

# SYLLABUS FOR 1<sup>ST</sup> SEMESTER

## THEORY

BS1101 Mathematics-I

BS1102 Physics – I

Or

BS1103 Chemistry-I

BE2101 Basic Electronics

Or

BE2102 Basic Electrical Engineering

BE2103 Thermodynamics

Or

BE2103 Mechanics

HM3101 Communicative English

BE2105 Programming in 'C'

## PRACTICAL / SESSIONAL

BE7101 Engineering Drawing

Or

BE7102 Workshop Practice

BE7103 Physics Laboratory

Or

BE7104 Chemistry Laboratory

BE7105 Basic Electronics Laboratory

Or

BE7106 Basic Electrical Engg. Lab

BE7107 'C' Programming Laboratory

HM7101 Communicative English Lab

# BS1101 - MATHEMATICS-I

## 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-efficient, Solutions by variation of parameters, Modeling of electric circuits

## Module-II (15 Hours)

Calculus: Asymptote, Curvature

Series solution of differential equations, Power series method, Legendres equation and Legenders 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

# BS1102 - PHYSICS-I

## Module - I

### Unit - 1 (Oscillation and Waves)

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.

1. Oscillatory Systems : Simple harmonic oscillation, damped harmonic oscillation, forced vibration, resonance, coupled oscillation.
2. Waves as periodic variation quantity in space and time, wave equation, Reflection and transmission of waves at boundary of two media.

### Unit - 2 (Interference)

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.

1. Superposition of waves: Two beam superposition, Multiple-beam superposition, coherent and incoherent superposition.
2. Two source interference pattern, Intensity distribution, Biprism, Determination of wavelength of light. Newton's rings: Determination of wavelength of light, refractive index of liquid.

### Unit - 3 (Diffraction)

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

1. Huygen's principle, Fresnel and Fraunhofer diffraction, zone plate.
2. Fraunhofer diffraction due to a single slit, Plane transmission grating- diffraction spectra, determination of wave length of light.

## Module - II

### Unit - 4 (Polarization)

The unit covers elementary features of polarization of light waves.

1. Polarization of transverse waves, plane, circular and elliptically polarized light. Polarization by reflection, refraction and scattering.
2. Double refraction; Nicol prism, Quarter - wave plate, half - wave plate-construction and use.
3. Production and analysis of circular and elliptically polarized light, Optical rotation (Only concepts)

### 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 be sufficient.

1. Vector calculus: gradient of scalar field, divergence, curl of vector field (Only Physical significance) Gauss divergence theorem, Stoke's theorem, Green's theorem (Only Statements)
2. Gauss's law of electrostatics in free space and in a medium (Only statements) electric displacement (D) magnetic Induction (B), Amperes circuital law (Only statements), displacement current, Faraday's law of electromagnetic induction (Only statements).
3. Maxwell's electromagnetic equation in differential form and in integral form (Only statements). Electromagnetic energy density, Poynting vector, Poynting theorem, vector potential and scalar potential, electromagnetic wave equation for E and B, transverse nature of EM waves.

## Module - III

### Unit - 6 (Quantum Physics) :

This unit deals with elementary concepts of quantum physics formulation to deal with physical systems.

1. Need for Quantum physics-Historical overviews, Particle aspects of radiation-Black body radiation, photoelectric effect, Compton scattering, pair production.( No derivations), Wave aspect of particles-matter wave, de Broglie Hypothesis, Heisenberg Uncertainty principles- Statement, Interpretation and example.
2. 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 - 7 (Application of Quantum Mechanics-)

This unit deals with applications of quantum Mechanics to specific one-dimensional problems (Sketch, Schrodinger equation for different regions, Boundary conditions, final expressions and physical interpretations only, no derivations).Free particles- continuous states, Potential steps- Reflections, transmissions, Potential Barrier-Tunneling, Infinite deep potential well-energy eigen values, eigen functions.

#### Text Books:

1. Engineering Physics by D.R. Joshi, Mc Graw Hill
2. Engineering Physics by H.K. Malik and A.K. Singh, Mc Graw Hill.

#### Reference Book:

1. Quantum Mechanics by Powel & Craseman.
2. Optics- A. K. Ghatak
3. Electricity & Magnetism : E.M. Purecell
4. Introduction to Electrodynamics- David J. Griffiths, PHI Publication
5. Concepts of Modern Physics - Arthur Beiser.
6. Engineering Physics- K.P.Mishra and P. Patojoshi, Scitech Pub.
7. Concepts in Engineering Physics-I Md. N. khan, Alok Publication.
8. Physics-I for engineering degree students-B.B. Swain and P.K.Jena.
9. An Introduction to Machanics by D.Klippner & R. Kolenkow, TMH

# BS1103 - CHEMISTRY-I

## Module - I

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

1. Structure Bonding: Dual nature of matter, Schrodinger equation (need not be derived), interpretation of wave functions, molecular orbital theory of diatomic molecules, metallic bonding.  
Phase rule: Phase diagram of one & two component systems, H<sub>2</sub>O, S, Cd-Bi and Fe-C systems.  
Solid State: Crystal systems, Bravais lattices, closed packed structures, ionic solids, and crystal defects including Schottky and Frenkel defects.

