

**MRSPTU B.TECH. 1<sup>ST</sup> YEAR SYLLABUS 2016 BATCH ONWARDS**  
**(Approved in 1<sup>st</sup> MRSPTU Standing Committee of Academic Council on 20.12.2016)**

**GROUP-A**

**B.TECH. 1<sup>ST</sup> SEMESTER TOTAL CONTACT HRS. = 31 TOTAL CREDITS = 25**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHY0-101	Applied Physics	3	1	0	40	60	100	4
BMAT0-101	Applied Mathematics-I	4	1	0	40	60	100	5
BHUM0-101	Communicative English	2	1	0	40	60	100	3
BELE0-101	Basics of Electrical Engineering	2	0	0	40	60	100	2
BHUM0-103	Human Values & Professional Ethics	2	0	0	40	60	100	2
BESE0-101	Environmental Science	2	0	0	40	60	100	2
BPHY0-102	Applied Physics Lab.	0	0	2	60	40	100	1
BHUM0-102	Communicative English Lab.	0	0	2	60	40	100	1
BELE0-102	Basics of Electrical Engineering Lab.	0	0	2	60	40	100	1
BMFP0-101	Manufacturing Practice	1	0	6	60	40	100	4
<b>Total 6 Theory &amp; 4 Lab. Courses</b>		<b>16</b>	<b>3</b>	<b>12</b>	<b>480</b>	<b>520</b>	<b>1000</b>	<b>25</b>

**B.TECH. 2<sup>ND</sup> SEMESTER TOTAL CONTACT HRS. = 31 TOTAL CREDITS = 25**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHM0-101	Applied Chemistry	3	1	0	40	60	100	4
BMAT0-201	Applied Mathematics-II	4	1	0	40	60	100	5
BMEE0-101	Elements of Mechanical Engineering	3	1	0	40	60	100	4
BECE0-101	Basics of Electronics Engineering	2	0	0	40	60	100	2
BCSE0-101	Basics of Computer Programming	3	0	0	40	60	100	3
BMEE0-102	Engineering Drawing	1	0	4	40	60	100	3
BCHM0-102	Applied Chemistry Lab.	0	0	2	60	40	100	1
BECE0-102	Basics of Electronics Engineering Lab.	0	0	2	60	40	100	1
BCSE0-102	Basics of Computer Programming Lab.	0	0	4	60	40	100	2
<b>Total 6 Theory &amp; 3 Lab. Courses</b>		<b>16</b>	<b>3</b>	<b>12</b>	<b>420</b>	<b>480</b>	<b>900</b>	<b>25</b>

**Note:** Marks of 4 Week Training during Summer Vacation will be included in 3<sup>rd</sup> Semester  
**Total Marks in Group-A B.Tech. First Year = 1<sup>st</sup> Semester 1000 + 2<sup>nd</sup> Semester 900 = 1900**

**Total Credits in Group-A B.Tech. First Year = 1<sup>st</sup> Semester 25 + 2<sup>nd</sup> Semester 25 = 50**

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**GROUP-B**

**B.TECH. 1<sup>ST</sup> SEMESTER TOTAL CONTACT HRS. = 31 TOTAL CREDITS = 25**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHM0-101	Applied Chemistry	3	1	0	40	60	100	4
BMAT0-101	Applied Mathematics-I	4	1	0	40	60	100	5
BMEE0-101	Elements of Mechanical Engineering	3	1	0	40	60	100	4
BECE0-101	Basics of Electronics Engineering	2	0	0	40	60	100	2
BCSE0-101	Computer Programming	3	0	0	40	60	100	3
BMEE0-102	Engineering Drawing	1	0	4	40	60	100	3
BCHM0-102	Applied Chemistry Lab.	0	0	2	60	40	100	1
BECE0-102	Basics of Electronics Engineering Lab.	0	0	2	60	40	100	1
BCSE0-102	Basics of Computer Programming Lab.	0	0	4	60	40	100	2
<b>Total 6 Theory &amp; 3 Lab. Courses</b>		<b>16</b>	<b>3</b>	<b>12</b>	<b>420</b>	<b>480</b>	<b>900</b>	<b>25</b>

**B.TECH. 2<sup>ND</sup> SEMESTER TOTAL CONTACT HRS. = 31 TOTAL CREDITS = 25**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHY0-101	Applied Physics	3	1	0	40	60	100	4
BMAT0-201	Applied Mathematics-II	4	1	0	40	60	100	5
BHUM0-101	Communicative English	2	1	0	40	60	100	3
BELE0-101	Basics of Electrical Engineering	2	0	0	40	60	100	2
BHUM0-103	Human Values & Professional Ethics	2	0	0	40	60	100	2
BESE0-101	Environmental Science	2	0	0	40	60	100	2
BPHY0-102	Applied Physics Lab.	0	0	2	60	40	100	1
BHUM0-102	Communicative English Lab.	0	0	2	60	40	100	1
BELE0-102	Basics of Electrical Engineering Lab.	0	0	2	60	40	100	1
BMFP0-101	Manufacturing Practice	1	0	6	60	40	100	4
<b>Total 6 Theory &amp; 4 Lab. Courses</b>		<b>16</b>	<b>3</b>	<b>12</b>	<b>480</b>	<b>520</b>	<b>1000</b>	<b>25</b>

**Note:** Marks of 4 Week Training during Summer Vacation will be included in 3<sup>rd</sup> Semester  
**Total Marks in Group-B B.Tech. First Year = 1<sup>st</sup> Semester 900 + 2<sup>nd</sup> Semester 1000 = 1900**

**Total Credits in Group-B B.Tech. First Year = 1<sup>st</sup> Semester 25 + 2<sup>nd</sup> Semester 25 = 50**

**APPLIED PHYSICS**

**Subject Code: BPHY0-101**

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

**Duration: 48 Hrs.**

**UNIT-I**

**1. EM waves & Dielectrics (6 Hrs.)**

Introduction and physical significance of Gradient, Divergence & Curl, Dielectric polarization (qualitative only), Types of polarization, Displacement Current Maxwell's Equations, Equation of EM waves in free space, velocity of EM waves, Poynting Theorem, Electromagnetic Spectrum (Basic ideas of different region).

