# BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

## ROURKELA

**Course Structure & Syllabus for 1st year(2008-admission batch) B.Tech Programme**

| 1st Semester | | | | 2nd Semester | | | |
|---|---|---|---|---|---|---|---|
| **Theory** | | **Contact Hours** | | **Theory** | | **Contact Hours** | |
| **Code** | **Subject** | **L-T-P** | **Credit** | **Code** | **Subject** | **L-T-P** | **Credit** |
| **BS1101** | Mathematics-I | 3- 1- 0 | 4 | **BS1104** | Mathematics-II | 3- 1- 0 | 4 |
| **BS1102** | Physics – I | | | **BS1103** | Chemistry-I | | |
| | Or | 3- 0- 0 | 3 | | Or | 3- 0- 0 | 3 |
| **BS1103** | Chemistry-I | | | **BS1102** | Physics – I | | |
| **BE2101** | Basic Electronics | | | **BE2102** | Basic Electrical Engineering | | |
| | Or | 3- 0- 0 | 3 | | Or | 3- 0- 0 | 3 |
| **BE2102** | Basic Electrical Engineering | | | **BE2101** | Basic Electronics | | |
| **BE2103** | Thermodynamics | | | **BE2104** | Mechanics | | |
| | Or | 3- 0- 0 | 3 | | Or | 3- 0- 0 | 3 |
| **BE2104** | Mechanics | | | **BE2103** | Thermodynamics | | |
| **HM3101** | English Communication Skills | 2- 0- 0 | 2 | **HM3102** | Business Communication | 2- 0- 0 | 2 |
| **BE2105** | Programming in 'C' | 3- 0- 0 | 3 | **BE2106** | Data Structure using 'C' | 3- 0- 0 | 3 |
| | **Theory Credits** | | **18** | | **Theory Credits** | | **18** |
| **Practical/ Sessional** | | | | **Practical/ Sessional** | | | |
| **BE7101** | Engineering Drawing | | | **BE7102** | Workshop Practice | | |
| | Or | 0- 0- 3 | 2 | | Or | 0- 0- 3 | 2 |
| **BE7102** | Workshop Practice | | | **BE7101** | Engineering Drawing | | |
| **BE7103** | Physics Laboratory | | | **BE7104** | Chemistry Laboratory | | |
| | Or | 0- 0- 3 | 2 | | Or | 0- 0- 3 | 2 |
| **BE7104** | Chemistry Laboratory | | | **BE7103** | Physics Laboratory | | |
| **BE7105** | Basic Electronics Laboratory | | | **BE7106** | Basic Electrical Engg. Lab | | |
| | Or | 0- 0- 3 | 2 | | Or | 0- 0- 3 | 2 |
| **BE7106** | Basic Electrical Engg. Lab | | | **BE7105** | Basic Electronics Laboratory | | |
| **BE7107** | 'C' Programming Laboratory | 0- 0- 3 | 2 | **HM7102** | Business Communicative Lab. | 0- 0- 3 | 2 |
| **HM7101** | Communicative English Lab. | 0- 0- 3 | 2 | **BE7108** | Data Structure using 'C' Lab | 0- 0- 3 | 2 |
| | **Practical/Sessional Credits** | | **10** | | **Practical/ Sessional Credits** | | **10** |
| **TOTAL SEMESTER CREDITS** | | | **28** | **TOTAL SEMESTER CREDITS** | | | **28** |
| **TOTAL CUMULATIVE CREDITS** | | | **28** | **TOTAL CUMULATIVE CREDITS** | | | **28** |

# BS1103 CHEMISTRY – I (3-0-0)

## Module – I

(To develop basic concepts of quantum mechanics and its applications in bonding)

Structure & Bonding: Dual nature of matter, Schrodinger equation (need not be derived), interpretation of wave functions, molecular orbital theory of diatomic molecules, metallic bonding.

(No. of Lectures = 7)

*Phase rule*: Phase diagram of one & two component systems, $H_2O$, S, Cd-Bi and Fe-C systems.

(No. of Lectures = 5)

*Solid State*: Crystal systems, Bravais lattices, closed packed structures, ionic solids, and crystal defects including Schottky and Frenkel defects.

(No. of Lectures=4)

## Module – II

(To develop basic concepts about the rates of reactions and catalysis)

1. Reaction Kinetics & Catalysis:
   Rate law, Order & Molecularity, Determination of order of reaction, Kinetics of Zero, $1^{st}$ and $2^{nd}$ order reactions, Collision theory, theory of absolute reaction rates, Energy of activation, Homogeneous & Heterogeneous catalysis (a general idea)

   (No. of Lectures= 7 )

2. Electrochemistry: Electrochemical cells, EMF, Measurement of EMF, Relation between EMF & free energy change of cell reactions, Electrode potentials and measurements with reference to standard hydrogen electrode, calomel electrodes, determination of pH, dry cells, storage cells and fuel cells.

