Oriented Analysis & Design	3	1	0	40	60	100	4
MHUM0-204	Business Communications	2	0	2	40	60	100	3
MITE1-209	RDBMS Lab	0	0	4	60	40	100	2
Departmental Elective – II (Select any one)		3	0	0	40	60	100	3
MITE1-259	Mobile Computing							
MITE1-260	Mobile Application Development							
MITE1-261	Real Time & Embedded Systems							
Departmental Elective – III (Select any One)		3	0	0	40	60	100	3
MITE1-262	Advance Operating System							
MITE1-263	Soft Computing							
MITE1-264	Artificial Intelligence							
Total		17	3	6	300	400	700	23

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2016 BATCH ONWARDS**

Total Contact Hours = 29

Total Marks = 800

Total Credits = 24

SEMESTER 3 rd		Contact Hrs..			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MITE1-310	Computer Graphics	3	1	0	40	60	100	4
MITE1-311	Advanced Computer Networks	3	1	0	40	60	100	4
MITE1-312	Information Security	3	1	0	40	60	100	4
MITE1-313	Computer Graphics Lab	0	0	4	60	40	100	2
MITE1-314	Computer Network Lab	0	0	4	60	40	100	2
MITE1-315	Seminar	0	0	2	60	40	100	1
Departmental Elective –I (Select any one)		3	1	0	40	60	100	4
MITE1-356								
MITE1-357	Cloud Computing							
MITE1-358	Virtualization & Cloud Security							
Open Elective – I		3	0	0	40	60	100	3
Total		15	4	10	360	420	800	24

Total Contact Hours = 32

Total Marks = 500

Total Credits = 20

SEMESTER 4 th		Contact Hrs..			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MITE1-416	Advanced Java Programming	3	1	0	40	60	100	4
MITE1-417	Theory of Computation	3	1	0	40	60	100	4
MITE1-418	Advanced Java Lab.	0	0	2	60	40	100	1
MITE1-419	Programming Lab.	0	0	2	60	40	100	1
MITE1-420	Project	0	0	20	60	40	100	10
Total		6	2	24	260	240	500	20

Overall

Semester	Marks	Credits
1 st	700	23
2 nd	700	23
3 rd	800	24
4 th	500	20
Total	1400	90

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OBJECT ORIENTED PROGRAMMING

Subject Code – MITE1- 101

**L T P C
3 1 0 4**

Duration – 45 Hrs.

UNIT-I (12 Hrs.)

Object Oriented Programming Concepts: Objects, Classes, Methods and Messages - Abstraction and Encapsulation, Inheritance - Abstract Classes, Polymorphism, Introduction To C++, Classes- Access Specifiers, Function and Data Members, Default Arguments - Function Overloading, Friend Functions- Const and Volatile Functions - Static Members - Objects - Pointers and Objects - Constant Objects - Nested Classes - Local Classes

UNIT-II (11 Hrs.)

Constructors - Default Constructor - Parameterized Constructors - Constructor with Dynamic Allocation - Copy Constructor - Destructors - Operator Overloading - Overloading Through Friend Functions - Overloading The Assignment Operator - Type Conversion - Explicit Constructor

UNIT-III (10 Hrs.)

Function and Class Templates - Exception Handling – Try Catch-Throw Paradigm - Exception Specification - Terminate and Unexpected Functions - Uncaught Exception.

UNIT-IV (12 Hrs.)

Inheritance - Public, Private and Protected Derivations - Multiple Inheritance - Virtual Base Class - Abstract Class - Composite Objects Runtime Polymorphism - Virtual Functions - Pure Virtual Functions - RTTI – Type id - Dynamic Casting - RTTI and Templates - Cross Casting - Down Casting, Streams and formatted I/O - I/O manipulators - file handling - random access - object serialization - namespaces - std namespace - ANSI String Objects - standard template library.

INTERNET AND WEB TECHNOLOGY

Subject Code – MITE1-102

**L T P C
3 1 0 4**

Duration – 45 Hrs.

UNIT-I (12 Hrs.)

Introduction: Internet Protocol Model, Internet Addresses, IP Routing Concepts, Table Driven and Next Hop Routing, Other Routing Related Protocols, Internet Access Through PPP, SLIP, WWW, Web Servers, Browsers.

UNIT-II (13 Hrs.)

Name Services and Configuration: DNS, DHCP, X500 Directory Services, LDAP, Internet Security, Authentication and Encryption, Watermarks, Firewall, SSL, Digital Signatures. **Web Services:** Web Services, Evolution and Differences with Distributed Computing, XML, WSDL, SOAP, UDDI, Transactions, Business Process Execution Language for Web Services, WS-Security and The Web Services Security Specifications, WS-Reliable Messaging, WS-Policy, WS-Attachments. Web 2.0 Technologies: Introduction to Ajax, Ajax Design Basics, Javascript, Blogs, Wikis, RSS Feeds.

UNIT-III (11 Hrs.)

Content Delivery and Preparation: Introduction to WWW, TCP/IP, HTTP, FTP, UDP, N-Tier, Markup Languages VRML– HTML, DHTML, DNS, URL, Browsers, Platform for Web Services Development, MVC Design Pattern, .NET, J2EE Architecture, J2EE Components & Containers, Specification, Application Servers, Struts.

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UNIT-IV (10 Hrs.)

Dynamic Web Programming: Java Applets, Java script, JSP, JSTL, ASP, PHP, Servlets, Servlet Life Cycle, C#, Component Technologies, Java Beans, CORBA, Introduction to EJBs, JDBC, Secure Electronic Transactions Over Web.

Recommended Books

1. E. Balagurusamy, 'Programming with Java', 4th Edn., Tata McGraw Hill Education, 2009.
2. E. Ladd and J. O'Donnell, 4th Edn., Platinum Edition Using XHTML XML and Java 2, Que Publishing, 2001.
3. P.J. Deitel,, H. Deitel, and A. Deitel, 'Internet and World Wide Web How to Program', 5th Edn., Pearson Education Limited, India, 2011.

ADVANCED DATABASE SYSTEM

Subject Code – MITE1 - 103

**L T P C
3 1 0 4**

Duration - 45 Hrs.

UNIT-I (12 Hrs.)

Parallel Databases: Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra Operation Parallelism – Case Studies.

UNIT-II (13 Hrs.)

Object Oriented Database: Object Oriented Databases – Introduction – Weakness of RDBMS – Object Oriented Concepts Storing Objects in Relational Databases – Next Generation Database Systems – Object Oriented Data models – OODBMS Perspectives – Persistence – Issues in OODBMS – Object Oriented Database Management System Manifesto – Advantages and Disadvantages of OODBMS – Object Oriented Database Design – OODBMS Standards and Systems – Object Management Group – Object Database Standard ODMG – Object Relational DBMS–Postgres - Comparison of ORDBMS and OODBMS.

UNIT-III (11 Hrs.)

Web Database: Web Technology and DBMS – Introduction – The Web – The Web as a Database Application Platform – Scripting languages – Common Gateway Interface – HTTP Cookies – Extending the Web Server – Java – Microsoft's Web Solution Platform– Oracle Internet Platform – Semi structured Data and XML – XML Related Technologies – XML Query Languages.

UNIT-IV (10 Hrs.)

Intelligent Database: Enhanced Data Models for Advanced Applications – Active Database Concepts and Triggers – Temporal Database Concepts – Deductive databases – Knowledge Databases. **Current Trends:** Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Parallel Database – Spatial Databases - Database administration – Data Warehousing and Data Mining.

Recommended Books

1. Thomas M. Connolly, Carolyn E. Begg, 'Database Systems - A Practical Approach to Design, Implementation, and Management', 3rd Edn., Pearson Education, 2003.
2. Ramez Elmasri & Shamkant B. Navathe, 'Fundamentals of Database Systems', 4th Edn., Pearson Education, 2004.
3. Tamer Ozsu M., Patrick Ualdurriel, 'Principles of Distributed Database Systems', 2nd Edn., Pearson Education, 2003.
4. C.S.R. Prabhu, 'Object Oriented Database Systems', PHI, 2003.

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5. Peter Rob and Corlos Coronel, 'Database Systems – Design, Implementation and Management'.

ETHICAL HACKING

Subject Code – MITE1 - 156

**L T P C
3 1 0 4**

Duration – 45 Hrs.

UNIT-I (12 Hrs.)

Introduction: To Ethical hacking: Terminology, Ethical hacking versus auditing, Nontechnical attacks, Network attacks, operating system attacks, Application attacks, Ethical hacking process, social engineering, physical security, Passwords.

UNIT-II (12 Hrs.)

Hacking: Hacking windows, Network hacking, Web hacking, Password hacking, Hardware hacking, Virtual Private Network hacking, Study of various attack: Input validation attacks, SQL injection attacks, Buffer overflow attacks, Privacy attacks, VoIP attacks.

UNIT-III (10 Hrs.)

Hacking TCP/IP: Checksums, IP spoofing, port scanning, DNS spoofing, DOS attacks: SYN attacks, Smurf attacks, UDP flooding, DDOS – Models.

UNIT-IV (11 Hrs.)

Wireless Hacking: Wireless footprint, Wireless scanning and enumeration, wireless network defense and counter measures, gaining access (hacking 802.11), WEP, WPA Web Hacking: Web server hacking, Web application hacking. Firewall Identification, Scanning Through firewalls, packet Filtering, Application Proxy Vulnerabilities, Denial of Service Attacks, Motivation of DoS Attackers, Types of DoS attacks, Generic Dos Attacks, UNIX and Windows DoS.

Recommended Books

1. A. Fadia, 'An Unofficial Guide to Ethical Hacking', 2nd Edn., MacMillan, 2010.
2. K. Beaver and McClure S., 'Hacking for Dummies', 3rd Edn., John Wiley & Sons, 2010.
3. Stuart McClure, Joel Scambray and Goerge Kurtz, 'Hacking Exposed Network Security Secrets & Solutions', 5th Edn., Tata Mc Graw Hill Publishers, 2010.

INTRUSION DETECTION SYSTEM

Subject Code – MITE1-157

**L T P C
3 1 0 4**

Duration – 45 Hrs.

UNIT-I (12 Hrs.)

History of Intrusion Detection, Audit, Concept and Definition, Internal and External Threats to Data, Attacks, Need and Types of IDS, Information Sources Host Based Information Sources, Network Based Information Sources.

UNIT-II (12 Hrs.)

Intrusion Prevention Systems, Network Ids Protocol Based Ids, Hybrid Ids, Analysis Schemes, Thinking About Intrusion. A Model for Intrusion Analysis, Techniques Responses Requirement of Responses, Types of Responses Mapping Responses to Policy Vulnerability Analysis, Credential Analysis Non Credential Analysis.

UNIT-III (10 Hrs.)

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-by-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

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UNIT-IV (11 Hrs.)

Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Pre-processors and Output Modules, Using Snort with MySQL, Using ACID and Snort Snarf, Agent development for intrusion detection, Architecture models of Intrusion Detection and Intrusion Prevention Systems.

Recommended Books

1. Rafeeq Rehman 'Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID', 1st Edn., Prentice Hall, **2003**.
2. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna, 'Intrusion Detection and Correlation Challenges and Solutions', 1st Edn., Springer, **2005**.
3. Carl Endorf, Eugene Schultz and Jim Mellander, 'Intrusion Detection & Prevention', 1st Edn., Tata McGraw Hill, **2004**.
4. Stephen Northcutt, Judy Novak, 'Network Intrusion Detection', 3rd Edn., New Riders Publishing, **2002**.