**2. Quantum Theory (6 Hrs.)**

Need and origin of Quantum Concept, Wave-particle duality, Matter waves, Group & Phase velocities, Concept of Uncertainty Principle, wave function & its Significance, normalization of wave function, Schrodinger wave equation: time independent and dependent, Eigen functions & Eigen values, particle in a box in 1-D.

**UNIT-II**

**3. Elements of crystallography (6 Hrs.)**

Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes & Directions in cubic system, Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in Crystals, Bragg's spectrometer, X-ray radiography.

**4. Magnetic Materials & Superconductivity (7 Hrs.)**

Basic ideas of Dia, Para, Ferro & Ferri, Ferrites, Magnetic Anisotropy, Magnetostriction its applications in production of Ultrasonic waves, Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, Introduction to BCS theory, Application of superconductivity.

**UNIT-III**

**5. Lasers (6 Hrs.)**

Spontaneous & Stimulated emissions, Population Inversion, Pumping Mechanisms, Einstein's Coefficients, Components of a laser System, Three and four level laser systems; Ruby, He-Ne, CO<sub>2</sub> and semiconductor Lasers, Introduction to Holography.

**6. Fibre Optics (6 Hrs.)**

Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, applications of optical fibres.

**UNIT-IV**

**7. Special Theory of Relativity (5 Hrs.)**

Concept of Ether, Michelson Morley Experiment, Einstein's postulates, Lorentz transformation equations; length, time and simultaneity in relativity, addition of velocity, variation of mass with velocity (concept only), Mass-Energy and Energy-momentum relations.

**8. Nanophysics (6 Hrs.)**

Nanoscale, surface to volume ratio, electron confinement, nanoparticles (1D, 2D, 3D), Nanomaterials, Unusual properties of nanomaterials, synthesis of nanomaterials- ball milling and sol-gel techniques, Carbon nanotubes (synthesis and properties), applications of nanomaterials.

**Recommended Books**

1. Serway and Jewett, 'Physics of Scientists and Engineers', Vol.1, 2, 6<sup>th</sup> Edn, Cengage Learning.
2. A.K. Malik, H.K. Singh, 'Engineering Physics', Tata McGraw Hill, 2010.
3. V. Raghvan, 'Material Sciences and Engg.', 5<sup>th</sup> Edn., Prentice Hall of India, 2004.

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4. A. Beiser, S. Mahajan, S.R. Choudhary, 'Concepts of Modern Physics', 6<sup>th</sup> Edn., Tata McGraw Hill, 2003.
5. D.J. Griffiths, 'Introduction to Electrodynamics', 4<sup>th</sup> Edn., Prentice Hall, 2013.
6. C.K. Kao, 'Optical Fibre System, Technology, Design & Applications', McGraw Hill, 1982.
7. K. Thygrajan; A.K. Ghatak, 'Laser Theory & Applications', Mc Millan India Ltd., 2007.

**APPLIED MATHEMATICS-I**

**Subject Code: BMAT0-101**

**L T P C**  
**4 1 0 5**

**Duration: 48 Hrs.**

**Learning objectives**

To introduce the concepts and to develop working knowledge on matrix theory, Complex numbers, Convergence of infinite series and concepts of differential equations.

**UNIT-I**

**1. Linear Algebra (10 Hrs.)**

Elementary transformations, Rank of a matrix, Row reduced echelon form, Reduction to normal form, Linear independence and dependence of vectors, Gauss- Jordan method to find inverse of a matrix, Solution of simultaneously linear algebraic equations, Linear transformations, Orthogonal transformations, Eigen values and eigen vectors, Cayley-Hamilton theorem, Reduction to diagonal form, Orthogonal, Unitary, Hermitian matrices.

**UNIT-II**

**2. Complex Numbers and Elementary Functions of Complex Variable (11 Hrs.)**

De-Moivre's theorem and its applications, Real and imaginary parts of exponential, Logarithmic, circular, Inverse circular, Hyperbolic, Inverse hyperbolic functions of complex variables. Summation of trigonometric series (C+iS method).

**UNIT-III**

**3. Sequence and Series (11 Hrs.)**

Introduction to sequence and series, Convergence and divergence of series, Tests of convergence (without proofs), Comparison test, Integral test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test and Gauss test. Alternating series- Absolute and conditional convergence, Leibnitz test. Power series-Weirstrass M-test.

**UNIT-IV**

**4. Differential Equations and its Applications (3 Hrs.)**

Leibnitz's linear and Bernoulli's equation, exact differential equations, Equations reducible to exact form by integrating factors, Equations of the first order and higher degree, Clairaut's equation.

Solution of linear ordinary differential equations of second and higher order; Methods of finding complementary functions and particular integral, Special methods for finding particular integrals- Method of variation of parameters. Cauchy's homogeneous and Legendre's linear equation. Simultaneous linear equations with constant coefficients.

Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple pendulum.

