Course Details for UG Common 1st Year Curriculum of UG Programs
(except Architecture and Pharmacy)
Faculty of Engineering & Technology,
Jadavpur University
(to be ratified in E.C. and Court Council)

<table>
<thead>
<tr>
<th>Course code</th>
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<tbody>
<tr>
<td>Category</td>
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<td>Course title</td>
<td>Mathematics I (To be followed in Semester I)</td>
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<td>Scheme and Credits</td>
<td>L–T–P*: 3–1–0; Credits: 4.0; Semester – I</td>
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<td>Pre-requisites (if any)</td>
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* Contact hours per week; L – Lecture hour, T – Tutorial hour, P – Practical hour.

**Syllabus**

**Differential Calculus (Functions of one Variable):**
Rolle’s theorem, Cauchy’s mean value theorem (Lagrange’s mean value theorem as a special case), Taylor’s and Maclaurin’s theorems with remainders, indeterminate forms, concavity and convexity of a curve, points of inflexion, asymptotes and curvature.

**Differential Calculus (Functions of several variables):**
Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, differentials, derivatives of composite and implicit functions, derivatives of higher order and their commutativity, Euler’s theorem on homogeneous functions, harmonic functions, Taylor’s expansion of functions of several variables, maxima and minima of functions of several variables - Lagrange’s method of multipliers.

**Abstract Algebra:**
Groups, subgroups, permutation groups, cyclic groups, Lagrange’s Theorem on finite groups, Homomorphisms of groups, normal subgroups, quotient groups, Isomorphism theorems, Rings, subrings, Integral domains, Fields, subfields, Finite fields, Prime fields.

**Linear Algebra:**
Vector spaces over the real field, Linearly dependent and independent vectors, Subspaces, basis and dimension, Matrix and Determinant; Inverse of a square matrix; Elementary row and column operations; Echelon form; Rank of a matrix; Solution system of linear equations, Cramer’s rule; Matrix inversion method, Characteristic equations, Eigenvalues and Eigenvectors, Cayley-Hamilton theorem.

**Books:**
1. T. M. Apostol, Calculus, Volumes I and II.
Content Delivery Method
- Class room lecture (chalk and board)
- Tutorial
- Discussion

Course Outcomes
The students of the course should be able to –

CO1: Explain different theorems of Differential Calculus in one or several variables. (K2)

CO2: Solve problems of Differential calculus in one or more variables (K3)

CO3: Define and illustrate groups, rings, fields. (K2)

CO4: Solve problems related to matrix, its operations, system of linear equations, vector space, Eigen value and Eigen vector (K3)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Syllabus

**Integral Calculus:** [13L+4T]

**Complex Variables:** [9L+3T]
Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy’s integral theorem, independence of path, existence of indefinite integral, Cauchy’s integral formula, derivatives of analytic functions, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem, evaluation of real integrals.

**Sequences and Series:** [5L+1T]
Sequences and their limits, convergence of series, comparison test, Ratio test, Root test, Absolute and conditional convergence, alternating series, Power series.

**Fourier Series and Integral Transforms:** [8L+3T]
Fourier series; Periodic functions; Trigonometric series of sine and cosines; Euler’s formula; Even and odd functions; Dirichlet's conditions; Half range sine and cosine series; Fourier transform, definitions and properties; Inverse Fourier transform; Convolution; Laplace transform, properties; Inverse Laplace transform; Convolution; Z transform and properties.
Books:
1. T. M. Apostol, Calculus, Volumes I and II.

Content Delivery Method
- Class room lecture (chalk and board)
- Tutorial
- Discussion

Course Outcomes

The students of the course should be able to

CO1: Solve problems related to Definite integral using Fundamental Theorem of Calculus, Convergence tests for improper integrals and understand Beta Gamma functions (K3)

CO2: Comprehend Differentiation under integration and solve problems related to Double and triple integrals with applications in geometry (K3)

CO3: Define and analyze limits and continuity, derivatives and integral operations for complex numbers and functions. (K3)

CO4: Evaluate complex contour integrals, apply the Cauchy integral theorem (K3)

CO5: Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals and analyze convergence of sequences and series (K3)

CO6: Explain Fourier series and integral transforms and their properties (K2)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Course code | BS/CH/TP103  
---|---  
Category | Basic Science Course  
Course title | CHEMISTRY  
Scheme and Credits | L–T–P: 3–0–2; Credits: 4.0; Semester – I & II  
Pre-requisites (if any) |  