ADHOC AND SENSOR NETWORKS

Subject Code – MITE1-158

**L T P C
3 1 0 4**

Duration – 45 Hrs.

UNIT-I (12 Hrs.)

Introduction to Wireless Networks, Evolution of 3G Mobile Systems, Wireless LANs, Bluetooth, Scatternet, Piconet, Ad hoc Networks, Heterogeneity in Mobile Devices, Types of Ad hoc Mobile Communications, Types of Mobility, Challenges in Ad hoc Mobile Networks, Energy Management, Scalability, Addressing and Service Discovery, Deployment Considerations.

UNIT-II (11 Hrs.)

MAC protocols for Ad hoc Networks: Design issues, Classifications, Contention based protocols, MACAW, FAMA, BTMA, DBTMA, MACABI, Real-Time MAC protocol, Multichannel protocols, Power aware MAC, Routing protocols: Design issues, Table-driven protocols - DSDV, WRP, CGSR, On-Demand protocols - DSR, AODV, TORA, LAR, ABR, Zone Routing Protocol, Power Aware Routing protocols.

UNIT-III (12 Hrs.)

Multicast Routing, Preferred Link based Multicast, Mesh-based protocols, Core-Assisted Mesh protocol, Issues in Transport layer protocols, TCP over Ad hoc Networks, TCP Reno, Tahoe, Vegas, TCP SACK, Indirect TCP, Snooping TCP, Split-TCP, TCP-BuS, Quality of Service issues, MAC layer solutions, Network layer solutions, QoS framework for Ad hoc networks, INSIGNIA, INORA, SWAN. Wireless Sensor Networks, Unique constraints and challenges, Applications, Collaborative processing, Architecture, Data Dissemination, MAC protocols, S-MAC, IEEE 802.15.4 and ZigBee.

UNIT-IV (12 Hrs.)

Geographic, Energy-Aware Routing, Attribute-based routing, Directed Diffusion, Rumor Routing, Geographic Hash Tables -GHT, Data Gathering, PEGASIS, Location Discovery, Localization, Communication and Sensing Coverage, Topology Control, Time Synchronization, Sensor Taking and Control, Sensor Selection, IDSQ, Cluster Leader-based Protocol, Joint Routing and Information Aggregation, Sensor Network Databases, Challenges, In-Network Aggregation, TinyDB query processing, Data Centric Storage, Data Indices and Range Queries, Distributed Hierarchical Aggregation, Temporal Data, Platforms and Tools, Berkeley Motes, Programming Challenges, TinyOS, nesC, Tiny GALS, ns2 extensions, TOSSIM, Actuators.

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Recommended Books

1. C. Siva Ram Murthy and B.S. Manoj, 'Ad Hoc Wireless Networks: Architectures and Protocols', Pearson Education, 2007.
2. C.K. Toh, 'Ad Hoc Mobile Wireless Networks: Protocols and Systems', Pearson Education, 2007.
3. Feng Zhao and Leonidas Guibas, 'Wireless Sensor Networks: An Information Processing Approach', Morgan Kaufman Publishers, 2007.
4. Jochen Schiller, 'Mobile Communications', Pearson Education, 2009.

ADVANCED SOFTWARE ENGINEERING

Subject Code: MITE1-206

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Principles and Motivations: History, Definitions; Engineering approaches to software development: Software development process models from the points of view of technical development and project management: waterfall, rapid prototyping, incremental development, spiral models, Agile Software Development, Emphasis on computer-assisted environments. Selection of appropriate development process.

Software Development Methods: Formal, semi-formal and informal methods; Requirements elicitation, requirements specification; Data, function, and event-based modelling; Some of the popular methodologies such as Yourdon's SAD, SSADM etc., CASE tools-classification, features, strengths and weaknesses; ICASE; CASE standards.

UNIT-II (11 Hrs.)

Software Project Management: Principles of software projects management; Organizational and team structure; Project planning; Project initiation and Project termination, Technical, quality, and management plans; Project control; Cost estimation methods: Function points and COCOMO.

UNIT-III (12 Hrs.)

Software Quality Management: Quality control, quality assurance and quality standards with emphasis on ISO 9000; Functions of software QA organization in a project; interactions with developers; Quality plans, quality assurance towards quality improvement; Role of independent verification & validation; Total quality management; SEI maturity model; Software metrics.

UNIT-IV (10 Hrs.)

Configuration Management: Need for configuration management; Configuration management functions and activities; Configuration management techniques; Examples and case studies.

Software Testing Fundamentals: Basic Terminology, Testing Techniques and strategies. Brief introduction to various standards related to Software Engineering.

Recommended Books

1. Roger Pressman, 'Software Engineering - A Practitioners Approach', McGraw Hill.
2. Ian Sommerville, 'Software Engineering', Addison-Wesley Publishing Company.
3. James F. Peter, 'Software Engineering - An Engineering Approach', John Wiley.
4. Pankaj Jalote, 'An Integrated Approach to Software Engineering', Narosa.

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RELATIONAL DATABASE MANAGEMENT SYSTEM

Subject Code: MITE1-207

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (13 Hrs.)

Introduction to Database Systems: Database System Concepts and Architecture, Data Models, Data Independence, SQL: DDL, DML, DCL, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF. Query Processing and Optimization: Query Processing, Syntax Analyser, Query Decomposition, Query Optimization, Heuristic Query Optimization, Cost Estimation, Cost Functions for Select, Join, Query Evaluation Plans. Transaction Processing and Concurrency Control: Transaction Processing Concepts, Concurrency Control Techniques: Two-phase Locking, Timestamp Ordering, Multiversion, Validation, Multiple Granularity Locking.

UNIT-II (10 Hrs.)

Object Oriented and Object Relational Databases: Object Oriented Concepts, Object Oriented Data Model, Object Definition Language, Object Query Language, Object Relational Systems, SQL3, ORDBMS Design.

UNIT-III (12 Hrs.)

Distributed Databases: Distributed Database Concepts, Advantages and Disadvantages, Types of Distributed Database Systems, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Five Level Schema Architecture, Query Processing, Concurrency Control and Recovery in Distributed Databases. Backup and Recovery: Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.

UNIT-IV (10 Hrs.)

Introduction to Data Warehousing and Data Mining: Introduction to OLAP, OLTP, Data Warehouse, Data Marts, Data Mining, Data Mining Process, Big Data. Enterprise Database Products: Enterprise Database Products, Familiarity with IBM DB2 Universal Database, Oracle, Microsoft SQL Server, MySQL, their features.

Recommended Books

1. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 5th Edn., Pearson Education, 2007.
2. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', Tata McGraw-Hill.
3. C.J. Date, 'An Introduction to Database Systems', 8th Edn., Pearson Education.
4. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press.
5. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', Tata McGraw Hill.
6. S.K. Singh, 'Database Systems Concepts, Design and Applications', Pearson Education.
7. Chris Eaton, Paul Zikopoulos, 'Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data'.

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OBJECT ORIENTED ANALYSIS AND DESIGN

Subject Code: MITE1-208

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Object Oriented Design and Modelling: Object Oriented Fundamentals, Objects and object classes, object oriented design process, importance of modelling, principles of modelling, object oriented modelling. Introduction to UML: Conceptual model of UML, building blocks of UML, Mechanisms in UML, architecture, software development life cycle.

UNIT-II (12 Hrs.)

Basic Structural Modelling Classes, relationships, common mechanisms, class and object diagrams. Advanced structural Modelling Advanced classes, advanced relationships, Interfaces types and roles, packages, instances and object diagrams. Collaboration Diagrams and Sequence Diagrams Terms, concepts and depicting a message in collaboration diagrams. Terms and concepts in sequence diagrams. Difference between collaboration and sequence. diagram. Depicting synchronous messages with/without priority call back mechanism.

UNIT-III (11 Hrs.)

Basic behavioural modelling Interactions, use cases, Use Case Diagrams, Interaction Diagrams and activity diagrams. Advanced behavioural modelling: Events and signals, state machines, process and threads, time and space, state chart diagrams.

UNIT-IV (10 Hrs.)

Architectural Modelling: Terms, Concepts, examples, Modelling techniques for component diagrams and deployment diagrams.

Recommended Books

1. Grandy Booch, James Rumbough, Ivar Jacobson, 'The Unified Modelling Language User Guide', Pearson Education.
2. Ian Sommerville, 'Software Engineering', 6th Edn.
3. Meilir Page Jones, 'Fundamentals of Object Oriented Design in UML', Addison Wesley.

BUSINESS COMMUNICATIONS

Subject Code: MHUM0-204

**L T P C
2 0 2 3**

Duration: 28 Hrs.

Course Objectives: This course is designed to give students a comprehensive view of communication, its scope and importance in business, the role of communication in establishing a favourable image of the organization. The aim is to develop students' ability to communicate correctly and effectively on matters having relevance to day-to-day business operations. This course will make student conversant with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform their communication abilities.

UNIT- I (7 Hrs.)

Introduction to Communication: Meaning, Process, Importance of Communication in Business, Types of Information, Formal and Informal Communication, Internal and External Communication. Approaches to Effective Communication, Essentials of Effective Business Communication (7Cs model).

Written Communication: Advantages and Disadvantages, Covering letter, Need, Functions and Kinds, Layout of Letter Writing, Types of Letter Writing: Persuasive Letters, Request Letters, Sales Letters, Complaints and Adjustments.

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UNIT –II (7 Hrs.)

Developing Reading Skills: Identify the Purpose of Reading, Factors Effecting Reading, Course How to Think and Read, Developing Effective Reading Habits, Reading Tactics and Strategies: Training Eye and Training Mind (SQ3R).

Developing Listening Skills: Importance, Purpose of Listening, Art of Listening, Factors Affecting Listening, Components of Effective Listening, Process of Listening, Principles and Barriers to Listening, Activities to Improve Listening.

UNIT- III (7 Hrs.)

Oral Communication: Advantages and Disadvantages, Conversation as Communication, Art of Public Speaking, Group Communication Through Committees, Preparing and Holding Meetings, Overcoming Stage Fright, Ambiguity Avoidance.

Departmental Communication: Meaning, Need and Types: Interview Letters, Promotion Letters, Resignation Letters, Newsletters, Circulars, Agenda, Notice, Office Memorandums, Office Orders, Press Release.

Report Writing: Structure, Types, Formats, Drafting of Various Types of Report. Nonverbal – Features, Understanding of Body Language, Posture, Gestures. Influences on Communication: Social Influences, Culture and Communication, Few Guidelines for Better Multicultural Communication, Business Etiquettes and Communication.

UNIT- IV (7 Hrs.)

Group Discussion: Nature, Uses and Importance, Guidelines for GD Presentations: How to Make Effective Presentations, Four P's of Presentation, Structuring, Rehearsing and Delivery Methods.

Resume Writing: Planning, Organizing Contents, Layout, Guidelines for Good Resume. Interviews: Preparation Techniques, Frequently Asked Questions about How to Face an Interview Board, Proper Body Posture, projecting a Positive Image, Steps to Succeed In Interviews, Practice Mock Interview in Classrooms.

The Case Method of Course: Dimensions of a Case, Case Discussion, Usefulness of The Case Method, Training of Managers, Use The Case Method. Report Writing: Structure, Types, Formats, Preparations and Presentation.