**Recommended Books**

1. E. Kreyszig, 'Advanced Engineering Mathematics', 9<sup>th</sup> Edn., John Wiley, 2006.
2. Michael D. Greenberg, 'Advanced Engineering Mathematics', 2<sup>nd</sup> Edn., Pearson Education, 1998.
3. Peter V.O. Nil, 'Advanced Engineering Mathematics', 7<sup>th</sup> Edn., Wordsworth Publishing Company, 2012.

4. R.K. Jain and S.R.K. Iyengar, 'Advanced Engineering Mathematics', 4<sup>th</sup> Edn., Narosa, 2014.
5. B.S. Grewal, 'Higher Engineering Mathematics', 40<sup>th</sup> Edn., Khanna Publishers, New Delhi, 2007.
6. L.A. Pipes, and L.R. Harvill, 'Applied Mathematics for Engineers and Physicists', 3<sup>rd</sup> Edn., Mc Graw Hill, 1970.
7. H.C. Taneja, 'Engineering Mathematics, Volume-I, II', 2<sup>nd</sup> Edn., I.K. Publishers, 2010.
8. Babu Ram, 'Advanced Engineering Mathematics', Pearson Education, 2009.
9. J.S. Bindra, 'Applied Mathematics', Volume II, 9<sup>th</sup> Edn., Kataria Publications, 2012.

### COMMUNICATIVE ENGLISH

**Subject Code: BHUM0-101**

**L T P C**

**Duration: 45 Hours**

**2 1 0 3**

#### **Course Objectives**

- i) To expose the students to effective communication strategies and different modes of communication.
- ii) To enable the students to analyze his/her communication behaviour and that of others.
- iii) 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.

#### **Learning 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.

**BASICS OF ELECTRICAL ENGINEERING**

**Subject Code: BELE0-101**

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

**Duration: 22 Hrs.**

**UNIT-1**

**1. Review of Direct Current (DC) Circuits (4 Hrs.)**

Review of circuit elements and connected terminology, Kirchhoff's Laws- Statement and Illustrations, Star-Delta Conversion, Ohm's Law- Statement, Illustration and Limitation, Effect of Temperature on Resistance.

**UNIT-II**

**2. Alternating Current (AC) Fundamentals (5 Hrs.)**

Generation of alternating electro-motive force (EMF), Peak, Root Mean Square and average value of alternating current, Phasor representation of alternating quantities, Alternating Quantities in Rectangular and polar forms. Introduction of Resistive, Inductive & Capacitive circuits and their series and parallel combinations, Concept of resonance in series and parallel circuits.

**3. Three Phase Balanced Systems (4 Hrs.)**

Concept of 3-phase EMF Generation, Numbering of phases, phase sequence, Types of connections: star and delta connections, relationship between line voltages/currents and phase voltages/currents, Phasor diagrams.

**UNIT-III**

**4. Magnetic Circuits and Transformer (5 Hrs.)**

Comparison between magnetic and electric circuits, Electromagnetic Induction and its law, Self-Inductance, Mutual Inductance, Coupling Coefficient between two magnetically coupled circuits. Single Phase Transformer: Construction, Working principle, Losses & Efficiency.

**UNIT-IV**

**5. Rotating Electrical Machines (4 Hrs.)**

Construction and working principle of D.C. machines (series and shunt), three phase Induction motor (squirrel cage and slip ring) and their applications.

**Recommended Books**

1. Vincent Deltoro, 'Electrical Engineering fundamentals', 2<sup>nd</sup> Edn., Prentice Hall, New Delhi, 2007.
2. Mittle and Mittle, 'Basic Electrical Engineering', 3<sup>rd</sup> Edn., Tata McGraw Hill, New Delhi, 2006.
3. H. Cotton, 'Advanced Electrical Technology', Reem Publications Ltd., 1983.
4. I.J. Nagrath and D.P. Kothari, 'Electrical Machines', Tata McGraw, Delhi, 2006.
5. Ashfaq Husain, 'Fundamentals of Electrical Engineering', Danpat Rai Publications, 2002.

**HUMAN VALUES & PROFESSIONAL ETHICS**

Subject Code: BHUM0-103

L T P C  
2 0 0 2

Duration: 24 Hrs

**Course Objectives and Learning 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 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 IITH, 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 fulfill the above human aspirations: understanding and living in harmony at various levels

**UNIT-II (8 Hrs)**

**Understanding Harmony in the Human Being - Harmony in Myself!**

Understanding human being as a co-existence of the sentient "I" and the material "Body"

Understanding the needs of Self ("I") and "Body" - *Sukh* and *Suvidha*

Understanding the Body as an instrument of "I" (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of "I" and harmony in "I"

Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyam* and *Swasthya*

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

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

competence Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

**UNIT-III (6 Hrs)**

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

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

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

Understanding the harmony in the Nature; Interconnectedness and mutual 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:

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

**Recommended Books**

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

**Suggested Readings/Books**

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



12. B.L. Bajpai, 2004, 'Indian Ethos and Modern Management', New Royal Book Co., Lucknow, Reprinted 2008.

### 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.
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.
- (e) Biodiversity at global, national and local levels.
- (f) India as a mega-diversity nation.
- (g) Hot-spots of biodiversity.
- (h) Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.
- (i) Endangered and endemic species of India.
- (j) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT-III**

**5. Environmental Pollution (8 Hrs.)**

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.