   (No. of Lectures= 7)

## Module – III

(Applications of thermodynamic principles to chemical systems)

1. Chemical thermodynamics: Thermo chemistry, Thermo-chemical calculations based on Hess's law and Born-Haber cycle, second law of thermodynamics, Entropy.
2. The free energy concepts, applications to gases, Gibbs Helmholtz equation, free energy change and criterion of spontaneity and equilibrium of chemical reactions, chemical equilibrium, Maxwell's relations.

(No of Lectures= 9)

**Text Books:**


1. Physical Chemistry by G.M. Barrow, $6^{th}$ edition, Tata McGraw Hill, New Delhi.
2. Physical Chemistry by P.W. Atkins, $5^{th}$ / $6^{th}$ edition Oxford.


**Reference Books:**


1. Principles of Physical Chemistry by Puri, Sharma and Pathania.

2. Physical Chemistry by Bahl and Tuli.
3. Engineering Chemistry by Jain and Jain (15th edition).
4. Physical Chemistry-Thomas Engel, Philip Reid by Pearson Education.

## BE7104 Chemistry Laboratory (0-0-3)

(Any ten experiments may be done)

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Determination of total hardness of water by EDTA method.
3. Estimation of calcium in limestone.
4. Determination of percentage of available chlorine in a sample of bleaching powder.
5. Preparation of Phenolphthalein.
6. Preparation of Aspirin.
7. Preparation of buffer solution and determination of pH of a buffer solution.
8. Standardization of $KMnO_4$ using sodium oxalate.
9. Determination of Ferrous iron in Mohr's salt by potassium permanganate.
10. Determination of partition coefficients of iodine between benzene and water.
11. Determination of rate constant of acid catalysed hydrolysis reaction.
12. Determination of concentration of a coloured substance by spectrophotometer.
13. Determination of dissolved Oxygen in a sample of water.
14. Determination of Viscosity of a lubricating oil by Red wood viscometer.
15. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.

## BS1102 PHYSICS – I (1st year)

### Module – I (15 hrs)

Unit- I — **Oscillation and Waves** — Lectures 6 hrs

The aim of this unit is to familiarize the students with basic features of different oscillatory systems waves in general. The topics included in this unit should be treated qualitatively.

(a) Oscillatory systems: Simple harmonic oscillation, damped harmonic oscillation, forced vibration, resonance, coupled oscillation.

(b) Waves as periodic variation quantity in space and time, wave equation, longitudinal and transverse waves, progressive and stationary waves, examples of different types of waves.

(c) Reflection and transmission of waves at boundary of two media.

**Unit - 2** — **Interference** — Lectures 4 hrs

The principle of superposition of waves is extended to the interference of light of waves. Some systems for production of observable interference patterns are covered.

(a) Superposition of waves: Two beam superposition, Multiple-beam superposition, coherent and incoherent superposition.

(b) Two source interference pattern (Young's double slit), Intensity distribution.

(c) Newton's rings: Determination of wavelength of light, refractive index of liquid.

**Diffraction** Lectures 5 hrs

**Unit - 3** Diffraction of light waves at some simple obstacles are to be covered in this unit. Both Fresnel and Fraunhofer pattern are included.

(a ) Huygen's principle, Fresnel and Fraunhofer diffraction, zone plate.

(b) Fraunhofer diffraction due to a single slit.

(c ) Plane transmission grating- diffraction spectra, determination of wave length of light, dispersion.

**Module : II ( 13 hour)**

**Polarization** Lectures 5 hrs

**Unit- 4** The unit covers elementary features of polarization of light waves.

(a) Polarization of transverse waves, plane, circular and elliptically polarized light. Polarization by reflection, refraction and scattering.

(b) Double refraction; Nicol prism, Quarter – wave plate, half – wave plate- construction and use.

(c) Production and analysis of circular and elliptically polarized light.

(d) Optical rotation, sacharimeter-construction and use.

**Unit – 5** **Electromagnetism**- Student will be familiarized with some basic used in vector calculus prior to development of Maxwell's electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should sufficient. Lectures 4 hrs

(a) Vector calculus: gradient, divergence, curl of vector field, Gauss divergence theorem, Stoke's theorem, Green's theorem.

(b) Gauss's law of electrostatics in free space and in a medium, electric displacement( **D)** magnetic Induction (**B**) and magnetic Intensity (**H**), Amperes circuital law, displacement current, Faraday's law of electromagnetic induction.

(c ) Maxwell's electromagnetic equation in differential form and in integral form.

**Unit - 6** **Electromagnetic waves**: Some aspects of propagation of em waves are to be covered. Electromagnetic energy density, poynting vector, poynting theorem, vector potential and scalar potential, electromagnetic wave equation for E and B, transverse nature and speed of em waves in ionized media. Lectures 4 hrs

**Module III ( 8 hours)**

**Unit - 7** **Quantum Physics :** This unit deals with elementary concepts of quantum physics formulation to deal with physical systems. Lectures 4 hrs

(a) Need for Quantum physics-Historical overviews, Particle aspects of radiation-Black body radiation, photoelectric effect, Compton scattering, pair production.( No derivation), Wave aspect of particles-matter wave, de Broglie Hypothesis, Heisenberg Uncertainty principles- Statement, Interpretation and example.