Course Outcomes: After studying this course the students will enable to:

- Know the dynamics of communication in the business world
- Practice the different tools of communication
- Enable them to speak effectively suited to the situation
- Improve their competence in English

Recommended Books

1. Lesikar, Petit & Flately, 'Lesikar's Basic Business Communication', Tata McGraw Hill.
2. Raman Meenakshi, 'Prakash Singh, Business Communication', Oxford University Press.
3. Rizvi Ashraf, 'Effective Technical Communication', Tata McGraw Hill.
4. Krizan, Buddy, 'Merrier, Effective Business Communication', Cengage Course.
5. Diwan & Aggarwal, 'Business Communication', Excel.
6. Baugh, Frayer & Thomas, 'How to Write First Class Business Correspondence', Viva Book.
7. Taylor, English Conversion Practice', Tata McGraw Hill.
8. Devaraj, 'Executive Communication', Tata McGraw Hill.
9. Ober, 'Effective Bossiness Communication', Cengage Course.

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2016 BATCH ONWARDS**

MOBILE COMPUTING

Subject Code: MITE1-259

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (10 Hrs.)

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT-II (10 Hrs.)

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP.

UNIT-III (10 Hrs.)

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client- Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT-IV (10 Hrs.)

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

Recommended Books

1. Jochen Schiller, 'Mobile Communications', 2nd Edn., Addison Wesley, Pearson Education.
2. Raj Kamal, 'Mobile Computing', Oxford University Press, 2007.
3. Mazliza Othman, 'Principles of Mobile Computing and Communications', Auerbach Publications.
4. William Stallings, 'Wireless Communications and Networks', Prentice Hall, 2005.
5. M. Richharia, 'Mobile Satellite Communication: Principles and Trends', Pearson Education.

MOBILE APPLICATION DEVELOPMENT

Subject Code: MITE1-260

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (09 Hrs.)

Introduction: Mobile Development Importance, Survey of mobile based application development, Mobile myths, third party frameworks, Mobile Web Presence and Applications, creating consumable web services for mobile, JSON, Debugging Web Services, Mobile Web Sites, Starting with Android mobile Applications.

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UNIT-II (11 Hrs.)

Mobile Web: Introduction, WAP1, WAP2, Fragmentation Display, Input Methods, Browsers and Web Platforms, Tools for Mobile Web Development.

Application Architectures and Designs: Mobile Strategy, Navigation, Design and User Experience, WML, XHTML Mobile Basics, Mobile HTML5, CSS for Mobile, WCSS extensions, CSS3, CSS for mobile browsers, HTML5 Compatibility levels, Basics of Mobile **HTML5:** Document Head, Document Body, HTML5 Mobile Boilerplate, the Content, HTML5 Forms: Design, Elements, Attributes, Validation.

UNIT-III (09 Hrs.)

Devices, Images, Multi-Media: Device Detection, Client-side Detection, Server-side Detection, Device Interaction, Images, Video, Audio, Debugging and Performance, Content Delivery, Native and Installed Web Apps.

UNIT-IV (11 Hrs.)

Advanced Tools & Techniques: J2ME programming basics, HTML5 Script Extensions, Code Execution, Cloud based browsers, JS Debugging and profiling, Background Execution, Supported Technologies and API, Standard JavaScript Behaviour, Java Libraries, Mobile Libraries, UI Frameworks: Sencha Touch, JQueryMobile, Enyo, Montage, iUI, jQTouch, JavaScript Mobile UI Patterns.

Advanced Applications: Geolocation and Maps app, Online Apps, Storage, and Networks, Distribution and Social Web 2.0.

Recommended Books

1. Je McWherter, Scott Gowell, 'Professional Mobile Application Development', John Wiley & Sons.
2. Maximiliano Firtman, 'Programming the Mobile Web', 2nd Edn., Oreilly, 2013.
3. 'Digital Content': [http://en.wikibooks.org/wiki/Category: J2ME Programming](http://en.wikibooks.org/wiki/Category:J2ME_Programming).
4. 'Android Studio Development Essentials', Ref: <http://www.techotopia.com/>.

REAL TIME & EMBEDDED SYSTEMS

Subject Code: MITE1-261

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (11 Hrs.)

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems, Design cycle in the development phase for an embedded system, Use of software tools for development of an ES.

UNIT-II (10 Hrs.)

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

UNIT-III (09 Hrs.)

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

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UNIT-IV (10 Hrs.)

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, how to Choose an RTOS.

Recommended Books

1. K.V. Shibu, 'Introduction to Embedded Systems', McGraw Hill.
2. Raj Kamal, 'Embedded Systems', Tata McGraw Hill.
3. Frank Vahid, Tony Givargis, 'Embedded System Design', John Wiley.
4. Lyla, 'Embedded Systems', Pearson, 2013.
5. David E. Simon, 'An Embedded Software Primer', Pearson Education.

ADVANCE OPERATING SYSTEM

Subject Code: MITE1-262

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (11 Hrs.)

Processes and Scheduling: Process States and System Call Interface; Life Cycle of a Process; Process Dynamics; Scheduler: working and implementation; Linux Process States and System Calls; Process Groups, Sessions, Foreground and Background Processes.

UNIT-II (09 Hrs.)

Interprocess Communication and Synchronisation: Signals, Pipes and Named Pipes (FIFOs); Threads and pthread library; Mutexes and Condition Variables; Semaphores; Producer-Consumer Problem and Solutions using mutexes, condition variables and semaphores

UNIT-III (09 Hrs.)

Files and File Systems: File and File Meta-data; File Naming Systems; File System Operations; File System Implementation; File System Structures; Booting an OS; File System Optimisation.

UNIT-IV (11 Hrs.)

Devices and Device Drivers: Devices and Types of Devices; Terminal, Disk, SCSI, Tape and CD devices; Unification of Files and Devices; Device Drivers: Concepts and Implementation Details.

Resource Management and Security: Resource Management Issues; Types of Resources; Integrated Resource Scheduling; Queuing Models of Scheduling; Protection of Resources – hardware, software, and attacks; Security Policies.

Recommended Books

1. Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Tata McGraw Hill.
2. Richard Stevens, Stephen Rago, 'Advanced Programming in the Unix Environment', Addison-Wesley.
3. M. Maekawa and Arthur E. Oldehoeft and R.R. Oldehoeft, 'Operating Systems: Advanced Concepts', Benjamin Cummings.

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SOFT COMPUTING

Subject Code: MITE1-263

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (10 Hrs.)

Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues - systems

UNIT-II (10 Hrs.)

Neural Model and Network Architectures, Perceptron Course, Supervised Hebbian Course, Backpropagation, Associative Course, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

UNIT-III (10 Hrs.)

Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

UNIT-IV (10 Hrs.)

Advanced Topics: Support Vector Machines, Evolutionary computation (EC)- Evolutionary algorithms, Harmony search, Swarm intelligence

Recommended Books

1. M. Mitchell, 'An Introduction to Genetic Algorithms', Prentice-Hall
2. D.E. Goldberg, 'Genetic Algorithms in Search, Optimization, and Machine Course', Addison Wesley.
3. S.V. Kartalopoulos, 'Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications', IEEE Press – PHI.
4. S. Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications', Prentice Hall India.
5. S.N. Sivanandam & S.N. Deepa, 'Principles of Soft Computing', Wiley India.

ARTIFICIAL INTELLIGENCE

Subject Code: MITE1-264

**L T P C
3 0 0 3**

Duration: 40 Hrs.

UNIT-I (10 Hrs.)

Introduction, Intelligent agents Problem Solving: Solving problems by searching, Informed search and exploration, constraint satisfaction problems, adversarial search.

UNIT-II (10 Hrs.)

Knowledge and Reasoning: Logical agents, first order logic, Inference in first order logic, knowledge representation. Planning; Planning and acting in real world.

UNIT-III (10 Hrs.)

Uncertain Knowledge and Reasoning: Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over time, Making Simple decisions.

UNIT-IV (10 Hrs.)

Course: Course from observations, knowledge in Course, Reinforcement Course. Communication, Perceiving and acting: Communication, Perception, Probabilistic language processing.

Recommended Books

1. E. Rich, 'Artificial Intelligence', McGraw Hill.
2. E. Charniak and D. McDermott, 'Introduction to Artificial Intelligence', Addison Wesley.

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3. Stuart Russell, Peter Noving, 'Artificial Intelligence: A Modern Approach', Pearson Education.
4. George F. Luger, 'Artificial Intelligence', 4th Edn., Pearson Education.

RDBMS LAB.

Subject Code: MITE1-209

L T P C

0 0 4 2

1. Case studies on normalization
2. Study and usage of query optimization techniques
3. Study and usage of backup and recovery features of database management software
4. Server administration of any database management software
5. Study and usage of any object oriented or object relational database management software
6. Study and usage of open source data mining tool: Weka
7. Study of web databases 8. Development of a project by making use of tools studied above

COMPUTER GRAPHICS

Subject Code: MITE1-310

L T P C

Duration: 45 Hrs.

3 1 0 4

UNIT-I (12 Hrs.)

Introduction to Active and Passive Graphics, Applications of Computer Graphics. Input devices: light pens, Graphic tablets, Joysticks, Trackball, Data Glove, Digitizers, Image scanner, Graphs and Types of Graphs. Video Display Devices-Refresh Cathode Ray Tube, Raster Scan displays, Random Scan displays, Architecture of Raster and Random Scan Monitors, Color CRT-monitors and Color generating techniques (Shadow Mask, Beam Penetration), Direct View Storage Tube, Flat-Panel Displays; 3-D Viewing Devices, Raster Scan Systems, Random Scan Systems, Graphics monitor and workstations, Color Models (RGB and CMY), Lookup Table.

UNIT- II (10 Hrs.)

Process and need of Scan Conversion, Scan conversion algorithms for Line, Circle and Ellipse, effect of scan conversion, Bresenham's algorithms for line and circle along with their derivations, Midpoint Circle Algorithm, Area filling techniques, flood fill techniques, character generation.

UNIT-III (11 Hrs.)

2-Dimensional Graphics: Cartesian and need of Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection, Shearing), Two-dimensional viewing transformation and clipping (line, polygon and text), Cohen Sutherland, Sutherland Hodgeman and Liang Barsky algorithm for clipping.

Introduction to 3-dimensional Graphics: Geometric Transformations (Translation, Scaling, Rotation, Reflection, Shearing), Mathematics of Projections (parallel & perspective). Introduction to 3-D viewing transformations and clipping.

UNIT- IV (12 Hrs.)

Hidden Line and Surface Elimination Algorithms: Z-buffer, Painters algorithm, scan-line, subdivision, Shading and Reflection: Diffuse reflection, Specular reflection, refracted light, Halftoning, Dithering techniques. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading (Mash Band effect). Morphing of objects.

Note: Graphics Programming using C/C++ with introduction to Open GL.

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Recommended Books

1. D. Hearn and M.P. Baker, 'Computer Graphics', PHI, New Delhi.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, R.L Phillips, 'Computer Graphics'.
3. 'Principles & Practices', Pearson Education, 2007.
4. R.A. Plastock and G. Kalley, 'Computer Graphics', McGraw Hill, 1986.
5. F.S. Hill, 'Computer Graphics using Open GL', Pearson Education, 2003.

ADVANCED COMPUTER NETWORKS

Subject Code: MITE1-311

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Objectives: The objective of the course is to offer good understanding of the concepts of network security, wireless, Adhoc and various emerging network technologies.

UNIT-I (11 Hrs.)

Network Security: Fundamentals of network security, Basics of IPv6, IPsec: overview of IPsec, IP and IPv6, Authentication header (AH), Encapsulating Security Payload (ESP).
Internet Key Exchange (IKE): History, Photuris, Simple Key-management for Internet protocols (SKIP), IKE phases, IKE encoding.