Syllabus

Chemistry – Theory

Chemistry I

1. **Atomic structure**, chemical bond, valence bond, MOT [5L]
2. **Theory of acids and bases** [4L]
3. **Nuclear chemistry**: nuclear structure, stability, decay, nuclear reactions, isotopic chemistry; radioactive nuclides: methodology [4L]
4. **Corrosion**: Types, mechanism, prevention [3L]
5. **Nano-particles**: Introduction and applications [3L]

Chemistry II

1. **Electrochemical cells**: Batteries and Fuel cells: working principle, types and application [3L]
2. **Introduction to spectroscopy**: Molecular-UV-Vis, FTIR [3L]
3. **Solid state**: Basics, electronic properties and band theory: metals, semiconductors, supercapacitors [4L]

Chemistry III

1. **Reaction mechanisms**: Electrophillic and nucleophillic/ addition/ substitution in aromatic systems, carbocations, carboanions and their reactions. [5L]
2. **Stereochermy**: Stereoisomers, stereospecific and stereoselective reactions. [2L]
3. **Biomolecules**: Reactions of carbohydrates, lipids and proteins. [2L]
4. **Industrial preparation of organic chemicals** [2L]

Books:

1. University General Chemistry Ed. by C N R Rao
2. Organic Chemistry by I. L. Finar
3. Organic Chemistry by G. Solomons
4. Advanced Industrial Chemistry by B. K. Sharma
5. General and Inorganic Chemistry by R.P. Sarkar
6. Concise Inorganic Chemistry by J.D. Lee
7. Solid State Chemistry and its Applications by A. R. West
8. Fundamentals of Molecular Spectroscopy by C. N. Banwell
9. Fundamental Concept in Inorganic Chemistry by A. K. Das
11. Engineering Chemistry by P. C. Jain & Monica Jain
CHEMISTRY Laboratory

1. Determination of surface tension of a liquid / solution by drop weighing method using Stalagmometer.
2. Determination of the viscosity coefficient of a liquid by Ostwald Viscometer.
3. Determination of Hardness of Water by complexometric titration.
4. Determination of Fe(II) in Mohr salt solution using potassium dichromate.
5. Solubility test: solubility of selected organic compounds.
7. Separation: two-component systems (binary mixture) based on solubility test.

Books: An advanced course in practical chemistry by Ghoshal, Mahapatra and Nad

Content Delivery Method

- Class room lecture (chalk and board)
- Tutorial
- Discussion

Course Outcomes

The students of the course should be able to:

CO1: Describe various theories of atomic structure, acid and bases. (K2)
CO2: Review nuclear chemistry, mechanism and preventive measures of corrosion and applications of nanoparticles. (K2)
CO3: Explain the working principles and applications of electrochemical cells, spectroscopy (K1)
CO4: Solve problems related to solid state and band theory on metals, semiconductors and supercapacitors. (K2)
CO5: Explain reaction mechanism associated with aromatic systems, carbocations and carbo-anions, the stereo isomers, stereo specific and selective reactions. (K2)
CO6: Interpret different reactions of carbohydrates, lipids and proteins and illustrate industrial preparation methods of organic chemicals. (K3)
CO7: Perform experiments to determine different chemical properties of water/liquid. (S2, A2)
CO8: Prepare organic compounds and conduct solubility test for separation of compound from binary mixture. (A2)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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<th>CHEMISTRY</th>
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Course code | BS/PH/TP104
---|---
Category | Basic Science Course
Course title | Physics
Scheme and Credits | L–T–P: 3–0–2; Credits: 4.0; Semester – I & II
Pre-requisites (if any) | 

**Syllabus:**

**Physics Theory**

*Theory module 1: Geometrical and Physical Optics*

Ray optics and aberration of images- Fermat’s principle and its application to reflection and refraction at plane surface; spherical aberration, astigmatism, coma and chromatic aberration and their remedies (basic concepts only).

Physical optics: Regions of electromagnetic spectrum (radio frequency, microwave, IR, visible, UV, x-rays, gamma-rays).

Interference: coherence (spatial and temporal), Young’s double slit experiment, measurement of fringe width, wavelength of light, thickness of thin sheet with the help of interference phenomenon; interference in thin films, Newton’s ring.