(b ) Basic features of Quantum mechanics- Transition from deterministic to probabilistic, States of system- Wave function, probability density, superposition principle, observables and operators, expectation values. Schrodinger equation-Time dependent and time independent, wave packets.

**Unit – 8** Application of Quantum Mechanics- This unit deals with applications of quantum Mechanics to specific problems solutions of one-dimensional problems, free particles- continuous states, Potential steps- Boundary conditions, reflection, transmission., Potential Barrier-Tunneling, Infinite deep potential well-energy eigen values, eigen functions. Lectures 4 hrs

**Text Books:**

1. Physics-I for engineering degree students-B.B. Swain and P.K.Jena
2. Concepts in Engineering Physics-I Md. N. khan

**Reference Books**:

1. Engineering Physics- K.P.Mishra and P. Pattojoshi
2. Optics- A. K. Ghatak
3. Geometrical and Physical optics- P.K.Chakraborty
4. Electricity and Magnetism : E.M. Purecell
5. Introduction to Electrodynamics- David J. Griffiths
6. Concepts of Modern Physics – Arthur Beiser
7. Relativity and Quantum Mechanics- P.K.Palanisamy
8. Quantum Mechanics- M.Das and P.K.Jena

## BE7103 PHYSICS LABORATORY (0-0-3)

A Student is expected to perform ten experiments from the list given below.

1. Determination of Young's modulus by Searle's methods.
2. Determination of Rigidity modulus by static methods.
3. Determination of surface tension by capillary rise method.
4. Determination of acceleration due to gravity by Bar / Kater's pendulum.
5. Determination of thermal conductivity by Lee's method.
6. Determination of wave length of light of light by Newton's rin apparatus.
7. Determination of grating element of a diffraction grating.
8. Plotting of characteristic curves of a PN junction diode.
9. Plotting of characteristic curves of BJT.
10. Varification of laws of verification of strings using sonometer.
11. Determination of wavelength of laser source by diffraction rating methods.
12. Study of Hall effect.

13. Study of RC circuit.
14. Study of a power source- output imedence.
15. Study of a Photoemission.

## BE2104 Mechanics (3-0-0)

**Module I (13 Hours)**

Concurrent forces on a plane – Composition and resolution of forces and equilibrium of concurrent coplanar forces, Method of projections, Methods of moment, Friction.

Parallel forces in a plane- Two parallel forces, General case of parallel forces, Center of parallel forces in a plane and center of gravity- centroids of composite plane figure and curves, Distributed parallel forces in a plane. General case of forces in a plane- composition of forces in a plane and equilibrium of forces in a plane.

**Module II (13 Hours)**

Plane trusses- method of joints and method of sections, Principle of virtual work – equilibrium of ideal systems.
Moments of Inertia- Plane figure with respect to an axis in its plane and perpendicular to the plane- parallel axis theorem, Moment of Inertia of material bodies.
Rectilinear Translation- Kinematics- Principles of Dynamics- D'Alemberts Principles.

**Module III (14 Hours)**

Momentum and impulse, Work and Energy- impact

Curvilinear translation- Kinematics- equation of motion- projectile- D'Alemberts Principle in curvilinear motion, Moment of momentum, Work- Energy in curvilinear motion.
Kinetics of Rotation of rigid body

**Text Books:**

1. Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, Revised 4th edition (Special Indian Edition), McGraw Hill.

**Reference Books:**

1. Fundamental of Engineering Mechanics(2nd Edition) by S. Rajesekharan & G.Sankara Subramanium, Vikash Publishing House Pvt. Ltd.
2. Engineering Mechanics by Shames and Rao, Pearson Education.
3. Engineering Mechanics, Statics and Dynamics by Boresi and Schmidt, Thomson.
4. Engineering Mechanics by I.S.Gunjal, Laxmi publications.
5. Engineering Mechanics by K.L.Kumar, Tata McGraw Hill
6. Engineering Mechanics by Kumaravelan, Scitech

## BE2103 Thermodynamics (3-0-0)

**Module – I (9Hours)**

1. Basic concepts and definition: Scope of Thermodynamics, Macroscopic and Microscopic approaches; Definition of Fixed mass (closed systems) and Control volume(open system), Properties (extensive and Intensive), State and its representation on a property diagram, Process and its representation, Cyclic process (or cycle) and its representation, Characteristics of properties (point and path function);Reversible and Irreversible processes; Thermal, mechanical and Chemical equilibrium, Thermodynamic equilibrium, Zeroth
Law of Thermodynamics and temperature, Measurement of temperature and calibration of thermometers, the ideal gas temperature scale, Measurement of pressure, Bourdon pressure gage and manometers, gage and absolute pressure.

2. Ideal gages and their P-V-T relations, Gas mixtures

3. Energy Transfer: Work Transfer (definition and calculation), Different modes of work, Displacement Work for various process, Heat Transfer; Modes of heat transfer, Basic laws in conduction, convection and radiation, combined modes of heat transfer with examples.