UNIT-II (12 Hrs.)

Adhoc 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.

UNIT-III (10 Hrs.)

3G Wireless Networks: Wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.

UNIT-IV (12 Hrs.)

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', Pearson Education.
2. Charlie Kaufman, 'Radio Perlman, Mike Speciner, Network 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 Course / Thomson Brooks / Cole
5. S. Keshav, 'An Engineering Approach to Computer Networking', Pearson Education.
6. Mayank Dave, 'Computer Networks', Cengage Course.

INFORMATION SECURITY

Subject Code: MITE1-312

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Computer Security Concepts, Threats, Attacks, Assets, Security Functional Requirements, Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy Cryptographic Tools: Confidentiality with Symmetric Encryption, Message

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Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudo Random Numbers, Practical Application: Encryption of Stored Data.

UNIT-II (12 Hrs.)

User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System

Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control Example: UNIX File Access Control, Role-Based Access Control.

Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security

UNIT-III (11 Hrs.)

Malicious Software: Types of Malicious Software(Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAME-mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload– Information Theft– Keyloggers, Phishing, Spyware, Payload–Stealth–Backdoors, Rootkits

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of- Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack

Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output

UNIT-IV (12 Hrs.)

Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security

Trusted Computing and Multilevel Security: The Bell-LaPadula Model for Computer Security, Other Formal Models for Computer Security, The Concept of Trusted Systems, Application of Multilevel Security, Trusted Computing and the Trusted Platform Module, Common Criteria for Information Technology Security Evaluation, Assurance and Evaluation

IT Security Management and Risk Assessment: IT Security Management, Organizational Context and Security Policy, Security Risk Assessment, Detailed Security Risk Analysis

IT Security Controls, Plans and Procedures: IT Security Management Implementation, Security Controls or Safeguards, IT Security Plan, Implementation of Controls, Implementation Follow-up.

Recommended Books

1. W. Stallings, 'Computer Security: Principles and Practice', Prentice Hall.
2. M.Stamp, 'Information Security: Principles and Practice', Wiley Publication.
3. M.E. Whitman and H.J. Mattord, 'Principles of Information Security', 4th Edn., Course Technology.
4. M. Bishop, 'Computer Security: Art and Science', Addison Wesley.
5. G. McGraw, 'Software Security: Building Security In', Addison Wesley.

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BIG DATA

Subject Code: MITE1-313

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Introduction to Big Data: Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

UNIT –II (12 Hrs.)

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop EcoSystem – 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 (11 Hrs.)

Hadoop Ecosystem and Yarn: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT-IV (11 Hrs.)

HIVE and HIVEQL, HBASE: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, 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. Practical.

Recommended Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, 'Professional Hadoop Solutions', Wiley.
2. Chris Eaton, Dirk deroos et al., 'Understanding Big data', McGraw Hill.
3. Vignesh Prajapati, 'Big Data Analytics with R and Hadoop', Packet Publishing.
4. Tom Plunkett, Brian Macdonald et al, 'Oracle Big Data Handbook', Oracle Press.
5. Jy Liebowitz, 'Big Data and Business Analytics' CRC press.

CLOUD COMPUTING

Subject Code: MITE1-314

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS, Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure.

UNIT-II (11 Hrs.)

Introduction to Cloud Technologies: Study of Hypervisors, SOAP, REST, Compare SOAP and REST, Web services, AJAX and Mashups-Web services, Mashups: user interface services, Virtual machine technology, virtualization applications in enterprises, Pitfalls of

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virtualization, Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications.

UNIT-III (12 Hrs.)

Data in the Cloud: Relational Databases, Cloud File Systems: GFS and HDFS, BigTable, HBase and Dynamo, Map-Reduce and extensions: Parallel computing, the Map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Introduction to cloud development, Monitoring in Cloud, A grid of clouds, Mobile Cloud Computing, Sky computing, Utility Computing, Elastic Computing.

UNIT-IV (10 Hrs.)

Cloud Security: Fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture, Cloud computing security challenges, Issues in cloud computing, implementing real time application over cloud platform, Issues in Intercloud environments, QoS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment, Inter Cloud issues, load balancing, resource optimization.

Recommended Books

1. Antohy. T. Velte, et.al, 'Cloud Computing: A Practical Approach', McGraw Hill.
2. Judith Hurwitz, R. Bloor, M. Kanfman, F. Halper, 'Cloud Computing for Dummies', Wiley India Edition.
3. Tim Malhar, S. Kumaraswamy, S. Latif, 'Cloud Security & Privacy', SPD,O'Reilly.
4. Barrie Sosinsky, 'Cloud Computing Bible', Wiley India.
5. George Reese, 'Cloud Applications', O'Reilly Publication.
6. Ronald Krutz and Russell Dean Vines, 'Cloud Security', Wiley India.

VIRTUALIZATION & CLOUD SECURITY

Subject Code: MITE1-315

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems: Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

UNIT-II (12 Hrs.)

Multi-tenancy Issues: Isolation of users/VMs from each other. How the cloud provider can provide this; Virtualization System Security Issues: e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities: Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets, etc.).

UNIT-III (11 Hrs.)

Virtualization System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking.

Technologies for Virtualization-Based Security Enhancement: IBM security virtual server protection, virtualization-based sandboxing; Storage Security: HIDPS, log management, Data Loss Prevention. Location of the Perimeter.

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UNIT-IV (10 Hrs.)

Legal and Compliance Issues: Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Recommended Books

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, 'Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance', O'Reilly Media Inc., 2009.
2. Ronald L. Krutz, Russell Dean Vines, 'Cloud Security'.
3. John Rittinghouse, James Ransome, 'Cloud Computing'.
4. J.R. ("Vic") Winkler, 'Securing the Cloud'.
5. Cloud Security Alliance: Security Guidance for Critical Areas of Focus in Cloud Computing, 2009

ADVANCED JAVA PROGRAMMING

Subject Code: MITE1-416

**L T P C
3 1 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Introduction to Multithreading and Concurrency in Java, Creating and managing threads in Java, Priority management, Thread synchronization, inter thread communication, Thread groups and Daemon threads, Concepts of concurrency, task scheduling, Callable and Futures, Synchronizes, Semaphores, Concurrent collections, Atomic variables and Locks.

UNIT-II (11 Hrs.)

Understanding Input Output Streams, Basic concepts of Stream data, Input Stream hierarchy, Output Stream hierarchy, Understanding of various API's and methods used or streaming of data. Serialization and security in Serialization.

UNIT-III (12 Hrs.)

Introduction to Java Data Base Connectivity, Basic concept on Database Connectivity Drivers. Database interaction using Statement Interface, Result set Interface. Prepared Statements and Callable statements. Transaction management.

UNIT-IV (11 Hrs.)

Java Beans and Generics, Reflection API, Introduction to Java Bean, Java Beans in User Interface, Naming Convention, Importance of Bean Serialization. Introduction to generics, Importance of generics, Implementation of various types in Generics and Concept of Erasure. Annotations: Introduction to Annotations, build in Annotations, Annotation Inheritance, Creation of user defined Annotations and Advantages of Annotations.

Recommended Books

1. Bruce Eckel, 'Thinking in Java', Pearson Education.
2. Bruce Eckel, 'Head First Java', O'Reilly Media.

THEORY OF COMPUTATION

Subject Code: MITE1-417

**L T P C
3 1 0 4**

Duration: 45 Hrs.

Course Objectives:

1. Understanding and development of theoretical models of computations and their analysis.
2. The models of computations include (i) Finite Automata (and Regular Languages), (ii) Push Down Automata (and Context-free Languages), (iii) Turing Machine (and their Languages)
3. The aim of analysis is to identify and prove the capabilities and limitations of particular models of Computations.

UNIT-I (11 Hrs.)

Introduction, Sets, Logic, Functions, Relations, Languages, Proofs Mathematical Induction, Strong Principle of Mathematical Induction, Recursive Definitions, Structural Induction, Regular Languages & Regular Expressions, Finite Automata (FA), Distinguishing Strings w.r.t. Language, Union, Intersection, & Compliment of Languages.

UNIT-II (12 Hrs.)

Non-deterministic Finite Automata (NFA), NFA with Null-Transitions, Kleene's Theorem, A Criterion for Regularity, Minimal Finite Automata, Pumping Lemma for Regular Languages. Introduction to Context-Free Grammar (CFG), Regular Grammars, Derivation (Parse) Trees & Ambiguities, An Unambiguous CFG for Algebraic Expressions, Simplified Forms & Chomsky Normal Forms.

UNIT-III (11 Hrs.)

Introduction to Push Down Automata (PDA), Deterministic PDA (DPDA), PDA corresponding to a Given CFG, CFG Corresponding to a Given PDA, Parsing The Pumping Lemma for CFG, Intersection & Complement of CFGs, Decision Problems Involving CFGs.

UNIT-IV (11 Hrs.)

Turing Machine (TM) Definition & Examples, Computing a Partial Function with a TM. Recursive Enumerable & Recursive Languages, Enumerating a Language, Context-Sensitive Languages & Chomsky Hierarchy.

Recommended Books

1. John C. Martin, 'Introduction to Languages and the Theory of Computation', Tata McGraw Hill, 2003
2. Harry Lewis & Christos H. Papadimitriou, 'Elements of the Theory of Computation', Prentice Hall of India.
3. Michael Sipser, 'Theory of Computation', Cengage Course, 2007.
4. Hopcroft, Motwani & Ullman, 'Introduction to Automata Theory, Languages, and Computation', Pearson Education, 2008.

ADVANCED JAVA LAB.

Subject Code: MITE1-418

**L T P C
0 0 2 1**

Implementation of all the programs related to theory concepts studied in Advanced Java subject:

1. Interfaces.
2. Packages.

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3. Exception handling.
4. Applet Programming.
5. AWT.
6. Event Handling.
7. I/O Handling.
8. Multithreading and concurrency
9. Input and Output streams
10. Java data base connectivity (JDBC)
11. Java Beans and Genrics
12. Annotations.

PROGRAMMING LAB.

Subject Code: MITE1-419

L T P C

0 0 2 1

In this lab students have to cover the technology related to the Project which he/she has undertaken. Lab activities for the learning of that technology.