**APPLIED PHYSICS LAB.**

**Subject Code: BPHY0-102**

**L T P C**

**0 0 2 1**

**At least 10 experiments should be performed in one semester**

**LIST OF PRACTICALS**

- 1. To study the magnetic field of a circular coil carrying current.
- 2. To find out polarizability of a dielectric substance.
- 3. To study the laser beam characteristics like; wave length using diffraction grating element.
- 4. Study of diffraction using Laser beam and thus to determine the grating element.
- 5. To study the angular divergence of laser beam.
- 6. To study laser interference using double slit or Michelson's Interferometer.
- 7. To determine numerical aperture of an optical fibres
- 8. To determine attenuation and propagation losses in optical fibres.
- 9. To find out the frequency of AC mains using electric-vibrator.
- 10. To find the refractive index of a material (solid or liquid) using spectrometer.
- 11. To study the B-H curve using CRO.
- 12. To determine the grain size of a material using optical microscope.
- 13. To find the velocity of ultrasound in liquid.

**Recommended Books**

- 1. C.L. Arora, 'Practical Physics', S. Chand & Co., 1997.
- 2. R.S. Sirohi, 'Practical Physics', Wiley Eastern.

**COMMUNICATIVE ENGLISH 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 learning.
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 the 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:

- Role Play
- Question-Answer
- Discussion
- Presentation of Papers
- Seminars etc.

**Minimum Requirement**

The Communicative English Language Lab shall have two parts:

- i) 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.
- ii) 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, 7<sup>th</sup> Edition
8. Learning 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.
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

### **Learning Outcomes**

The students after undertaking this course will be able to:

- i) Understand and appreciate the need of communication skills in personal and professional life.
- ii) Use different medias/channels of communication and select the most appropriate for a given situation.
- iii) Speak and present himself/herself professionally and socially effectively through effective talks, resumes, interviews etc.

## **BASICS OF ELECTRICAL ENGINEERING LAB.**

**Subject Code: BELE0-102**

**L T P C**

**0 0 2 1**

### **List of Experiments**

**NOTE: Students are required to perform eight experiments, they must perform at least one experiment each from Group I to III and all experiments from Group-IV.**

#### **Group-I**

1. To verify Ohm's law and its limitations.
2. To verify Kirchoff's Laws (KVL and KCL)
3. To measure the resistance and inductance of a coil by ammeter-voltmeter method.
4. To find voltage-current relationship in a R-L series circuit and to determine the power factor of the circuit.

#### **Group-II**

5. To verify the voltage and current relations in star and delta connected systems.
6. To measure power and power factor in a single- phase AC circuit.
7. To Study the various types of switches like Relays, SPST, DPST, MCB and Stair case switch.

#### **Group-III**

8. To study the principle of fluorescent lamp.
9. To verify the rating of compact fluorescent lamp (CFL).

10. To Study the home power supply system.

**Group-IV**

11. To perform open- and short circuit tests on a single phase transformer and calculate its efficiency

12. To start and reverse the direction of rotation of a

i) DC motor

ii) Induction motor

**Recommended Books**

1. S.K. Bhattacharya, 'Experiments in Basic Electrical Engineering', New Age International, New Delhi, 2007.

**MANUFACTURING PRACTICES**

**Subject Code: BMFP0-101**

**L T P C**

**1 0 6 4**

Introduction of various manufacturing practices, tools and equipment used, Hand on experience by making different jobs in respective shops like:

1. Machine Shop
2. Sheet Metal Shop
3. Fitting Shop
4. Welding Shop
5. Carpentry and Pattern Making Shop
6. Forging Shop
7. Foundry Shop
8. Electrical and Electronics Shop

Safety Awareness in workshop: it is very important to know & understand to keep the safety in workshop during working. The concerned shop in-charge must ensure the safe practice sessions. The student must be aware of and follow safety norms and rules during practice in Workshop.

**APPLIED CHEMISTRY**

**Subject Code: BCHM0-101**

**L T P C**

**3 1 0 4**

**Duration: 48 Hrs.**

**UNIT - I**

**1. Molecular Spectroscopy (8 Hrs.)**

**UV/Visible Spectroscopy:** Selection rule, Principle and instrumentation, Electronic Transitions, Chromophores & Auxochromes, Factors affecting  $\lambda_{\max}$  intensity of spectral lines, Types of absorption bands, Frank Condon Principle, Applications.

**IR Spectroscopy:** Principle and instrumentation; Force Constant, Anharmonic Oscillator Model, Finger Print region, Fundamental modes of vibrations, Factors affecting vibrational frequency, Applications.

**2. NMR Spectroscopy (8 Hrs.)**

Principle & instrumentation; Chemical shift; Factors affecting Chemical Shift; Spin-Spin Splitting; Coupling Constant, High resolution NMR spectrum, NMR spectrum of EtOH, Relaxation process, Applications.

## UNIT - II

### 3. Polymers (5 Hrs.)

Introduction; Functionality; Classifications of Polymers, Types of polymerization; Specific features of polymers; Structures - regularity and irregularity; Tacticity of polymers; Average molecular weights and size; Effect of molecular weight on the properties of polymers; Glass Transition Temperature, Crystallinity of polymers, Introduction to polymer reinforced composite.

### 4. Petrochemicals (5 Hrs.)

Introduction; First, second & third generation petrochemicals; Primary Raw Materials for Petrochemicals. Natural gas and its treatment processes; Properties of natural gas; Crude oil: Composition of and classification of crude oil; Physical separation processes; Conversion processes.

## UNIT - III

### 5. Water and its Treatment (5 Hrs.)

Specifications of water, Hardness of water, Treatment and problems of Boiler feed water, Different methods of the water softening, Domestic water treatment of water, Desalination of water.