## 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, 1st and 2nd order reactions, Collision theory, theory of absolute reaction rates, Energy of activation, Homogeneous & Heterogeneous catalysis (a general idea)
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.

## 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.

## Text Books:

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

## Reference Book:

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.

# BE2101 BASIC ELECTRONICS

## Module - I

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)
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. 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)

## Module - II

1. Bipolar Junction Transistors (BJTs): BJT Circuits at DC, Biasing in BJT amplifier circuits, Small Signal Operation of BJT: Simplified hybrid-p 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)
2. 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)
3. 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)

## Module - III

1. 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. 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)
3. 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)

## Text Books:

Microelectronic Circuits (Fifth Edition), Adel S. Sedra and Kenneth C. Smith, Oxford University Press, YMCA Library Building Jai Singh Road, New Delhi - 110 001.

Digital Fundamentals (Eighth Edition), Thomas L. Floyd and R.P. Jain, Pearson Education, 482 FIE, Patparganj, Delhi - 110 092.

Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.

## Reference Books:

Electronic Devices (Seventh Edition), Thomas L. Floyd, Pearson Education, 482 FIE, Patparganj, Delhi - 110 092 (Selected Portions).

Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylestad and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi - 110 092.

Electronics Principles (7th Edition), Albert Malvono and David J. Bates, Tata McGraw-Hill Publishing Company Limited, New Delhi.

# BE2102 BASIC ELECTRICAL ENGINEERING

## Module - I

1. **Fundamentals of Electric Circuits:** Charge, current, KCL, Voltage and KVL, Electric Power and sign conventions, circuit elements and their characteristics, Resistance and Ohm's Law Practical voltage and current sources, Measuring devices (Rizzoni: Ch 2.2 to 2.8) Resistive Network Analysis Node voltage analysis, Mesh current analysis, node and mesh current analysis with controlled sources, principle of superposition, maximum power transfer (Rizzoni: Ch3.1 to 3.5 and 3.7)

## Module - II

1. **AC Network analysis:** Energy Storage elements, time-dependent signal sources, solution of circuits containing energy storage elements, phasor solutions of circuits with sinusoidal excitations, AC circuit analysis methods(Rizzoni: Ch 4.1 to 4.5)
2. **Transient Analysis:** Transient Analysis, Writing differential equations for circuits, DC steady state solutions of circuits, Transient Response of second order circuits(Rizzoni: Ch 5.1 to 5.5)
3. **AC Power:** Power in AC circuits, Complex Power, Transformers, Three-phase power, Residential Wiring: Grounding and safety Generation and distribution of AC Power(Rizzoni: Ch 7.1 to 7.6)
4. **Electronic Instrumentation and Measurements:** Measurement Systems and Transducers, Wiring, Grounding and noise, signal conditioning, A/D and D/A Conversion(Rizzoni: Ch 15.1 to 15.4)

## Module - III

1. **Principles of Electro mechanics:** Electricity and Magnetism, Magnetic Circuits, Magnetic Materials and B-H curves, Transformers, Electromechanical Energy Conversion(Rizzoni: Ch 18.1 to 18.5)
2. **Introduction to Electric Machines:** Rotating Electric machines, DC Machines, DC Generators, DC Motors, AC machines, Alternator(Rizzoni: Ch 19.1 to 19.6)

## Text Books:

1. Principles and Applications of Electrical Engg., Rizzoni, McGrawHill

## Reference Books:

1. Electrical & Electronic Technology, E. Huges, Pearson, 9th Edition
2. Basic Electrical Engineering, A. Fitzerlad, D. E.Higginbotham and A.Grabel, TMH, 5th Ed.
3. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition, PHI

# BE2103 THERMODYNAMICS

## Module-I

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

**First Law of Thermodynamics:** Formal statement (using cyclic processes)

1. 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.  
Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger.(only steady flow need be considered)
2. 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.

## Module - III

1. 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.
2. 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.

# BE2104 MECHANICS

## Module-I

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

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

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 Subramaniam, 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.Gunjaj, Laxmi publications.
5. Engineering Mechanics by K.L.Kumar, Tata McGraw Hill
6. Engineering Mechanics by Kumaravelan, Scitech

# HM3101 Communicative English

## Module-I

(The elements of communication)

1. the importance of communication through English at the present time
2. the process of communication and factors that influence communication: sender, receiver, channel, code, topic, message, context, feedback, 'noise', filters and barriers
3. the importance of audience and purpose
4. the information gap principle : given and new information ; information overload
5. verbal and non-verbal communication : body language
6. comparing general communication and business communication

## Module-II

(The sounds of English)

1. vowels, diphthongs, consonants, consonant clusters
2. the International Phonetic Alphabet (IPA) ; phonemic transcription
3. problem sounds
4. sentence rhythm and weak forms
5. contrastive stress in sentences to highlight different words
6. Intonation: falling, rising and falling-rising tunes
7. 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)

1. stative and dynamic verbs
2. the auxiliary system ; finite and non-finite verbs
3. time, tense and aspect
4. voice: active and passive
5. modality
6. negation
7. Interrogation ; reported and tag questions
8. conditionals
9. concord
10. 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).

# BE2105 PROGRAMMING in 'C'

## Module-I

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, bitwise 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

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

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. E. Balaguruswamy "Programming in C", 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