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M. Sc. MEDICAL LABORATORY TECHNOLOGY (CLINICAL BIOCHEMISTRY)

Total Contact Hours = 28

Total Marks = 700

Total Credits = 22

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMLT1- 101		4	0	0	40	60	100	4
MMLT1- 102	Enzymes & Metabolism- I	4	0	0	40	60	100	4
MMLT1-103	Clinical Biochemistry- I	4	0	0	40	60	100	4
MMLT1-104	Physiology & Nutrition-I	4	0	0	40	60	100	4
MMLT1-105	Biostatistics	4	0	0	40	60	100	4
MMLT1-106	Clinical Biochemistry- I Lab	0	0	4	60	40	100	2
MMLT1-107	Biostatistics Lab	0	0	4	60	40	100	2
Total		20	0	8	320	380	700	24

« Course was dropped and was not included in December 2016 Final Exam schedule of MRSPTU

Total Contact Hours = 26

Total Marks = 700

Total Credits = 22

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMLT1-208	Analytical Biochemistry	4	0	0	40	60	100	4
MMLT1- 209	Enzymes & Metabolism- II	4	0	0	40	60	100	4
MMLT1-210	Physiology & Nutrition-II	4	0	0	40	60	100	4
MMLT1-211	Clinical Biochemistry-II	3	0	0	40	60	100	3
MMLT1-212	Molecular Diagnostics	3	0	0	40	60	100	3
MMLT1-213	Analytical Biochemistry Laboratory	0	0	4	60	40	100	2
MMLT1-214	Clinical Biochemistry-II Laboratory	0	0	4	60	40	100	2
Total		18	0	8	320	380	700	22

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BIOCHEMISTRY) 2016 BATCH ONWARDS**

Total Contact Hours = 28

Total Marks = 800

Total Credits = 25

SEMESTER 3 rd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MMLT1- 315	Organ Function Tests	4	0	0	40	60	100	4
MMLT1-316	Molecular Biology	4	0	0	40	60	100	4
MMLT1-317	Physical Biochemistry	4	0	0	40	60	100	4
MMLT1-318	Bio Safety and Bio Ethics	4	0	0	40	60	100	4
MMLT1-319	Organ Function Test Laboratory	0	0	4	60	40	100	2
MMLT1-320	Molecular Biology laboratory	0	0	4	60	40	100	2
MMLT1-321	Physical Biochemistry Laboratory	0	0	4	60	40	100	2
MMLT1-322	Seminar on Recent Advances in Clinical Biochemistry	0	0	4	40	60	100	2
Total		16	0	12	380	420	800	25

Total Contact Hrs. = 25

Total Credits= 20

Course		Load Allocation	Marks			Credits
Code	Name		Internal	External	Total	
MMLT1- 423	Dissertation	Submission within 5 Months	200	200	400	20

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ENZYMES & METABOLISM- I

Subject Code: MMLT1- 102

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. Students will learn about the role of various enzymes as well as their mechanism in metabolic processes.

UNIT-I (11 Hrs.)

Introduction to enzyme & mechanism of catalysis: Classification and characteristics, nature of active site, enzyme substrate complex, factors responsible for catalysis, allosteric enzymes, regulation of metabolic pathways, isozymes & their importance.

UNIT-II (12 Hrs.)

Enzyme Kinetics: A brief concept of bioenergetics and kinetics, Kinetics of single and bi-substrate enzyme catalyzed reactions, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of Km and Vmax values, Enzyme inhibition: reversible and irreversible inhibition.

UNIT-III (10 Hrs.)

Carbohydrate Metabolism: Digestion and absorption of carbohydrates, glycolysis, and citric acid cycle, oxidative phosphorylation, Gluconeogenesis, biosynthesis & degradation of di and polysaccharides.

UNIT-IV (12 Hrs.)

Lipid Metabolism: Digestion and absorption of lipids transport of lipoproteins, Oxidation of fatty acids, degradation and synthesis of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, and cholesterol.

Recommended Books

1. T. Palmer and P.L. Bonner, 'Enzymes: Biochemistry, Biotechnology and Clinical Chemistry', 2nd Edn, Woodhead Publishing
2. J.M. Berg, J.L. Tymoczko, G.J. Gatto and L. Stryer, 'Biochemistry', 8th Edn., W.H. Freeman & Co., New York.
3. D.L. Nelson and M.M. Cox, 'Lehninger Principles of Biochemistry', 6th Edn., Macmillan Worth Publishers, New Delhi.
4. Voet D., Voet JG and Pratt CW, 'Fundamentals of Biochemistry', 5th Edn. John Wiley & Sons. New York.

CLINICAL BIOCHEMISTRY- I

Subject Code: MMLT-103

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I

Course Objectives

1. Students will learn the clinical aspects of the biochemistry.

UNIT-I (12 Hrs.)

Disorders of carbohydrates & lipids metabolism - Diabetes mellitus, glycohemoglobins, hypo-glycemias, galactosemia and ketone bodies, various types of glucose tolerance tests, glycogen storage diseases, Plasma lipoproteins, cholesterol, triglycerides & phospholipids in

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health and disease, hyperlipidemia, hyperlipoproteinemia, Gaucher's disease, Tay-Sach's and Niemann-Pick disease, ketone bodies, Abetalipoproteinemia.

UNIT-II (11 Hrs.)

Hormonal Disturbance: Protein hormones (anterior pituitary hormones, posterior pituitary hormones), steroid hormones, adrenocorticosteroids, and reproductive endocrinology. Disturbances in thyroid function.

UNIT-III (10 Hrs.)

Electrolytes, Acid-Base Balance & Digestive Diseases: Regulation of electrolyte content of body fluids and maintenance of pH, reabsorption of electrolytes, maldigestion, malabsorption, creatorrhoea, diarrhea and steatorrhoea.

UNIT-IV (12 Hrs.)

Biochemical Aspects of Hematology, Liver & Kidney: Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemias thrombosis and anemias. Laboratory tests to measure coagulation and thrombolysis, jaundice, fatty liver, normal and abnormal functions of liver and kidney, inulin and urea clearance.

Recommended Books

1. M.N. Chatterjea and Rana Shinde, 'Textbook of Medical Biochemistry', Jaypee Brothers.
2. John W. Baynes and Marek Dominiczak, 'Medical Biochemistry', Mosby.
3. G. Beckett, S. Walker, P. Rae, P. Ashby, 'Clinical Biochemistry', Blackwell Publishing.

PHYSIOLOGY & NUTRITION- I

Subject Code: MMLT1- 104

**L T P C
4 0 0 4**

Duration: 45 Hrs.

Course Objectives

1. Students will learn the physiological and nutritional aspects of the human body.

UNIT-I (12 Hrs.)

Cellular Physiology & Biochemical aspects of Tissues - Body fluid compartments, membrane potential, inter and intra cellular communication, homeostasis, electrolytes contents, functions of sodium, potassium, chloride and their absorption & transportation, hydrogen ion balance, structure, chemical composition and functions of muscles, nerves and sensory tissues.

UNIT-II (11 Hrs.)

Respiration: Functional anatomy of air- passages and lung, respiratory muscles, mechanics of respiration- intrapleural and airway pressures, lung volumes and capacities dead space, alveolar ventilation transport of gasses- O₂ dissociation and CO₂ dissociation curves, Gas exchange- diffusion and gases across alveolo- capillary membrane, ventilation- perfusion ratio, control of breathing.

UNIT-III (11 Hrs.)

Gastro- Intestinal System: Mastication and swallowing, salivary secretion and its regulation, gastric secretion and motility, function and regulation of bile secretion, intestinal secretion and motility- regulation (including defecation).

UNIT-IV (11 Hrs.)

Human Nutrition & Dietetics: Energy value of foods- direct and indirect calorimetry- respiratory quotient- energy needs of the body- basal metabolism calculation of total caloric

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requirements, recommended dietary allowances (RDA) protein efficiency ratio, nutritional and food requirements to meet the needs of infants, adolescents, adults.

Recommended Books

1. E.P. Widmaier, H. Raff, K.T. Strang, Vander, Sherman, 'Luciano's Human Physiology: The Mechanisms of Body Function', McGraw Hill.
2. L.K. Mahan, Krause, 'Food, Nutrition and Diet Therapy', Saunders Publishers.
3. C.W. Sutor, M.F. Crowley, 'Nutrition Principles and Applications in Health Promotion', Lippincott Williams and Wilkins.
4. G.A. Spiller, 'CRC Handbook of Dietary Fiber in Human Nutrition', CRC Press.
5. G.H. Bell, J.N. Davidson and H. Scarborough, 'Textbook of Physiology and Biochemistry', Livingstone Ltd.

BIostatISTICS

Subject Code: MMLT1-105

**L T P C
3 0 0 3**

Duration: 36 Hrs.

Course Objectives

1. Students will understand the various aspects of biostat and its importance in the medical sciences.

UNIT-I (10 Hrs.)

Introduction to Statistics: Biological data types, accuracy and significant figures, frequency distribution and its graphical representations, sampling, measures of central tendency, AM, GM, HM, QM, median, quartiles and quantiles, mode. Measures of dispersion and variability, range, quartile deviation, mean deviation, variance, standard deviation, coefficient of variation, Shannon-Wiener diversity index.

UNIT-II (12 Hrs.)

Probability and Distributions: Permutations, combinations, probability, addition and multiplication of probabilities, binomial distribution, Poisson distribution, normal distribution, symmetry and kurtosis of normal distribution curve, proportions of normal distribution.

UNIT-III (11 Hrs.)

Hypothesis Testing: Introduction to statistical hypothesis testing, significance level and critical value, type I and type II errors, power of statistical test, one- and two tailed tests, confidence interval, parametric and non-parametric tests. One sample, two sample and paired sample t-tests, Mann Whitney test and Wilcoxon paired sample test, variance ratio test.

UNIT-IV (12 Hrs.)

Multiple Sample Hypothesis: Single factor and two factor ANOVA, multiple comparison tests, Tukey test, SNK, Chi-square test, simple linear regression, coefficient of correlation, coefficient of determination and rank correlation, contingency tables, relative risk ratio and odds ratio.

Recommended Books

1. J.H. Zar, 'Biostatistical Analysis', Pearson Education.
2. K.V. Rao, 'Biostatistics – A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology', Jaypee Brothers.

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CLINICAL BIOCHEMISTRY- I LAB.

Subject Code: MMLT1-106

**L T P C
0 0 2 1**

Duration: 24 Hrs.

1. Determination of serum and urine creatinine, serum bilirubin, serum chloride
2. Estimation of blood urea by Nesslerization method
3. Estimation of Serum Cholesterol
4. Determination of Serum Uric Acid by Henry Caraway's method
5. Estimation of Serum amylase
6. Glucose Tolerance Test
7. Colorimetric determination of Calcium in food

Recommended Books

1. G.P. Talwar, 'Text book of Biochemistry & Human Biology'.
2. Linten, 'Nutritional Biochemistry & Metabolism'.
3. M.E. Skills and V.R. Yong, 'Modern Nutrition in Health & Diseases'.
4. W.J. Marshall and S.K. Angert, 'Clinical Biochemistry – Metabolic and Clinical Aspects'.
5. T. Devli, 'Biochemistry with Clinical Correlation'.

BIostatISTICS LAB.

Subject Code: MMLT1-107

**L T P C
0 0 2 1**

Duration: 24 Hrs.

1. Calculation of AM, GM, HM, QM of given raw data. Also plot frequency polygon and bar graph of the raw as well as classified data
2. Determine median, mode, range, quartile deviation, mean deviation, standard deviation and coefficient of variation for the give set of data
3. Determining Shannon-Wiener diversity index
4. Determine binomial and Poisson probability distributions
5. To plot normal density function
6. Hypothesis test problems based on normal distribution, two sample test and paired t-test
7. ANOVA based problems and extension into Tukey test problem
8. Problems based on Mann Whitney test and Wilcoxon paired sample test
9. Problem based on test of goodness by chi square test
10. Correlation, regression and rank correlation based problems
11. Problems based on contingency tables
12. Odds ratio and relative risk ratio

Recommended Books

1. J.H. Zar, 'Biostatistical Analysis', Pearson Education.
2. K.V. Rao, 'Biostatistics – A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology', Jaypee Brothers.

ANALYTICAL BIOCHEMISTRY

Subject Code: MMLT1-208

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Electrochemical Analysis: The concepts of pH, dissociation and ionization of acids and bases, pKa, buffers and buffering mechanism, Henderson Hasselbalch equation, dissociation of amino acids and determination of pKa; Principle and Applications of Biosensors.

UNIT-II (12 Hrs.)