### 6. Coordination and Organometallic Chemistry (6 Hrs.)

Coordination number and structures of coordination complexes, Nomenclature of Coordination Compounds, Theory of bonding- crystal field and molecule orbital theory for Tetrahedral and octahedral complexes, JT distortion.

## UNIT - IV

### 7. Green Chemistry and its Applications (5 Hrs)

Introductory overview - Definition and concepts of Green chemistry; Twelve Principles of Green chemistry, Use of alternative feedstock (bio-fuels); Use of innocuous reagents in natural processes; Alternative solvents; Design of the safer chemicals; Designing alternative reaction methodology. Microwave and ultrasonic radiation in Green synthesis - Minimizing energy consumption.

### 8. Corrosion and its Prevention (6 Hrs.)

Introduction; Wet and Dry corrosion; Different types of surface films; Mechanisms of wet corrosion; Galvanic corrosion; Galvanic Series; Concentration cell corrosion and differential aeration corrosion; Soil and microbial corrosion; Factors affecting corrosion; Various methods of corrosion control.

### Recommended Books

1. William Kemp, 'Organic Spectroscopy', Palgrave Foundations, **1991**.
2. D.A. Skoog, F.J. Holler and A.N. Timothy, 'Principle of Instrumental Analysis', 5<sup>th</sup> Edn., Saunders College Publishing, Philadelphia, **1998**.
3. G.W. Castellan, 'Physical Chemistry', 3<sup>rd</sup> Edn, 1995, Narosa, Reprint **2004**.
4. C.P. Poole, Jr., F.J. Owens, 'Introduction to Nanotechnology', Wiley Interscience, **2003**.
5. L.E. Foster, 'Nanotechnology', Science Innovation & Opportunity, Pearson Education, **2007**.
6. M. Lancaster, 'Green Chemistry- An Introductory Text', 1<sup>st</sup> Edn., Royal Society of Chemistry, Cambridge, UK, **2010**.
7. Sami Matar, Lewis F. Hatch, 'Chemistry of Petrochemical Processes', 2<sup>nd</sup> Edn, Gulf Publishing Company, Houston, Texas, **2000**.
8. Jones, Denny, 'Principles and Prevention of Corrosion', 2<sup>nd</sup> Edn, Upper Saddle River, New Jersey: Prentice Hall, **1996**.

9. Nicholas J. Turro, 'Modern Molecular Photochemistry', University Science Books, Sausalito, California, 2010.
10. Mohamed Belgacem, Alessandro Gandini, 'Monomers, Polymers and Composites from Renewable Resources', ELSEVIER, 2008.

### **APPLIED MATHEMATICS-II**

**Subject Code: BMAT0-201**

**L T P C**

**4 1 0 5**

#### **Learning Objectives**

To introduce the concepts and to develop working knowledge on curve tracing, Partial differentiation and its applications, Multiple integration and vector calculus.

#### **UNIT-I**

##### **Differential & Integral Calculus and its Applications (11 Hrs.)**

Curve tracing- Tracing of standard Cartesian, Parametric and polar curves, Curvature of Cartesian, Parametric and polar curves. Rectification of standard curves, Areas bounded by standard curves, Volumes and surfaces of revolution of curves, Applications of integral calculus to find center of gravity and moment of inertia.

#### **UNIT-II**

##### **Partial Differentiation and its Applications (13 Hrs.)**

Functions of several variables, Limit and continuity, Change of variable, Chain rule, Partial differentiation, Homogeneous functions and Euler's theorem, Composite functions, Total derivative, Derivative of an implicit function; Change of variable, Jacobians. Tangent and normal to surface, Taylor's and Maclaurin's series for functions of two variables, Errors and approximations, Maxima and minima of function of several variables, Lagrange's method of undetermined multipliers.

#### **UNIT-III**

##### **Multiple Integrals and its Applications (10 Hrs.)**

Double and triple integrals and their evaluation, Change of order of integration, Change of variables, Applications of double and triple integral to find area and volumes.

#### **UNIT-IV**

##### **Vector Calculus and its Applications (11 Hrs.)**

Scalar and vector fields, Differentiation of vectors, Velocity and acceleration, Vector differential operators: Del, Gradient, Divergence and curl and their physical interpretations, Formulae involving del applied to point function and their products, Line, surface and volume integrals, Solenoidal and irrotational vectors, Gauss divergence theorem, Green's theorem in plane, Stoke's theorem (without proofs) and their applications.

#### **Recommended Books**

1. G.B. Thomes, R.L. Finney, 'Calculus and Analytic Geometry', 9<sup>th</sup> Edn., Pearsons Education, 1995.
2. E. Kreyszig, 'Advanced Engineering Mathematics', 9<sup>th</sup> Edn., John Wiley, 2006.
3. Peter V.O. Nil, 'Advanced Engineering Mathematics', Wordsworth Publishing Company.
4. R.K. Jain and S.R.K. Iyengar, 'Advanced Engineering Mathematics', 4<sup>th</sup> Edn., Narosa.
5. B.S. Grewal, 'Higher Engineering Mathematics', 40<sup>th</sup> Edn., Khanna Publishers, New Delhi, 2007.
6. H.C. Taneja, 'Engineering Mathematics', Volume-I, II, 2<sup>nd</sup> Edn., I.K. Publisher, 2010.
7. Babu Ram, 'Advanced Engineering Mathematics', Peaeson Education, 2009.
8. J.S. Bindra, 'Applied Mathematics', Volume-I, 9<sup>th</sup> Edn., Kataria Publications, 2009.