**Module-II(13 hours)**

4. First Law of Thermodynamics:
   i Formal statement (using cyclic processes), First law for processes of fixed masses(closed systems) and introduction of internal energy as a thermodynamics property, Introduction of enthalpy as a thermodynamic property; Definition of specific heats and their use in calculation of internal energy and enthalpy with emphasis on ideal gages.
   ii Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger.(only steady flow need be considered)

5. Second Law of Thermodynamics: Kelvin- Planck and Clausius statements of Second Law, Reversible and irreversible engines and their efficiency, Entropy concepts and the principle of entropy increase.

6.

**Module-III(13 hours)**

7. Properties of pure substances:
   p-v, p-T, T-S, h-S diagram for steam, different types of steam, Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy

8. Application of thermodynamics:
   Air compressors, steam power plant, Refrigerators and Heat pump, I.C. Engines (Brief Description of different components of above mentioned systems and working principles with Schematic diagram only)

**Text Books**:


1. Engineering Thermodynamics by P.K.Nag, Publisher: TMH
2. Basic Engineering Thermodynamics by Rayner Joel, Pearson Education

**Reference Books:**


1. Engineering Thermodynamics by Van Wylen and Sontang, John Wiley
2. Engineering Thermodynamics by M.Achuthan, Publisher: PHI
3. Applied Thermodynamics by Eastop and McConkey, Publisher: Pearson
4. Fundamental of Engineering Thermodynamics by E. Rathakrishnan, publisher. PHI
5. Engineering Thermodynamics by Russel and Adebiyi, publisher, Oxford
6. Steam Tables in SI Units by Ramalingam, Scitech.


## BE7101 Engineering Drawing (0-0-3)

Sheet Lay-out & Sketching, Line Drawing, Lettering & Dimensioning; Concept of Orthographic Projection, First-angle Projection, Projections of Points, Projection of straight line, Projection of planes, Projection of Solids, Intersection of surfaces, Development of surfaces, Isometric Projection, Sectional Views of solids, Full section, Introduction to computer-Aided Drafting.

**Text Books:**


1. Engineering Drawing by N.D.Bhatt & V.M.Panchal, Charotar publishing House, Anand
2. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill


**Reference Books:**


1. Machine Drawing by Junarkar, Pearson Education.
2. Machine Drawing (Includes AutoCAD) by Ajeet Singh, Tata McGraw Hill.
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson Education.
4. Text Book on Engineering Drawing by Narayana / Kannaiah, Scitech.
5. Engineering Drawing by Shah and Rana, Pearson Education
6. Engineering Drawing and Graphics using AutoCAD by T.Jeyapoovan, Vikas Publishing
7. Engineering Drawing and Graphics by K.Venugopal, New Age International.


## BE7102 Workshop Practice (0-0-3)

Fitting Practice: Use of hand tools in fitting, preparing a male and female joint of M.S. or making a paper weight of M.S.

Welding Practice : Gas welding & Electric Arc welding Practice.
A joint such as a Lap joint, a T-joint or a Butt joint is to be prepared or to make furniture.

**Machining:**

(i) Stepped cylindrical Turning of a job and Thread-cutting in lathe.
(ii) Shaping
(iii) Milling

**Reference:**


1. Elements of Workshop Technology, Vol. I and II by Hajra choudhary, Khanna Publishers
2. Workshop Technology by WAJ Chapman, Viva Books
3. Workshop Manual by Kannaiah/ Narayana, Scitech


# BE2101 - Basic Electronics

## (3 – 0 – 0; Credits: 3; Contact Hours: 3)

## Theory

### MODULE – I (11 hours)

1. Introduction to Electronics: Signals, Frequency spectrum of signals, Analog and digital signals, Amplifiers, Digital logic inverters. (1.1 to 1.4 and 1.7 of Sedra and Smith) (1 Lectures)
2. The Operational Amplifier (Op-Amp): The ideal Op-Amp, Inverting and non-inverting configurations, Difference amplifier, CMRR, Application of Op-Amp (Instrumentation amplifier, Summing amplifier, Integrator and Differentiator). (2.1 to 2.4 and 2.8 of Sedra and Smith) (3 Lectures)
3. Semiconductor Diodes: Introduction, Physical operation of p-n junction diodes, Characteristics of p-n junction diodes, Zener diode, Rectifier circuits (half-wave, full-wave, bridge and peak rectifiers), Diode clipper and clamper circuits, Light emitting diodes. (3.7, 3.2, 3.4 to 3.6 and 3.8 of Sedra and Smith) (4 Lectures)
4. Bipolar Junction Transistors (BJTs): Simplified structure and physical operation of n-p-n and p-n-p transistors in the active region, Current-voltage characteristics of BJT, BJT as an amplifier and as a switch. (5.1 to 5.3 of Sedra and Smith) (3 Lectures)