Chromatography & Electrophoresis: Principles, Instrumentations and applications of High-performance liquid chromatography, Adsorption chromatography, Ion-exchange chromatography, Gas chromatography; Electrophoresis of proteins- SDS- PAGE, 2D- PAGE, native gels and nucleic acids.

UNIT-III (11 Hrs.)

Spectroscopy & Radioactivity: Principle, Instrumentations and applications of Ultraviolet and visible light spectroscopy, Fluorescence spectroscopy, Luminometry, Atomic spectroscopy. Nature of radioactivity - stable and radioactive isotopes - units and interaction of radioactivity with matter. Detection and measurement of radioactivity - GM counter, solid and liquid scintillation counter; Autoradiography. Applications of radioisotopes in the biological sciences.

UNIT-V (11 Hrs.)

Immunoassays: Radio Immuno- Assay (RIA), Homogeneous Enzyme Immuno Assays, Heterogeneous Immuno Assays, ELISA (indirect, direct, competitive), Chemiluminescence, Elispot assay, Western Blotting.

Recommended Books

1. Katoch, Rajan, 'Analytical Techniques in Biochemistry and Molecular Biology', Springer, 2011.
2. Martin Holtzhauer, 'Basic Methods for the Biochemical Lab', Springer, 2007.
3. Keith Wilson and John Walker, 'Principles and Techniques of Biochemistry and Molecular Biology', Cambridge University Press, 2010.
4. S.B. Primrose, R.M. Twyman, and R.W. Old, 'Principles of Gene Manipulations', Blackwell Science, 2012.
5. Walker and Gastra, 'Techniques in Molecular Biology', Croom Helm, 1983.
6. Cornish Bowden, 'Basic Mathematics for Biochemists', Oxford University Press, 1998.

ENZYMES & METABOLISM- II

Subject Code: MMLT1-209

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Integration of Metabolism: Recurring motifs in biochemistry, regulation of major metabolic pathways, metabolic fates of glucose-6-phosphopate, pyruvate and acetyl CoA, Metabolic profiles of brain, muscle, adipose tissue, liver and kidney, Hormonal regulation of metabolism, metabolic adaptations.

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UNIT-II (10 Hrs.)

Metabolism of Nitrogen Compounds: Digestion and absorption of proteins, Nitrogen fixation and its mechanism, Assimilation of ammonia, Nitrogen cycle.

UNIT-III (12 Hrs.)

Anabolism & Catabolism of Amino Acids: Biosynthesis of essential and non-essential amino acids, Regulation of amino acid biosynthesis, Metabolism of amino acids precursors; General reactions of amino acids metabolism i.e. transamination deamination decarboxylation, Urea cycle, Catabolism of individual amino acids.

UNIT- IV (11 Hrs.)

Biosynthesis & Degradation of Nucleotides: Biosynthesis of purine and pyrimidine nucleotides, biosynthesis of deoxyribonucleotides and nucleotide coenzymes, Regulation of nucleotide biosynthesis. Degradation of purines and pyrimidines, Salvage pathways.

Recommended Books

1. D.L. Nelson and M.M. Cox, 'Lehninger Principles of Biochemistry', Macmillan Worth Publishers, New Delhi, 2013.
2. J.M. Berg, J.L. Tymoczko and L. Stryer, 'Biochemistry', W.H. Freeman & Co., New York.
3. R.K. Murray, D.A. Bender, K.M. Botham, P.J. Kennelly, V.W. Rodwell and P.A. Weil 'Harper's Biochemistry', McGraw Hill Medical Canada.
4. D. Voet, J.G. Voet and C.W. Pratt, 'Fundamentals of Biochemistry', John Wiley & Sons. New York.

PHYSIOLOGY & NUTRITION- II

Subject Code: MMLT1-210

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Carbohydrates & Lipids: Classification, sources and functions of carbohydrates and fats, their absorption, utilization and storage, digestion, absorption, hormonal regulation of blood glucose; dietary fiber, disadvantages of dietary fibers; role of saturated fat, cholesterol, lipoprotein and triglycerides and EFA in the diet.

UNIT-II (11 Hrs.)

Proteins & Nucleic Acids: Classification, sources, functions, digestion, absorption, utilization and storage, protein quality evaluation, nutritional classification of amino acids and their balance and imbalance, toxicity; Structure of nucleoside, nucleotide. De novo and salvage pathways of nucleotide synthesis.

UNIT-III (10 Hrs.)

Hormones: Mode of action, functions of hormones of the endocrine glands- Pituitary, adrenal, thyroid, gonadal hormones, pineal body and parathyroid, hypo and hyper functions of the glands.

UNIT-IV (12 Hrs.)

Vitamins & Minerals: Chemistry, functions, physiological action, digestion and absorption of vitamins, interaction of fat and water soluble vitamins with other nutrients, hypo and hypervitaminosis; major trace minerals, their bound forms and functions.

Recommended Books

1. E.P. Widmaier, H. Raff, K.T. Strang, Vander, Sherman, 'Luciano's Human Physiology: The Mechanisms of Body Function', McGraw Hill.

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2. L.K. Mahan, 'Krause's Food, Nutrition and Diet Therapy', Saunders Publishers.
3. C.W. Sutor, M.F. Crowley, 'Nutrition Principles and Application in Health Promotion', Lippincott Williams and Wilkins.
4. G.A. Spiller, 'CRC handbook of Dietary Fiber in Human Nutrition', CRC Press.
5. G.H. Bell, J.N. Davidson and H. Scarborough, 'Textbook of Physiology and Biochemistry', Livingstone Ltd.
6. A.B.S. Mahapatra, 'Essentials of Medical Physiology', Current Books International Publishers.
7. Z. Kroner, 'Vitamins and Minerals: Facts versus Fictions', Greenwood Pub Group Inc.

CLINICAL BIOCHEMISTRY- II

Subject Code: MMLT1-211

**L T P C
3 0 0 3**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Principles and Methods for Biological Materials Estimation: Blood serum, plasma, glucose in urine, estimation of uric acid, urea, creatinine, cholesterol; quantification of enzymes: alkaline phosphate, acid phosphate, amylase, creatine phosphokinase, Serum glutamic oxaloacetic transaminase, serum glutamic-pyruvic transaminase; estimation of Na, K, Ca, Cl, O₂, CO₂, P, Zn, Mg.

UNIT-II (11 Hrs.)

Hormones & Vitamins Estimation Methods and Their Principles: Androgen, pregnonediol, estrogens, corticosteroids, catecholamine, thyroid, prolactin, growth hormones: FSH, LH, testosterone; vitamins estimations: Vitamin A, thiamin, niacin, pyridoxine, ascorbic acid, vitamin D₃.

UNIT-III (12 Hrs.)

Immunological Techniques: RIA, ELISA, immunofixation, immunochemistry, turbidimetry and immunohistochemistry; Tumor markers.

UNIT-IV (10 Hrs.)

Automation in the Medical Laboratory: Various types of auto analyzers, reagents and kits, validation of machine, source of errors, quality assurance and quality control.

Recommended Books

1. Gowenlock Alen H., 'Varley's Practical Clinical Biochemistry', CRC Publishers, 1988.
2. Ranjna Chawla, 'Practical Clinical Biochemistry Methods and Interpretation, Jaypee Brothers Medical Publishers, 2014.
3. David T. Plummer, 'An Introduction to Practical Biochemistry', Tata-McGraw Hill, 1987.

MOLECULAR DIAGNOSTICS

Subject Code: MMLT1-212

**L T P C
3 0 0 3**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Introduction to Molecular Diagnostics: Reverse transcriptase PCR, Quantitative real time PCR, the basic concept and threshold cycle, fluorescent dyes used in real time PCR, TaqmanTM,

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specimen collection and transportation, nucleic acids extraction, PCR optimization and inhibitors, handling contamination, applications of real time PCR as diagnostic tool.

UNIT-II (11 Hrs.)

Signal Amplification Methods: Concept of molecular diagnostic techniques – identification, characterization and quantization of specific nucleic acids sequences, branched DNA amplification and its application in quantization of HCV and HIV, hybrid capture assay and its application in detection of HPV, invader technology.

UNIT-III (11 Hrs.)

Chip Based Diagnostics: DNA sequence analysis, gene expression profiling, biomarker detection, their role in detection of diseases or their susceptibility, applications of chips, on-chip blood cells separation, on-chip extraction of cell contents such as DNA and proteins, on-chip approach for genetic analysis using miniaturized PCR, SNP detection by probe ligation and amplification (MLPA), next generation sequencing in molecular diagnostics.

UNIT-IV (11 Hrs.)

Molecular Diagnostics of Infectious Diseases: Molecular diagnostics of infectious diseases such as, Leishmania, detection of large DNA viruses. Molecular diagnostics of non-infectious diseases such as cystic fibrosis, X-linked mental retardation disorder, Huntington disease, molecular markers for early detection of cancer.

Recommended Books

1. R.M. Nakamra, F.L. Kiechle, W.W. Grody and C. Strom, 'Molecular Diagnostics – Techniques and Applications for the Clinical Laboratory', Academic Press.
2. L. Buckingham, 'Molecular Diagnostics – Fundamentals, Methods and Clinical Applications', F.A. Davis Company.

ANALYTICAL BIOCHEMISTRY LAB.

Subject Code: MMLT1-213

L T P C

0 0 4 2

1. Preparation of Phosphate buffer and determination of pH.
2. Titration of strong and weak acids.
3. Demonstration of Osmosis and Dialysis.
4. Estimation of protein by UV Spectrophotometer by E_{280}/E_{260} method.
5. Separation of proteins by SDS gel electrophoresis.
6. Starch preparation and characterization.
7. Alpha and Beta amylolysis.

Recommended Books

1. Wilson and J. Walker, 'Practical Biochemistry: Principles and Techniques'.
2. David Plummer, 'Practical Biochemistry'.
3. S.K. Sawhney and R. Singh, 'Introductory Practical Biochemistry'.

CLINICAL BIOCHEMISTRY- II LABORATORY

Subject Code: MMLT1- 214

L T P C

0 0 4 2

1. Estimation of phospholipids, free fatty acids in serum.

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2. Estimation, of cholesterol and triacylglycerol plasma.
3. Estimation of LDH, phosphatases, CPK in serum.
4. Thyroid function tests like T3 T4 assays.
5. Analysis of Gastric juice.
6. Chromatographic separation of sugars, amino acids, lipids and proteins.

Recommended Books

1. Herold Varley et al, 'Practical Clinical Biochemistry', Vol. I and II, Arnold - Heinemann.
2. M.D. John Bernard Henry, 'Todd Sanford Davidson's Clinical Diagnosis and Management by laboratory methods', W.B. Saunders Company.
3. Colowich and N.O. Kaplan, 'Methods in Enzymology', Academic Press.
4. W.J. Marshall and S.K. Angert, 'Clinical Biochemistry – Metabolic and Clinical Aspects'.

ORGAN FUNCTION TESTS

Subject Code: MMLT1-315

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (11 Hrs.)

Cardiac Function: Definitions of Acute coronary syndrome, angina, coronary artery disease ischemia, myocardial infarction, plague, atherosclerosis, factors promoting atherosclerosis; Events leading to an acute myocardial infarction, hypercoagulable state; Cardiac markers, symbolism and embolism.

UNIT-II (11 Hrs.)

Uro-genital System Functions of Male & Female: Anatomy and functions of each part of renal system; End stage renal disease: acute renal failure, acute nephrotic syndrome, pyelonephritis and urinary tract obstruction, tumors of the urogenital system, prostate related diseases; Female genital system including breast; Diseases of cervix, cervical carcinoma, vulva, vagina, ureter, uterus, fallopian tubes, ovaries and breast cancer.