**BASICS OF ELECTRONICS ENGINEERING**

Subject Code: BECE0-101

L T P C  
2 0 0 2

Duration: 25 Hrs.

**UNIT-I**

**1. Diodes (3 Hrs.)**

PN Junction diode, LED, Photodiode, Zener diode, Avalanche & Zener phenomenon.

**2. Diode Applications (4 Hrs.)**

Rectification: Half Wave & Full Wave, Bridge vs Centre Tapped Rectifiers; Switching: ideal vs Practical; Regulation, Power supply design

**UNIT-II**

**3. Transistors (4 Hrs.)**

Bipolar Junction Transistors: NPN, PNP types; Terminology: Biasing, Q-Point; JFET

**4. Transistor Applications (4 Hrs.)**

Common Emitter, Common Base, Common Collector configurations; Transistor as Amplifier and Switch.

**UNIT-III**

**5. Digital Electronics Fundamentals (5 Hrs.)**

Analog vs Digital Signals, Digital Signal Representations with Binary and Timing diagrams, Multi-input Basic and Composite Gates working with symbolic representation, Universal Gates, ICs, Performance Characteristics terminology, Boolean Expression simplification with K-maps up to 4-variables

**UNIT-IV**

**6. Transducers (5 Hrs.)**

Measurements, Measurement system with blocks, Transducers & their nomenclature; Static Performance Characteristics- Qualitative & Quantitative description; Representation of Working Principal on fully labelled graphs and Applications of LVDT, RTD, Thermistors, Strain Gauges.

**Recommended Books**

1. Robert Boylestad and Louis Nashelsky, 'Electronic Devices and Circuits', Prentice Hall of India 10<sup>th</sup> Edn., 2009.
2. R.P. Jain, 'Modern Digital Electronics', Tata McGraw Hill, 2003.
3. Bhargava, Kulshreshtha, Gupta, 'Basic Electronics and Linear Circuits' TTTI Chandigarh, TMH, 1984.
4. M.S. Sukhija and T.K. Nagsarkar, 'Basic of Electrical and Electronics Engineering' Oxford University Press, 2012,

**BASICS OF ELECTRONICS ENGINEERING LAB.**

Subject Code: BECE0-102

L T P C  
0 0 2 1

**List of Experiments**

NOTE: Students shall perform at least 10 experiments out of the following to qualify and need to submit written record of each experiment in a Practical File with sketch and specifications of all components/Devices used in that Experiment

1. To measure amplitude and frequency of various signals (Sine, Triangular & Square) with CRO

2. To plot and analyze fully labeled V-I characteristics of P-N junction diode and compare results with the data sheets
3. To obtain and plot input-output waveforms of half wave Rectifier
4. To obtain and plot input-output waveforms of Full Wave Rectifier (Centre-tap and Bridge)
5. To obtain and plot input-output characteristics of Zener diode and compare results with the data sheets
6. To plot V-I characteristics of BJT in CB configuration and calculate static transistor parameters and compare results with the data sheets
7. To plot V-I characteristics of BJT in CE configuration and calculate static transistor parameters and compare results with the data sheets
8. To plot and evaluate V-I characteristic of FET and evaluate static parameters and compare results with the data sheets
9. To verify truth tables of various logic gates and realize various gates using universal gates
10. To obtain and analyze I/O graphical plot for LVDT and compare results with the data sheets
11. To obtain and analyze I/O graphical plot for RTD or Thermistor and compare results with the data sheets
12. Collect and comprehend the technical specifications of any two commercial electronic systems (LED TV, LCD TV, Microwave oven, Washing machine etc.).

**Recommended Books**

1. Paul B. Zbar, Albert Paul Malvino, Michael A. Miller, 'Basic Electronics', 7<sup>th</sup> Edn., Glenco, 1994.
2. R.P. Jain, 'Modern Digital Electronics', Tata Mc Graw Hill.
3. L.K. Maheshwari, M.M.S. Anand, 'Laboratory Manual for Introductory Electronics Experiments', New Age International, 1997.

**ELEMENTS OF MECHANICAL ENGINEERING**

**Subject Code: BMEE0-101**

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

**Duration: 43 Hrs.**

**Learning Objectives and Learning Outcomes**

1. In the vast spectrum of Mechanical Engineering, this subject gives a very primitive information in wide application of day to day life with emphasis on the principles and fundamentals involved in the inter-conversion of thermal energy into mechanical energy.
2. The subject also offers a bird's eye-view to all students about the basics of Mechanical Engineering.

**UNIT-I**

**1. Basic Concepts of Thermodynamics and various laws (12 Hrs.)**

Thermodynamic System, Boundary and Surroundings, Thermodynamic System types, basic definitions, reversible and irreversible process, Temperature, pressure, heat, work, internal energy, enthalpy and specific heat, Zeroth law of Thermodynamics, first law of Thermodynamics, its corollaries and applications on various cyclic processes (constant volume, constant pressure, constant temperature, adiabatic and polytropic, Free Expansion Process), Steady State energy flow process and its engineering applications

Second Law of Thermodynamics, its corollaries and applications. Heat Engine, Heat Pump and Refrigerator, Clausius Inequality, concept and philosophy of entropy, entropy changes during various Processes, third law of thermodynamics

**2. Basics of Automobiles (6 Hrs.)**

IC engines and its classification, petrol and diesel engines, two and four stroke engines, basic components of IC engines, BHP, IHP, FHP, Mechanical efficiency, gears and its types, power transmission in automobiles, basic function of clutch, brake, differential, axle, tyres.