### MODULE – II (11 hours)

5. Bipolar Junction Transistors (BJTs): BJT Circuits at DC, Biasing in BJT amplifier circuits, Small Signal Operation of BJT: Simplified hybrid-$\pi$ model and its application to single stage BJT amplifiers (Common-Emitter, Common-Base and Common-Collector configurations). (5.4 to 5.7 of Sedra and Smith) (4 Lectures)
6. Feedback Amplifiers and Oscillators: General feedback structure, Properties and advantages of negative feedback, Basic principles of sinusoidal oscillators, The Barkhausen criterion, Op-Amp Oscillator circuits (Wien-Bridge oscillator, RC phase-shift oscillator and Crystal oscillator). (8.1, 8.2 and 13.1 to 13.3 of Sedra and Smith) (4 Lectures)
7. Electronic Instruments: Basic principle of Oscilloscope, Function of the sweep generator, Block diagrams of oscilloscope, Simple CRO, Measurement of frequency and phase by Lissajous method, Application of oscilloscope for measurement of voltage, period and frequency, Block diagram of standard signal generator, AF sine and square wave generator, and Function generator.( 7.2 to 7.5, 7.20,7.26, 7.30, 8.5, 8.7 and 8.8 of Kalsi) (3 Lectures)

## MODULE – III (10 hours)

Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic. (1.2, 1.3 and 2.2 to 2.4 of Floyd and Jain) (2 Lectures)

8. Logic Gates and Boolean Algebra: The inverter, The AND, OR, NAND NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table. (3.1 to 3.6 , 4.1 to 4.7 of Floyd and Jain) (4 Lectures)
9. Combinational Logic and Their Functions: Basic combinational logic circuits, Implementation of combinational logic, The universal properties of NAND and NOR gates, Basic adders, Multiplexers and Demultiplexers., Elementary treatment of Latches, Basic concepts of Memory (RAMs) (5.1 to 5.4, 6.2, 6.4, 6.8, 6.9, 7.1 and 10.2 of Floyd and Jain) (4 Lectures)

### Text Books:


1. Microelectronic Circuits (Fifth Edition), Adel S. Sedra and Kenneth C. Smith, Oxford University Press, YMCA Library Building Jai Singh Road, New Delhi – 110 001.
2. Digital Fundamentals (Eighth Edition), Thomas L. Floyd and R.P. Jain, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
3. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.


### Reference Books:


4. Electronic Devices (Seventh Edition), Thomas L. Floyd, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092 (Selected Portions).
5. Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylestad and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
6. Electronics Principles ($7^{th}$ Edition), Albert Malvono and David J. Bates, Tata McGraw-Hill Publishing Company Limited, New Delhi.


# BE7105 - Basic Electronics Laboratory

## (0 – 0 – 3; Credits: 2; Contact Hours: 3)

(At least 8 experiments including experiments 1 to 7 and any one from experiments 8 to 10)

1. Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multimeter)
2. Study and use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.

3. V-I characteristics of semiconductor diode and determining its DC and AC resistance.
4. Studies on half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectifier output.
5. V-I characteristic of an n-p-n or p-n-p transistor, DC biasing the transistor in common-emitter configuration and determination of its operating point (i.e., various voltages and currents).
6. Studies on Op-Amp applications (Inverting, non-inverting integrating and differentiating configurations); recording of the input-output waveforms.
7. Studies on Logic gates (Truth table verification of various gates).
8. Gain-frequency response studies of a BJT common-emitter RC coupled amplifier.
9. Studies and experiments using MUX-DEMUX ICs.
10. Study on CMOS logic inverter.

## BS1101 - MATHEMATICS-I (3-1-0)
## (1st Sem)

**Module -1** (15 Hours)

Differential Equation: First order differential equations, Separable equation, exact differential equation, Linear differential equation, Bernoulli's equation and application to Electrical circuits. Linear differential equation of second and higher order, Homogeneous equation with constant co-efficient, Euler-Cauchy equations, Solution by undetermined co-effficient, Solutions by variation of parameters, Modeling of electric circuits

**Module-II** (15Hours )

Calculus: Asymptote, Curvature
Series solution of differential equations, Power series method, Legendres equation and Lagenders polynomials, Bessels equation , Bessels function and its application

**Module-III** (15 Hours )

Linear algebra, Matrices, Vectors, Determinants, System of linear equations, eigen values and eigen vectors, Symmetric and skew-symmetric matrices, Orthogonal matrices, Complex matrices, Hermitian and skew-hermitian matrices, Unitary matrices and similarity of matrices.

**Text Books :**

1. Differential Calculus by Santi Narayan and Mittal, Chapters 14, 15

   Publisher: S. Chand
2. Advanced Engineering Mathematics by E. Kreyszig

Publisher: John Willey & Sons Inc- 8th Edition

Chapter 1( 1.1 to 1.6),
Chapter 2(2.1 to 2.12)
Chapter 4( 4.1 to 4.3, 4.5, 4.6
Chapter 6( 6.1 to 6.6)
Chapter 7( 7.1 to 7.5)

**Reference Books:**

1. Higher Engineering Mathematics by B. V. Ramana

   Publisher: TMH

2. Mathematical Methods by Potter Goldberg

   Publisher: PHI

## BS1104 MATHEMATICS-II (3-1-0)
## (2nd Sem)

**Module – I** (15 Hours )
Laplace transformation and its use in getting solution to differential equations, Convolution , Integral equations
Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half range expansion