Diffraction: single slit diffraction and its intensity pattern; grating (plane diffraction grating), measurement of wavelength of light and number of rulings per unit length with the help of grating.

Polarization: Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster’s law, double refraction, measurement of specific rotation of an optically active solution with bi-quartz polarimeter.

*Theory Module 2: Elastic properties of materials, waves and vibrations*

Elastic properties: Relation among elastic constants, internal bending moments, bending of beams and cantilever, torsion of a cylinder, torsional rigidity.

Waves and vibration: Simple harmonic motion, differential equation of SHM, superposition of two linear SHMs (of same frequency), Lissajous figures.

Damped vibration, critical damping, logarithmic decrement, analogy with electrical circuits.

Forced vibration and its differential equation, amplitude and velocity resonance, sharpness of resonance and quality factor.

*Theory module 3: Sound*

Nature of sound waves and its velocity, frequency, wavelength, intensity, loudness etc., reflection of sound waves and echo, reverberation, Sabine’s law, remedies to overcome reverberation, absorption of sound, absorbent materials, condition for good acoustics of a building, noise and its effects.

Ultrasonics: production of ultrasonics by piezoelectric crystals, magnetostriction, detection of ultrasonics, infrasound-seismography (concepts only)

*Theory Module 4: Modern Physics*

Energy levels of H-atom and Bohr atomic model, de Broglie waves, Compton effect, photoelectric effect, particle diffraction and Davisson-Germer experiment, uncertainty principle and applications.

X-ray production, characteristic and continuous x-ray, x-ray diffraction, Bragg’s law.

Concept of quantum mechanics, Schrödinger equation, energy levels and wave functions, particle in a box (1-D), H-problem (derivation not required) with its different quantum numbers, selection rules.

Zeeman effect and its applications.
Text/ Reference Books:
1. Longhurst, Geometrical and physical optics
2. Ghatak, Optics
3. Ghosh, Mazumdar, A textbook on light
4. Sengupta, Chatterjee, A Treatise on General Properties of Matter
5. Raychaudhuri, Advanced Acoustics
7. Eisberg, Resnick, Quantum Physics of Atoms, Molecules, Solids, Nuclei & Particles
8. Beiser, Concepts of Modern Physics

Physics Laboratory

Laboratory module 1: (Any two experiments)
(i) Determination of refractive index of the material of a prism by a spectrometer
(ii) Newton’s ring experiment and determination of refractive index of a liquid
(iii) Determination of refractive index of a liquid by travelling microscope

Laboratory module 2: (Any one experiment)
(i) Determination of Young’s modulus (Y) of the material of a beam by the method of flexture
(ii) Determination of rigidity modulus of the material of a wire

Laboratory module 3: (Any one experiment)
(i) Determination of velocity of ultrasonic waves in liquid medium
(ii) Determination of frequency of a tuning fork

Laboratory module 4: (Any two experiments)
(i) Determination of specific charge of electron (e/m)
(ii) Determination of Planck’s constant (h)
(iii) To plot the V-I Characteristics of a solar cell and hence determine the fill factor.

Content Delivery Method
- Class room lecture (chalk and board) (D1)
- Visual presentation (D2)
- Tutorial (D3)
- Active learning (D4)
- Blended learning (D5)
- Discussion (D7)

Course Outcomes

The students of the course should be able to

CO1: Discuss theory of geometric and physical optics and conduct simple experiments. (K2, S2)

CO2: Explain theory and conduct simple experiments on (a) elastic properties of material, (b) simple harmonic motion and (c) free and forced vibrations. (K2, S2)

CO3: Discuss theory of sound with reference to building acoustics, noise and ultrasonics and conduct simple experiments. (K2, S2)

CO4: Discuss theory of modern physics and conduct simple experiments. (K2, S2)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Course code: ES/EE/T101A and ES/EE/T101B
Category: Engineering Science Course
Course title: Basic Electrical Engineering

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Scheme and Credits: L–T–P: 3-1-0; Credits: 4.0; Semester – I & II

Pre-requisites (if any)

Syllabus:

**MODULE-A (ES/EE/T101A)**

DC circuits: Mesh analysis, Superposition theorem, Thevenin’s and Norton’s theorems, Maximum Power Transfer theorem, delta star and star delta transformation. [4L+2T]