**UNIT-II**

**3. Fluids and Fluid Mechanics (5 Hrs.)**

Fluids, types of fluids, properties of Fluids, Pascal law, Archimedes law, buoyancy and buoyant force, Continuity equation and Bernoulli's equation

**UNIT-III**

**4. Laws of forces (6 Hrs.)**

Two dimensional force system, basic concepts, rigid body, free body diagram, resolution of forces into components, triangle law of forces, parallelogram law of forces, polygon law of forces, Lami's equation. Varignon's theorem, Application,

**5. Friction: Introduction (4 Hrs.)**

Laws of Coulomb's friction, equilibrium of bodies involving dry friction, Applications.

**UNIT-IV**

**6. Centroid, Centre of Gravity and Moment of Inertia (10 Hrs.)**

Difference between Centre of gravity and centroid. determination of position of centroid of plane geometric figures of I, T, Circular and Triangular Sections. Determination of position of Centre of Gravity (CG) of simple solid figures. Parallel axis theorem, Perpendicular axes Theorem, Radius of gyration, determination of area Moment of Inertia of I, T, Circular and Triangular Sections.

**Recommended Books**

1. A. Yunus Cengel and Mishal A. Boles, 'Thermodynamics & Engineering Approach', 4<sup>th</sup> Edn., Tata Mc Graw Hill, **2011**.
2. G.S. Sawhney, 'Fundamentals of Mechanical Engg.: Thermodynamics, Mechanics, Theory of Machines, Strength of Materials and Fluid Dynamics', 3<sup>rd</sup> Edn., PHI, **2013**.
3. P.N. Chandramouli, 'Engineering Mechanics', PHI, **2013**.
4. K.U. Siddiqui, 'A Text Book of Automobile Engineering', 1<sup>st</sup> Edn., New Age, **2011**.
5. K.L. Kumar, 'Engineering Fluid Mechanics', S. Chand, **2015**.
6. R.K. Rajput, 'A text Book of Fluid Mechanics', S. Chand, **2013**.

**BASICS OF COMPUTER PROGRAMMING**

**Subject Code: BCSE0-101**

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

**Duration: 45 Hrs.**

**COURSE OBJECTIVES**

This course is designed to explore computing and to show students the art of computer programming. Students will learn some of the design principles for writing good programs.

**LEARNING OUTCOMES**

CO1: Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure

CO2: Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language

CO3: Write small programs related to simple/ moderate mathematical, and logical problems in 'C'.

CO4: Study, analyze and understand simple data structures, use of pointers, memory allocation and data handling through files in 'C'.

### UNIT-I

#### 1. Introduction to Problem Solving and Programming Languages (10 Hrs.)

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 Problem: 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

#### 3. Introduction to C Programming Language (12 Hrs.)

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

#### 5. Arrays and Strings (11 Hrs.)

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

#### 6. Pointers

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

### UNIT-IV

#### 7. Functions and Storage Classes (12 Hrs.)

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. Yashwant P. Kanetkar, ‘Let us C’, BPB Publications.
2. Yashwant P. Kanetkar, ‘Pointers in C’, BPB Publications.
3. Jitender Chhabra, ‘Programming with C’, Schaum’s Series.
4. Reema Thareja, ‘Computer Fundamentals & Programming in C’, Oxford.
5. Peter Nortan, ‘Computing Fundamentals’, Tata McRaw Hill.

#### Reference Books

1. Cognizant, ‘Problem Solving and C Programming’,
2. R.S. Salaria, ‘Problem Solving and Programming in C’.

3. Allen B. Tucker, 'Computer Science Handbook', CRC Press B.E. Computer Science and Engineering 2014-2015.

### ENGINEERING DRAWING

**Subject Code: BMEE0-102**

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

**Duration: 45 Hrs.**

#### **Objectives and Expected Outcomes**

1. Main objective of the Engineering Drawing is to introduce the students to visual science in the form of technical graphics. General instructions related to Theory of Orthographic Projection of points, lines, planes and solids as per the BIS codes prevalent to drawing practice will be introduced initially.
2. Section of solids and development of surfaces, isometric projection and orthographic projection of simple solids/blocks will upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts.

#### **UNIT-I**

##### **1. Introduction (4 Hrs.)**

Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in drawing, Types of scales.

##### **2. Projection of Points and Lines (9 Hrs.)**

Projection of points in quadrants, projection of lines parallel to both H P and V P, Parallel to one and inclined to other, inclined to both. True length and angle orientation of straight line: rotation method and trapezoidal method and trace of line.

#### **UNIT-II**

##### **3. Projection of Planes (6 Hrs.)**

Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes and trace of planes.

##### **4. Projection of Solids (6 Hrs.)**

Definition of solids, types of solids. Projection of solids in first or third quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, Visible and invisible details in the projection.

#### **UNIT-III**

##### **5. Section of Solids (6 Hrs.)**

Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.

##### **6. Development of Surface (6 Hrs.)**

Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for both right angled.

#### **UNIT-IV**

##### **7. Isometric Projection (4 Hrs.)**

Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder

##### **8. Orthographic Projection (8 Hrs.)**

Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

### Recommended Books

1. P.S. Gill, 'Engineering Drawing', 4<sup>th</sup> Edn., S.K. Kataria.
2. N.S. Parthasarthy Vela Murli, 'Engineering Drawing', 3<sup>rd</sup> Edn., Oxford University Press.
3. Basant Aggarwal and C.M. Aggarwal, 'Engineering Drawing', 3<sup>rd</sup> Edn., Mc Graw Hill Education (India) Pvt., Ltd.