**Module – II** (15 Hours )
Fourier transform and Fourier Integral, Gamma, Beta functions, error function
Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc length, gradient, divergence, curl

**Module – III** (15 Hours )
Vector integral calculus: Line Integrals, Green Theorem, Surface integrals, Gauss theorem and Stokes theorem

**Text Book**

1. Advanced Engineering Mathematics by E. Kreyszig
   Publisher: John Willey & Sons Inc- 8th Edition
   Chapter 5( 5.1 to 5.7),
   Chapter 8(8.4, 8.5, 8.9 to 8.11)
   Chapter 9( 9.1 to 9.9)
   Chapter 10( 10.1 to 10.4, 10.8 to 10.10)

**Reference Books:**

3. Higher Engineering Mathematics by B. V. Ramana
   Publisher: TMH
4. Mathematical Methods by Potter and Goldberg
   Publisher: PHI

# HM 3101 English Communication Skills (2-0-0)

**(Theory)**

**Module-I** The elements of communication ( 6 hours )

1.1 the importance of communication through English at the present time
1.2 the process of communication and factors that influence communication : sender, receiver, channel, code, topic, message, context, feedback, 'noise', filters and barriers
1.3 the importance of audience and purpose
1.4 the information gap principle : given and new information ; information overload
1.5 verbal and non-verbal communication : body language
1.6 comparing general communication and business communication

**Module-II** The sounds of English ( 14 hours )

2.1 vowels, diphthongs, consonants, consonant clusters
2.2 the International Phonetic Alphabet (IPA) ; phonemic transcription
2.3 problem sounds
2.4 syllable division and word stress
2.5 sentence rhythm and weak forms
2.6 contrastive stress in sentences to highlight different words
2.7 intonation : falling, rising and falling-rising tunes
2.8 varieties of Spoken English : Standard Indian, American and British

(**Note :** This unit should be taught in a simple, non-technical manner, avoiding technical terms as far as possible. )

**Module-III** Review of English grammar (10 hours )

3.1 stative and dynamic verbs
3.2 the auxiliary system ; finite and non-finite verbs
3.3 time, tense and aspect
3.4 voice: active and passive
3.5 modality
3.7 negation
3.8 Interrogation ; reported and tag questions
3.9 conditionals
3.10 concord
3.11 Phrasal verbs

**(Note** The teaching of grammar should be treated as a diagnostic and remedial activity and integrated with communication practice. The areas of grammar in which errors are common should receive special attention when selecting items for review. Teaching need not be confined to the topics listed above.))

**Books recommended:**

1. An Introduction to Professional English and Soft Skills by B.K.Das et al., Cambridge University Press. (Facilitated by BPUT).

## HM 7101 Communicative Practice Lab -I (0-0-3)
## (1ST Sem)

Lab sessions will be devoted to practice activities based on all three modules of theory.

a. phonemic transcription 5 hours

Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation.

i transcription of words and short sentences in normal English orthography (writing) into their IPA equivalents ;
ii transcription of words presented orally ;
iii conversion of words presented through IPA symbols into normal orthography
iv syllable division and stress marking (in words presented in IPA form)

b. Listening 10 hours

i listening with a focus on pronunciation (ear-training) : segmental sounds, stress, weak forms, intonation

Students should be exposed, if possible, to the following varieties of English during listening practice : Standard Indian, British and American.

c. Speaking 15 hours

i pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
ii practising word stress, rhythm in sentences, weak forms, intonation
ii reading aloud of dialogues, poems, excerpts from plays, speeches etc. for practice in pronunciation

d. Grammar and usage 12 hours

The focus will be on the elimination of common errors. Some writing activities (e.g. writing of short paragraphs on assigned topics) can be used to identify these errors.

***Project Work***

Students will be required to produce and submit by the end of Semester 1 a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of the 100 marks allocated for the Lab test ) will be set apart for the project.

## HM 3102 Business Communication (2-0-0)
## (2nd Sem.)

**Module - I The Elements of Business Communication (10 hours)**

1.1 patterns of communication in the business world: upward, downward, horizontal, grapevine etc
1.2 internal and external channels of communication; formal and informal channels.
1.3 Introduction to cross-cultural communication.
1.4 avoiding gender, racial and other forms of bias in communication
1.5 common forms of oral and written communication in the business world:
Oral presentations, interviews and group discussions
Memos, reports, summaries and abstracts, e-mails

**Module-II Reading and writing (15 hours)**

2.1 the importance of developing reading skills
2.2 the sub-skills of reading :
a. understanding the main idea and supporting details
b. reading between the lines : inferential reading
c. understanding the writer's point of view
d. making predictions
e. guessing the meanings of unfamiliar words
f. skimming and scanning
g. note-making
2.3 the importance of writing skills
2.4 the differences between speech and writing
2.5 the qualities of effective writing : coherence, cohesion, logical structuring and organization, clarity of language, stylistic variation etc.
2.6 the writing process : pre-writing, drafting, re-writing
2.7

**Module -III Soft skill development (5 hours)**

4.1 soft skills: becoming a good leader and team-player
4.2 inter-relating soft skills and communication skills