AC circuits: Sinusoidal and other periodic waveforms, average value, rms value, form factor, peak factor, representation of alternating quantities by phasors, Single phase series and parallel R, L and C circuits, reactance and impedance, resonance, active power, reactive power, apparent power and power factor, concept of power factor improvement. [4L+2T]


Three phase circuits: Introduction to balanced three phase systems, Concept of phase sequence, relationship between line and phase voltages in star and delta connected systems, two wattmeter method for power measurement in balanced three phase circuits. [4L+2T]

Electrical Machines: Principle of operation of transformers. Introduction to DC generators and motors. Principles of Three Phase Alternators, and Three Phase Induction Motors. [8L+2T]


Reference Books:

1. Advanced Electrical Technology – H. Cotton
2. Electrical Technology – Hughes
3. Alternating Current Circuits – Kerchner and Corcoran
4. Fundamentals of Electrical Engineering – Ashfaq Husain
5. Applied Electricity for Engineers – Bessonov
6. Electrical Engineering Fundamentals – V. Del Toro
7. Electrical Science- Choudhury, Chakraborty and Chatterjee
8. Theory and Practice of Alternating Current Circuits – A.T. Dover

Content Delivery Method

- Class room lecture (chalk and board) (D1)
- Visual presentation (D2)
- Tutorial (D3)
- Discussion (D7)
**Course Outcomes for Module A:**

The students of the course should be able to

CO1: **Describe** fundamental theorems of electrostatics, electromagnetics and electrical circuits. (K1)

CO2: **Describe** the operating principles of various electrical instruments and electrical machines (K2)

CO3: **Apply** fundamental concepts of alternating quantities, generation, transmission, distribution and measurement of power, in electrical systems. (K3)

CO4: **Solve** numerical problems on electrostatics, electromagnetics and electrical circuits and systems. (K3)

**CO-PO Mapping:** (3 – Strong, 2 – Moderate and 1 – Weak)

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**MODULE-B (ES/EE/T101B)**


[4L+ 2T]


[4L+2T]


[7L + 2T]

Network Theorems – Loop-current method, Superposition theorem, Thevenin’s and Norton’s theorems, Maximum power transfer theorem, Star-Delta conversion.

[4L+2T]

Magnetically coupled circuits; Introduction to electromagnetic induction and magnetically coupled circuits, Principle of operation of transformers.

[3L+1T]


[7L + 2T]

Non-sinusoidal periodic waves – Harmonics, Generation of harmonics by nonlinear circuit elements, Harmonic decomposition of periodic waves, r.m.s. and average values. Concept of power factor in presence of harmonics.

[5L+2T]

Electrical Machines: Principles of rotating electrical machines. Introduction to DC machines, different types of DC generators and motors. Principles of Three Phase Alternators, and Three Phase Induction Motors.

[4L+1T]

**Reference Books:**

1. Advanced Electrical Technology – H. Cotton
2. Electrical Technology – Hughes
3. Alternating Current Circuits – Kurchner and Corcoran
4. Fundamentals of Electrical Engineering – Ashfaq Husain
5. Applied Electricity for Engineers – Bessonov
6. Electrical Engineering Fundamentals – V. Del Toro
7. Electrical Science- Choudhury, Chakraborty and Chatterjee
8. Theory and Practice of Alternating Current Circuits – A.T. Dover
**Content Delivery Method**

- Class room lecture (chalk and board) (D1)
- Visual presentation (D2)
- Tutorial (D3)
- Discussion (D7)

**Course Outcomes for Module B:**

The students of the course should be able to

CO1: **Describe** fundamental theorems of electrostatics, electromagnetics and electrical circuits. (K1)

CO2: **Describe** the operating principles of different ac and dc electrical machines and systems. (K2)

CO3: **Apply** fundamental concepts of various electrical quantities related to single phase and 3 phase alternating current systems. (K3)

CO4: **Solve** numerical problems on electrostatics, electromagnetics and electrical circuits and systems. (K3)

**CO-PO Mapping:** (3 – Strong, 2 – Moderate and 1 – Weak)

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</table>
Course code: ES/BE/T102A and ES/BE/T102B
Category: Engineering Science Course
Course title: Basic Electronics
Module A: ES/BE/T102A
For ChE, CE, CSE, EE, FTBE, ME, MetE, ProdE, ConE, IT, PE, PrnE
Module B: ES/BE/T102B
For ETCE, IEE
Scheme and Credits: L–T–P: 3-1-0; Credits: 4.0; Semester – I & II
Pre-requisites (if any)