UNIT-III (12 Hrs.)

Liver & Intestinal Function: Anatomy and functions of hepatic system; diseases of the liver system: jaundice, viral and chronic hepatitis, cirrhosis, cholestasis, cholecystitis, liver cancer and secondary tumors, gall bladder tumors. Gastro-Intestinal tract anatomy, their different parts function and clinical significance; GI complications: Zollinger-Elison syndrome, gastritis, pancreatitis, pancreatic tumor, lactose intolerance and Diabetes Mellitus, benign and malignant tumors, reflux oesophagitis, hiatus hernia, barret, oesophageal cancer.

UNIT-IV (11 Hrs.)

Thyroid & Lung Function: Structure and function of thyroid gland; Laboratory tests to assess thyroid gland functions; Thyroid related complications: Hashimoto's disease, Graves disease. Anatomy of the lungs; Lungs Problems: lobule air way obstruction diseases, constricting diseases, bronchial asthma, chronic bronchitis emphysema, Pneumonia, TB, tumors of lung and pleura, plural cavity.

Recommended Books

1. M.N. Chatterjea, R. Chawla, 'Clinical Chemistry (Organ Function Tests, Laboratory Investigations and Inborn Metabolic Diseases)', Jaypee Brothers Medical Publishers.
2. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, 'Clinical Biochemistry: An Illustrated Colour Text', Churchill Livingstone/Elsevier.

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BIOCHEMISTRY) 2016 BATCH ONWARDS

MOLECULAR BIOLOGY

Subject Code: MMLT1- 316

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Genetic Material and DNA Replication: Structure and properties of nucleic acids, DNA as genetic material, nucleosomes, chromosomal structure and organization, Semiconservative mode of DNA replication, linear and circular replicons, origin of replication in bacteria and yeast, DNA replication in bacteria, eukaryotes and phages, prokaryotic and eukaryotic DNA polymerases and their properties, semi-discontinuous mode of DNA synthesis, Okazaki fragments, other proteins in DNA replication such as helicase, sliding clamps, clamp loader, primase.

UNIT-II (11 Hrs.)

Repair and Recombination: DNA damage, structural distortions and mutations, pyrimidine dimers, DNA repair, photoreactivation, mismatch repair system, excision repair (BER and NER), recombination repair, error prone repair, SOS system. Genetic recombination, synapsis and homologous recombination, site-specific recombination, mechanism involving breakage and reunion of DNA strands, Holliday structure.

UNIT-III (11 Hrs.)

Transcription: Transcription initiation, structure and properties of bacterial RNA polymerase, sigma factor, promoter structure and its recognition by RNA polymerase, transcription elongation and termination, rho dependent and rho-independent termination, operons, regulation of lac and trp operons, *cis*-elements and *trans*-factors. Structure and function of eukaryotic RNA polymerases and their respective promoters, transcription factors, TBP, regulatory elements, enhancers and insulators.

UNIT-IV (10 Hrs.)

Protein Expression: Post translational modifications, 5' capping, 3' polyadenylation and splicing of mRNA. mRNA, tRNA and rRNA, and their role in protein synthesis, structure of tRNAs, aminoacyl-tRNA, ribosome. Initiation, elongation and termination of protein synthesis, bacterial initiation factors, initiator tRNA, Shine-Dalgarno sequence. Initiation of translation in eukaryotes, eukaryotic initiation factors, elongation factors. Genetic code, degeneracy of codons, wobble hypothesis, initiation codon and termination codons.

Recommended Books

1. Lewin B, 'Genes IX', Pearson Prentice Hall.
2. Malacinski, GM, 'Freifelder's Essentials of Molecular Biology', Narosa Publishing House.

PHYSICAL BIOCHEMISTRY

Subject Code: MMLT1-317

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Thermodynamic and Hydrodynamic Aspects: Structure, conformation, folding, and assembly of biological molecules, macromolecules and membranes. Forces affecting the structure and conformation of biological macromolecules, and their interactions. Thermodynamics and Hydrodynamics properties of bio-molecules: Thermodynamic laws as applicable to bio-

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molecules: phase transition, helix- coil transition folding in proteins and nucleic acids. Hydrodynamic properties: Concept of ideal and non ideal solutions. Concept of Viscosity. Sedimentation, and Membrane transport.

UNIT-II (10 Hrs.)

Bio-Chemical Kinetics: Mechanisms of chemical and biochemical reactions. Concept of transition state theory and diffusion limited process. Chemical and Biochemical Kinetics: Differential and integrated rate laws. Enzyme kinetics and Kinetic methods in biomedical diagnostics.

UNIT-III (12 Hrs.)

Methods for Separation of Macromolecules: Basic principle of Sedimentation and centrifugation, determination of sedimentation rate and molecular mass, Analytical centrifugation and ultracentrifugation. Chromatographic techniques: General Principles of chromatography, Chromatographic techniques applicable to bio-molecules: Ion-exchange chromatography, Affinity chromatography, Molecular exclusion chromatography, High-performance liquid Chromatography Electrophoretic techniques: General Principles of electrophoresis, Agarose and Poly-acrylimide Gel electrophoresis of proteins, and nucleic acids. SDS-PAGE, 2-D gel electrophoresis, Iso-electric focusing of proteins, capillary electrophoresis, Microchip electrophoresis.

UNIT-IV (11 Hrs.)

Methods for Characterization of Macromolecules: Spectroscopic techniques: visible and UV spectroscopy. Fluorescence spectroscopy; principles and applications in the analysis of proteins and nucleic acids. Fluorescence resonance energy transfer (FRET); NMR, X-Ray diffraction, mass spectrometry and their applications in the characterization of macromolecules.

Recommended Books

1. David Sheehan, 'Physical Biochemistry: Principles and Applications'.
2. Peter Atkins, Julio de Paula, 'Physical Chemistry,' Either complete book or *Volume 2*:
3. Quantum Chemistry, Spectroscopy and Statistical Thermodynamics, W.H. Freeman & Co., New York.
4. David Eisenberg, Donald Crothers, 'Physical Chemistry with Applications to the Life Sciences', Benjamin/Cummings Publishing Co.
5. Kensal E. van Holde, W. Curtis Johnson, P. Shing Ho, 'Principles of Physical Biochemistry', Pearson Prentice Hall.

BIOSAFETY & BIOETHICS

Subject Code: MMLT1-318

**L T P C
4 0 0 4**

Duration: 45 Hrs.

UNIT-I (12 Hrs.)

Biosafety: Biosafety guidelines, regulations & operation; Biosafety decision making structure in India – Institutional Biosafety Committee (IBSC), District level committee (DCL), State Biotechnology Coordination Committee (SBLC), Review committee and genetic engineering approval committee (GEAC); Biosafety Levels; Biosafety Levels of Specific Microorganisms; Biosafety containment levels - Personal Protective Equipment and clothing; Biological waste disposal.

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UNIT-II (11 Hrs.)

Laboratory and Environmental Biosafety: Health aspects; toxicology, allergenicity, antibiotic resistance; Impact on environment: gene flow in natural and artificial ecologies; Sources of gene escape, tolerance of target organisms; Radiation safety and non- radio isotopic procedure; the laws of Radioactive Decay; Physical, biological and effective half lives, Radionuclide hazards; Contamination monitoring.

UNIT-III (10 Hrs.)

Medical Emergencies: Death of patient, Loss of radioactive sources; Internal exposure – contamination control; External exposure – shielding, distance, time; Safe handling of radioactive sources. Activity in body fluids – urine, blood, breast milk.

UNIT-IV (12 Hrs.)

Bioethics: Ethical decision making process; Bioethics guidelines; International bioethics survey (1993), International bioethics committee of UNESCO and International association of Bioethics, European bioethics Convention, EuropaBio's' Core Ethical Value (A document Drafted of European Association of Bioindustries, the EuropaBio), Convention of Human rights & Biomedicine (1996); Ethical issue in cloning, transgenic organisms & Gene therapy.

Recommended Books

1. Biosafety in the Laboratory: Prudent Practices for Handling and Disposal of Infectious Materials by National Research Council (U. S.)
2. O. Diane, Fleming and Debra Long Hunt, 'Biological Safety: Principles and Practices (Biological Safety: Principles & Practices)'
3. Sree Krishan, V. 'Bioethics and Biosafety in Biotechnology', New Age International (P) Ltd. Publ. Mumbai 2007
4. Robert J. Slater, 'Radioisotopes in Biology', Practical Approach Series

ORGAN FUNCTION TETS LAB.

Subject Code: MMLT1- 319

L T P C

0 0 4 2

1. Cardiac Function: Lipid profile.
2. Renal Function: urea, creatinine, uric acid.
3. Liver Function: Total protein, Bilirubin, SGOT, SGPT,
4. Intestinal Function: Serum Insulin level.
5. Thyroid Function: T3, T4, TSH.
6. Identification of Pathological Physical and Chemical Urine Constituents & Microscopic examination of Urine.
7. Quantitative Determination of Urine Creatinine- Measurement of Creatinine Clearance.

Recommended Books

1. M.N. Chatterjea, R. Chawla, 'Clinical Chemistry (Organ Function Tests, Laboratory Investigations and Inborn Metabolic Diseases)', Jaypee Brothers Medical Publishers.
2. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, 'Clinical Biochemistry: An Illustrated Colour Text', Churchill Livingstone/Elsevier, 2013.

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MOLECULAR BIOLOGY LAB.

Subject Code: MMLT1- 320

**L T P C
0 0 4 2**

1. Detection of DNA/RNA in a clinical sample.
2. Polymerase Chain reaction.
3. Karyotyping.
4. Detection of mutations.
5. Gene cloning.
6. Introduction of cloning in vectors.

Recommended Books

1. J. Fritsch and E.F. Maniatis, 'Molecular Cloning, A Laboratory Manual', Cold Spring Harbor Laboratory, 1999.
2. G.M. Malacinski, 'Freifelder's Essentials of Molecular Biology', Narosa Publishing House.

PHYSICAL BIOCHEMISTRY LAB.

Subject Code: MMLT1-321

**L T P C
0 0 4 2**

1. Isolation of proteins/enzymes
2. Isolation of nucleic acids
3. Determination of activity of enzyme (Amylase /phosphatase).
4. Study denaturation of proteins/enzymes: determination of thermo-stability of enzymes.
5. Study denaturation of Nucleic acids: determination of melting temperature (T_m) of DNA.
6. Separation of proteins using PAGE.
7. Determination of molecular mass of proteins using SDS- PAGE.
8. Determination of sedimentation rate of macromolecules using centrifugation technique.
9. Determination of proteins/nucleic acid by UV spectrophotometric method.
10. Separation and detection of nucleic acids using agarose gel electrophoresis.

Recommended Books

1. D.T. Plummer, 'An introduction to practical biochemistry', Tata McGraw Hill Publishers Co. Ltd., New Delhi. 2004
2. Fritsch, J. and Maniatis,E.F., Molecular Cloning, 'A laboratory Manual, Cold Spring Harbor Laboratory', **1999.**
3. G.M. Malacinski, 'Freifelder's Essentials of Molecular Biology', 4th Edn., Narosa Publishing House.

①

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
(Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)
Dabwali Road, Bathinda (Punjab) -151 001

Ref.No. DRD/MRSPTU/.....

Dated:.....