**Books recommended:**


1 Business Communication Today by Bovee et al ( Pearson)
2 Business Communication by Meenakshi Raman and Prakash Singh (Oxford)
3 Crash Course in Personal Development by Brian Clegg ( Kogan Page)
4 Activities for Developing Emotional Intelligence by Adele B.Lynn (HRD Press)
5 Lateral Thinking by Edward De Bono (Penguin)

## HM 7102 Communicative Practice Lab -II ( 0-0-3 )
## (2nd Sem)

a. **Communication Practice** **30 hours**

i Speaking : oral communication in social and work-related situations, e.g.: 10 hours

Greeting an acquaintance/ friend, introducing oneself, introducing a friend to another friend, breaking off a conversation politely, leave-taking;
making and responding to inquiries; expressing an opinion;
expressing agreement/ disagreement, contradicting/ refuting an argument;
expressing pleasure, sorrow, regret, anger, surprise, wonder, admiration, disappointment etc.
Narrating or reporting an event;
Describing people, objects, places, processes etc.
Ordering / directing someone to do something
Making requests; accepting / refusing a request
Expressing gratitude; responding to expressions of gratitude
Asking for or offering help; responding to a request for help
Asking for directions (e.g. how to reach a place, how to operate a device etc.) and giving directions
asking for and granting/ refusing permission
prohibiting someone from doing something
suggesting, advising, persuading, dissuading, making a proposal
praising, complimenting, felicitating
expressing sympathy (e.g. condolence etc.)
Complaining, criticizing, reprimanding

ii **Reading** **10 hours**

Students will be given practice in reading and comprehending 6-8 simple passages of 100-300 words each, on topics of general as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment, together with study skills (note making) and reference skills (using a dictionary).

Practice will be provided in the important sub-skills of reading which are introduced in Module 2 of the theory component.

iii **Writing** **10 hours**

Writing short paragraphs on given topics or topics of one's choice; social and business letters; reports; applications ; resumes ; summaries

The principles of 'Process Writing' should be used to teach writing skills.

i pre-writing : generating ideas, brain-storming, idea mapping, outlining
ii writing : generating a first draft ; reviewing, redrafting, editing
iii post-writing : making a presentation ; discussion and feedback, preparing the final draft

**b. Soft skills practice** **10 hours**

Activities designed to highlight leadership and 'team' skills ; Group discussion

# BE 2102 - BASIC ELECTRICAL ENGINEERING (3-0-0)

This is a foundation course aimed at explaining the basic and underlying principles of Electrical circuits, Electro-mechanical devices used for Generation, Transmission, Distribution, Utilization and Measurement of electric energy.

MODULE-I

(12 Lectures)

1. **Introduction**: Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor, Electric Power. (1)
2. **DC Networks**: Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin & Norton theorem), Transients in R-L and R-C circuits with DC excitation. (4)
3. **Magnetic Circuits**: Introduction to Electromagnetism, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. (3)
4. **D.C. Machines**: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Speed Equation of DC Motor. (3)

MODULE-II

(12 Lectures)

5. **Single-Phase AC Circuits**: Single-phase EMF Generation, Waveform and Phasor representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor. (5)
6. **Three-Phase AC Circuits**: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits. (3)
7. **Single-Phase Transformers**: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on transformer phasor diagram and transformer rating. (3)

MODULE-III

(12 Lectures)

8. **Induction Motors**: Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip, Slip-Torque characteristics (no derivations). (2)
9. **Measuring Instruments**: Introduction, PMMC Ammeters and Voltmeters with extension of range, Moving-Iron Ammeters and Voltmeters, Study of Digital Voltmeters and Multi-meters, Dynamometer type Wattmeter, Energy meter. (6)
10. **Power Systems**: Brief idea about various generating plants (Thermal, Hydel, and Nuclear), Transmission, Distribution and Utilization of Electric Energy. (3)

## Text Books:


1. Prasanta Kumar Satpathy, “Basic Electrical Engineering”, Oxford University Press (Printed in India), First Published-2008, Second Impression-2008.


## Reference Books:


2. Hughes, “Electrical & Electronic Technology”, Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education, First Impression-2007.
3. Nagsarkar & Sukhija, “Basic Electrical Engineering”, Oxford University Press (Printed in India), First Published-2005, Third Impression-2006..
4. Rajendra Prasad, “Fundamentals of Electrical Engineering”, Prentice-Hall of India, 2nd Printing-2006.

## BE 7106 - BASIC ELECTRICAL ENGINEERING LABORATORY (3-1-0)

**Select any 8 experiments from the list of 10 experiments :**

1. Connection and measurement of power consumption of a fluorescent lamp.
2. Measurement of armature and field resistances of a DC compound machine.
3. Starting and speed control of a DC shunt motor by (a) field flux control method, and (b) armature voltage control method.
4. V-I characteristics of incandescent lamps and time-fusing current characteristics of a fuse.
5. Connection and testing of a single-phase energy meter.
6. Starting of three-phase induction motor by star-delta starter.
7. Determination of open circuit characteristics (OCC) of DC shunt generator.
8. Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.
9. Calculation of no load losses of a single-phase transformer.
10. Study of single-phase induction motors/ fan motors.