## APPLIED CHEMISTRY LAB.

Subject Code: BCHM0-102

L T P C

0 0 2 1

### 1. Analysis of Effluents

- Determination of Residual Chlorine.
- Determination of water by EDTA method.
- Determination of COD in a given water sample.
- Determination of H<sub>2</sub>O by dissolved oxygen analyser.
- Determination of turbidity by Nephelometer

### 2. Analysis of Fuels and Lubricants

- Determination of Iodine value of oil.
- Determination of Flash & Fire point by Abele's Apparatus
- Determination of the viscosity of oil.
- Determination of Acid Value of and Aniline point of oil
- Determination of refractive index for oils.

### 3. Synthesis & analysis of metal complexes

- Preparation of Ni-DMG complex.
- Preparation of Tetramminecopper(II)sulphatemonohydrate [Cu(NH<sub>3</sub>)<sub>4</sub>SO<sub>4</sub>.H<sub>2</sub>O]
- Determination of copper & nickel in the given solution by iodometric method.
- Determination of amount of Cu in the copper ore.
- Estimation of ferrous & ferric ions in the given solution

### 3. Instrumental Analysis

- Determination of the surface tension by stalagmometer
- Determination  $\lambda$ -max by spectrophotometer and determination of unknown conc. of binary mixture of two liquids.
- Determination of the strength of a solution pH metrically.
- Determination of the concentration of a solution conductometrically.
- Distinction between acid, ester, ketone using IR spectrophotometer.

### 5. Synthesis & Green Chemistry experiments

- Preparation of aspirin.
- Preparation of a polymer phenol/urea formaldehyde resin
- Preparation of Nylon 66 polymer
- Preparation of ethyl-2-cyano-3-(4-methoxyphenyl)-propeonate (Microwave assisted reaction)
- Base catalysed aldol condensation by Green Methodology Acetylation of primary amines using eco-friendly method.

*Note: Each student is required to perform two experiments from each of the 5 titles (presented bold) depending on his/her Branch and Aptitude.*

**Recommended Books**

1. Vogel A-I, 'Quantitative Inorganic Analysis', 4<sup>th</sup> Edn., Longman Sc & Tech, **1980**.
2. Vogel A-I, 'Quantitative Organic Analysis', Oxford ELBS
3. [dst.gov.in/green-chem.pdf](http://dst.gov.in/green-chem.pdf) (monograph of green chemistry laboratory experiments)
4. S.S. Dara, 'A Textbook on Experiments and Calculations in Engineering Chemistry', 9<sup>th</sup> Edn., S. Chand Publications, **2003**.
5. Sunita Rattan, 'Experiments in Applied Chemistry' 3<sup>rd</sup> Edn., S.K. Kataria & Sons Publications, **2015**.

**BASICS OF COMPUTER PROGRAMMING LAB.**

**Subject Code: BCSE0-102**

**L T P C**

**0 0 4 2**

**1. Getting used to with the Computer System**

To explore the part of the computer system such as system unit, input devices, output devices connected to the computer, the outside view of the system unit that includes the panels on front and ports at the rear, the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans, the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use, the graphical user interface (desktop) of operating system to explain the various elements of the desktop such as taskbar, icons, short cuts, notification area, the desktop that includes selecting the wall paper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

**2. Working with Files & Folders**

Practical knowledge to navigate with the drives, create new folders, move folders from one drive to another drive, move files from one folder to another folder, search files and folders, share files and folders, view and/or change the attributes of the files and folders

**3. Setting the Environment**

Practical knowledge to work with date and time to create new user accounts, install new hardware and configuring existing hardware, install new software or remove existing installed software, configure network connections, manage security profile, practical view to work on the command prompt, open an application, folder, document or internet resource from the Run command, initialize storage media (formatting) To understand the menace of viruses, understand the working of virus guards and antivirus software

**5. Exploring the Internet**

Hand on to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc. create email-account, sending mails, receiving mails, sending files as attachments, etc., login to a remote computer, search information using search engines

**6. Documentation Tool**

Practical Knowledge to familiarize with parts of documents, create and save a document, set page settings, create headers and footers, edit a document and resave it, use copy, cut and paste features, use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc., use spelling and grammar checking feature, preview print a document, create a table with specified rows and columns, enter data in a table, select a table, a row, a column or a cell, inset new row and/or a column, delete a row and/or a column, split and merge a row, column or a cell, understand the mail-merge feature.

Practical Knowledge to familiarize with parts of spreadsheets, create and save a workbook with single and/or multiple worksheets, edit and format text as well numbers, apply operations on range of cells using built-in formulae, preview and print a worksheet, insert new row and/or column in a worksheet, delete a row and/or column in a worksheet, create a variety of charts, import and export data to or from worksheet

Hand on to familiarize with parts of Presentations, create and save a new presentation, apply design templates to a presentation, insert, edit and delete a slide, use different views of slides, use slide show from beginning or from the current slide, preview and print a presentation, check spellings in a presentation, add clip art and pictures in a slide, add chart, diagram and table in a slide, set animation for a selected slide and/or for entire presentation, create slide master and title master, create a custom show

**Introduction to Various C Compilers: Turbo C, GCC, Borland etc.**

**Practical implementation of Programs using C**

- Practical exercises to use various data types.
- Practical exercises using Conditional statements: if statements, if else statements, and nested statements
- Practical exercises using for loop, while loop, do while loop, Nested looping.
- Practical exercises using switch statements
- Practical exercises using arrays
- Practical exercises using strings and is functions
- Practical exercises using structures, unions, enumerations
- Practical exercises using functions
- Practical exercises using pointers
- Practical exercises to read and write the file content.