Pre-Ph.D Course Work Allocation Order

As per the decision made in the DDRC held on 24.6.2016, and the recommendations made by the Supervisor and Head of the Department (Physics), vide letter number Phy/17/043 dated 19-01-2017, the pre-Ph. D course work allocated to the Ph.D candidate, Sh. Shekhar Dwivedi, enrolled in the Faculty of SCIENCES in the Discipline PHYSICS under MRSPTU, Bathinda, vide enrolment number 16406MPE01, is as follows:-

Sr. No.	Subject Name	Subject Code	L-T-P	Credit
1.	Research Methodology	MREM0-101	4-0-0	4
2.	Research Lab*	PPHY-100	0-0-4	2
3.	Seminar*	PPHY-101	0-0-2	1
4.	Nuclear Accelerators & Radiation Physics	MPHY1-460	4-0-0	4
5.	Advanced Mathematical Physics	MPHY1-356	4-0-0	4

- In anticipation of approval from BoS/Academic Council

The candidate shall qualify this pre-PhD course work as per the applicable MRSPTU regulations in a REGULAR manner.

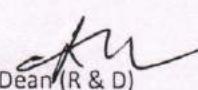

Dean (R & D)

Dated.....19.1.17

Endst No. DRD/MRSPTU/.....278..(6)

Cc: For information, records and further necessary action, as applicable. (Discrepancy, if any, be intimated immediately for rectification)

1. PA to VC for kind information of the VC
2. Dean Academic Affair, MRSPTU, Bathinda
3. Campus Director, GZSCCET, Bathinda
4. Dean Academic Affair, GZSCCET, Bathinda
5. CoE, MRSPTU, Bathinda
- ✓6. HoD (Physics), GZSCCET, Bathinda
7. Supervisor (Dr. Sandeep Kansal, GZSCCET, Bathinda)
8. Co-Supervisor (Dr. Vinod Kumar Dangwal, Govt. Medical College, Patiala)
9. Candidate (Sh. Shekhar Dwivedi)
10. Librarian, GZSCCET, Bathinda
11. Asstt Registrar (Accounts), MRSPTU
12. Candidate's Master File


Dean (R & D)
MRSPTU, Bathinda
(Dr Savina Bansal)

Ph.D file of Mr Shekhar Dwivedi
19/1/17

18

**Giani Zail Singh Campus, College of Engg. & Tech.,
Bathinda**
(A Constituent College of Maharaja Ranjit Singh Punjab Technical University, Bathinda)

Department of Applied Physics

Ref. No.: *Phy/17/038*

Date: *17/01/17*

Sub: Approval for Revised Study Scheme of Pre-Ph.D Course Work in Physics.

For the Pre-Ph.D. Course Work following changes have been incorporated. So, kindly give your kind approval to make the requested changes.

Sr. No	Old Study Scheme (Copy enclosed as Annexure-II)	Revised Study Scheme (Copy Enclosed as Annexure-I)					
		Subject	Code	L T P C	Marks		
					Int.	Ext.	Total
01	Research Methodology (PHY-601)	Research Methodology	MREM0-101	4 0 0 4	40	60	100
02	Lab Work/Literature Review/Assignment (PHY-602)	Research Lab*	PPHY-100	0 0 4 2	60	40	100
03	Seminar (PHY-603)	Seminar*	PPHY-101	0 0 2 1	Satisfactory / Un-satisfactory		
04	Elective Subject-I (as per Research Topic)	Elective Subject-I (as per Research Topic)	-----	4 0 0 4	60	40	100
05	Elective Subject-II (as per Research Topic)	Elective Subject-II (as per Research Topic)	-----	4 0 0 4	60	40	100

*These will be approved in Academic Council meeting please.

Elective-I & Elective-II Subjects will be chosen out of the available Deptt. Elective course Course.

It is requested to get the Revised Study Scheme approved in the Academic Council meeting, so that it can be implemented w.e.f. Jan 2017 session.

Santosh
17/1/17
**Prof. & Head Cum
Chairman BOS
Deptt. of Applied Physics**

Comments of Dean (R&D) Bathinda
Santosh
18/1/17
**Dean Academic/Affairs
MRSPTU, Bathinda**

Chairman BOS in Physics DRD/MRSPTU/277 dt-19-1-17
Respected Sir, Pl give your comments for request by DAA.
Santosh
19/1/17
Dean (R&D) No objection to the study scheme proposed by chairman
it will be offered to the candidate as
PTI

per the recommendation made by supervisor & HOD
in anticipation of their approval at Acad. Council
level / BOS.

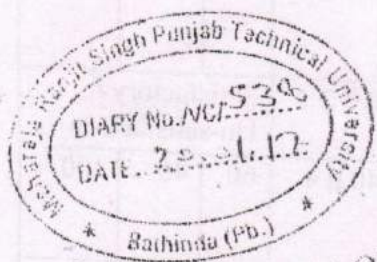
KL
18/1/17

DAA, MRSPTU Recommendation for approval

Sun
19/1/17

DAA MRSPTU

VICE CHANCELLOR



The course work has been started accordingly and is
submitted to DAA, MRSPTU Bathinda for further work.

Sun 19/1/17
Head & Chairman
Dept of Phy

DAA, MRSPTU Bathinda

Phy/17/053

23.01.2017

* Copy of same is submitted to Dean (R&D),
MRSPTU AST for information & via pl.

Sun 25/1/17
Head &
Chairman
Dept of Phy

Dean (R&D), MRSPTU AST

Received
Rpt
25-1-17

c/c

3

**MRSPTU RESEARCH METHODOLOGY SYLLABUS FOR 2016-17 BATCH
ONWARDS (COMMON TO ALL M.TECH. & Ph.D. PROGRAMMES)**

RESEARCH METHODOLOGY

Subject Code – MREM0-101

L T P C

Duration – 45 Hours

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.

4

Research Lab (Radiation/Computational Physics)

Subject Code:-PHY-602

L T P C
0 0 4 2

Duration: 48 Hrs

Note: Students of Pre PhD course work will be required to perform at least eight to ten experiments from the given list of experiments.

Programming software: Fortran/C++/Monte Carlo Method.

1. Research data analysis and graph plotting.
2. Counting statistics and error analysis.
3. Monte Carlo Integration.
4. Test of randomness for random numbers generators.
5. Calculate the Radioactivity and disintegration rate of a given radioisotopes.
6. Calculate the half and mean life of radioactive isotopes.
7. Calculation of Absorbed dose and Radiation Exposure for a given situation.
8. Estimation of Photon attenuation coefficient in high and low Z material.
9. Radiation shielding calculation.
10. Calculate the range of alpha particle and mono-energetic electrons.
11. Calculation of thicknesses of lead and concrete needed to reduce the gamma ray intensity to a particular value.
12. Calculation of binding energy of a given nucleus.

5

SEMINAR

Subject Code:-PPHY-101

L T P C
0 0 2 1

Duration: 24 Hrs

The Pre PhD course work candidate will do literature review of minimum 10 research paper of reputed journals related to the research field and will finally present the seminar.

Evaluation: Satisfactory/Unsatisfactory by a committee of three faculty member including head of the department.

NUCLEAR ACCELERATORS & RADIATION PHYSICS (NARP)

Subject Code: MPHY1- 460

L T P C
4 0 0 4

Duration: 48 Hrs

Unit 1 (12 Hrs)

Interactions of Nuclear Radiations and Neutron Detection: Introduction to Radiations, Types of Radiations, Radiation Dose, Units, Safety Limits, Biological Effects of Radiation, Radiation Monitoring. Neutron Discovery, Neutron Classification, Neutron Sources, Neutron Detectors, Diffusion of Thermal Neutrons.

UNIT 2 (12 Hrs)

Nuclear Radiation Detectors: Detection of Nuclear Radiation, Classification of Detectors, Gas Filled Detectors, Multiplicative Regions, Ionization Chamber, Proportional Counter, Geiger-Muller Counter, Solid State Detectors, Cerenkov Detector, Wilson Cloud Chamber, Bubble Chamber, Spark Chamber, Nuclear Emulsions, Solid State Nuclear Track Detectors, Semiconductor Detectors.

Unit 3 (10 Hrs)

Nuclear Accelerators: Introduction of Accelerators of Charged Particles: Classification and Performance Characteristics of Accelerator, Ion Sources, Electrostatic Accelerators (Cockroft---Walton Accelerators), Cyclotron, Betatron, Principle of Phase Stability, Synchro-Cyclotron, Electron And Proton Synchrotron, Microtron, Linear Accelerator, Drift Tube and Wave Guide Accelerator.

Unit 4 (14 Hrs)

Nuclear Reactors: Nuclear Chain Reactor, Four Factor Formula, Reactor Design, Classification of Reactors, Research Reactor: Graphite Moderator, Water Boiler, Swimming Pool, Light Water-Moderator, Tank Type; Heavy Water-Moderator: Tank Type, Production Reactor, Power Reactor: Pressurized Water Reactor, Boiling Water Reactors, Heavy Water Moderated Reactors, Organic Moderated Reactors, Gas Cooled Reactors, Sodium Graphite Reactors, Liquid Fuel Reactor, Fast Reactor, Breeder Reactors.

Recommended Books

1. Edward J.N. Wilson "An introduction to Particle Accelerators", Oxford University Press, 2003.
2. James Rosenzweig "Fundamental of Beam Physics", Oxford University Press, 2001.
3. P N Cooper "Introduction to Nuclear Radiation Detectors", Cambridge University press, 1986.
4. Kapoor S S and Ramamurthy V S "Nuclear Radiation Detectors", Wiley Eastern, New Delhi, 1986.
5. Knoll G. F., Radiation Detection and Measurement, John Wiley & Sons (1989).
6. Krane K. S., Introductory Nuclear Physics, John Wiley & Sons (1975).
7. Singuru R. M., Introduction to experimental nuclear physics, Wiley Eastern Publications (1987).

ADVANCED MATHEMATICAL PHYSICS

Subject Code: MPHY1-356

L T P C
4 0 0 4

Duration: 48 Hrs

Unit 1 (12 Hrs)

Complex Analysis: Limits, Continuity and Derivative of the function of Complex variable, Analytic Function, Cauchy- Riemann Equations, Harmonic Function, Orthogonal System, Conjugate Function, Taylor and Laurent series, Complex integration: Line Integral, Singularities, Cauchy integration Theorem, Cauchy's Integral formula, residues and evaluation of integrals, Contour Integration.

Unit 2 (12 Hrs)

Group Theory: Definition of a Group, Composition Table, Conjugate Elements And Classes of Groups, Directs Product, Isomorphism, Homeomorphism, Permutation Group, Definitions of The Three Dimensional Rotation Group and $SU(2)$, $O(3)$.

Unit 3 (12 Hrs)

Sampling and Probability Distribution: Random Variables: Definition, Probability distribution-Binomial, Poisson and Normal distributions. Sampling Distributions: Population and samples, Concept of Sampling distributions-Student's T - test, F-test and Chi-square test, Curve Fitting, Least Square Fitting.

Unit 4 (12 Hrs)

Tensors: Review of tensor, Equality of Tensors - Symmetric and Skew - Symmetric Tensors - Outer multiplication, Contraction and Inner Multiplication - Quotient Law of Tensors - Reciprocal Tensor of Tensor - Relative Tensor - Cross Product of Vectors, Riemannian Space - Christoffel Symbols and their properties.

Recommended Books

1. Complex Analysis, J.N. Sharma, Krishna Publishers (2nd Edition).
2. Mathematical Statistics, S.C.Gupta&V.K. Kapoor, S.ChandPublishers (2nd Edition)
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