## BE 2105 PROGRAMMING IN 'C' (3-0-0)

### Module – I [12 Hours]

Algorithm, flowchart, Structured Programming Approach, structure of C program (header files, C pre-processor, standard library functions, etc.),identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Input-output statements, statements and blocks, if and switch statements, loops:-while, do-while and for statements, break, continue, goto, programming examples.

### Module – II [12 Hours]

Designing structured programs: - Functions, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, recursive functions. Arrays- concepts, declaration, definition, accessing elements, and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments,

### Module – III [12 Hours]

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, C program examples. Input and output – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling, C program examples.

Text Books:


1. Balagurusamy : "C Programming" Tata McGraw-Hill
2. P. Dey & M. Ghosh, "Computer Fundamental & Programming in C"- Oxford University Press
3. Deitel -"C How to programme" PHI publication/ Pearson Publication


**Reference Books:**


1. Y. Kanitkar – "Let us C" BPB Publisher
2. H. Schildt – "C the complete Reference" McGraw-Hill
3. Schaum Series- "C Programming" - Gotterfried

# BE7107 – 'C' PROGRAMMING LAB (0-0-3)

***( Minimum 10 programs to be done covering 8 Experiments)***

***Experiment No. 1***

a) Write a C program to find the sum of individual digits of a positive integer.
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

***Experiment No. 2***

a) Write a C program to calculate the following Sum:
Sum=$1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$
b) Write a C program to find the roots of a quadratic equation.

***Experiment No. 3***

a) Write C programs that use both recursive and non-recursive functions
i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.
iii) To solve Towers of Hanoi problem.

***Experiment No. 4***

a) Write a C program to find both the larges and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
i) Addition of Two Matrices
ii) Multiplication of Two Matrices

***Experiment No. 5***

a) Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to given main string from a given position.
ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not

***Experiment No. 6***

a) Write a C program to construct a pyramid of numbers.
b) Write a C program to count the lines, words and characters in a given text.

***Experiment No.7***

a) Write a C program that uses functions to perform the following operations:
i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

***Experiment No. 8***

a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

**Book**:- PVN. Varalakshmi, Project Using C Scitech Publisher

## BE 2106 DATA STRUCTURE (3-0-0)

***Module – I***

**[12 hours]**

Introduction to data structures: storage structure for arrays, sparse matrices, Stacks and Queues: representation and application. Linked lists: Single linked lists, linked list representation of stacks and Queues. Operations on polynomials, Double linked list, circular list.

***Module – II***

**[12 Hours]**

Dynamic storage management-garbage collection and compaction, infix to post fix conversion, postfix expression evaluation. Trees: Tree terminology, Binary tree, Binary search tree, General tree, B+ tree, AVL Tree, Complete Binary Tree representation, Tree traversals, operation on Binary tree-expression Manipulation.

***Module –III***

**[12 Hours]**

Graphs: Graph terminology, Representation of graphs, path matrix, BFS (breadth first search), DFS (depth first search), topological sorting, Warshall's algorithm (shortest path algorithm.) Sorting and Searching techniques – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort, Heap sort, Radix sort. Linear and binary search methods, Hashing techniques and hash functions.

Text Books:


1. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication

2. "Data structure in C" by Tanenbaum, PHI publication / Pearson publication.

3. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.


**Reference Books:**


1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.

2. "Fundamental of Data Structure" ( Schaums Series) Tata-McGraw-Hill.

# BE 7108 DATA STRUCTURE LAB (0-0-3)

***(Minimum 10 experiments to be done)***

***Experiment No.1***

Write a C program to perform matrix multiplication using array.

***Experiment No.2***

(a) Write a C program to create a stack using an array and perform
(i) push operation (ii) pop operation
(b) Write a C program to create a queue and perform
i) Push ii) pop iii) Traversal

***Experiment No. 3***

Write a C program that uses Stack operations to perform the following:
i) Converting infix expression into postfix expression
ii) Evaluating the postfix expression

***Experiment No. 4***

Write a C program that uses functions to perform the following operations on Single linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

***Experiment No. 5***

Write a C program that uses functions to perform the following operations on Double linked list:
i) Creation ii) Insertion iii) Deletion

***Experiment No. 6***

Write a C program that uses functions to perform the following operations on Binary Tree:
i) Creation ii) Insertion iii) Deletion

***Experiment No. 7***

Write C programs that use both recursive and non recursive functions to perform the Linear search operation for a Key value in a given list of integers:
i) Linear search

***Experiment No. 8***

Write C program that use both recursive and non recursive functions to perform the Binary search operation for a Key value in a given list of integers:

***Experiment No.9***

Write a C program that implement Bubble Sort method to sort a given list of integers in descending order.

***Experiment No.10***

Write a C program that implement Quick Sort method to sort a given list of integers in ascending order:

**Book**:- “Data structure using C” by Sudipta Mukherjee, TMH Publication