Syllabus

Module A (ES/BE/T102A): Basic Devices and Circuits

1. **Semiconductor fundamentals**: Band structure of solids, Fermi-dirac distribution, Semiconductor – elemental & compound, Intrinsic and extrinsic semiconductor, concept of effective mass and hole, generation and recombination of carriers, carrier diffusion. [5L+1T]

2. **p-n junction**: Energy band diagram in equilibrium, under forward and reverse bias, I-V characteristics, breakdown mechanisms. [2L+2T]

3. **Semiconductor Diodes**: Zener diode, LED, 7-Segment display, Photodiode, Solar cell. [2L]

4. **Diode Circuits**: Ideal model, Clipper, Clamper, Half-wave rectifier, Full-wave rectifier, Filter, Zener voltage regulator. [4L+1T]

5. **Transistor**: Structure and operation of BJT, JFET, MOSFET. [4L+1T]


7. **IC and Op-amp Circuits**: Monolithic ICs, Analog/Digital/Hybrid ICs – basics, Ideal op-amp, Inverting amplifier, Non-inverting amplifier, Buffer amplifier, Summing amplifier, Difference amplifier, Differentiator; Integrator, Op-amp as a comparator, Square wave generator, Triangular wave generator. [5L+2T]

8. **Logic Circuits**: Number systems, Boolean algebra, Basic gates, Simple circuits using gates, Transistor as a switch, CMOS inverter; Block diagram level descriptions – Multiplexer, Encoder, Decoder, Flip-flop, Register, Counter. [5L+3T]

9. **Basic Electronic Measurements**: Multimeter and CRO. [1L]

Text Book:

Reference Book:

Course Outcomes for Module A:
By the end of this course, students should be able to:

**CO1**: Describe energy band structure and fundamentals of semiconductors. (K1)
CO2: Explain the working principle of solid state devices and ICs. (K2)
CO3: Employ the electronic devices and ICs to develop basic analog circuits (K3)
CO4: Clarify operations of Logic gates and Digital logic circuits. (K2)
CO5: Illustrate basic electronic measurements. (K2)

**CO-PO Mapping:** (3 – Strong, 2 – Moderate and 1 – Weak)

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**Module B (ES/ BE/T102B): Semiconductor Physics and Devices**

**Semiconductor physics:** Energy band structure of solid, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distribution, Fermi energy, classification of crystalline solids, elemental and compound semiconductors, intrinsic and extrinsic semiconductors, degenerate and non-degenerate semiconductors, concept of effective mass and hole, density of states, carrier concentration in semiconductors, doping and compensation, excess carrier, generation, recombination – life time of minority carriers, diffusion – diffusion length, Einstein’s relation, Poisson’s equation, continuity equation. [7L+2T]

**Semiconductor-semiconductor junction:** Homo junction and Hetero junction, abrupt p-n homo junction - charge, field and potential profiles, equilibrium band diagram, biased p-n junction, diode equation, ideal and real diode characteristics, temperature dependence of characteristics, diode capacitances, circuit models of p-n junction diode, Varactor diode.

Breakdown mechanisms in p-n junction: avalanche and zener processes and their dependence upon temperature and doping, punch through breakdown, Zener diode. [7L+2T]

**Degenerate p-n junctions** band model under large doping condition, Backward diode, Tunnel diode - I – V characteristics and applications. [2L+1T]

**Metal-semiconductors Junction:** energy band diagram, ohmic and rectifying contacts, Schottky diodes, comparison of p-n junction and Schottky diodes. [2L+1T]

**Bipolar transistors:** band diagram, the transistor action, current components in a BJT, current amplification factors, Early effect and its consequences, different modes of operation, input and output characteristics, Ebers-Moll model. [4L+2T]

**Junction field effect transistor (JFET):** principle of operation, output and transfer characteristics, JFET parameters. [1L]

**Insulated gate field effect transistor (IGFET):** construction and principle of operation of enhancement and depletion mode MOSFETS, drain and transfer characteristics, threshold voltage and its control, CMOS inverter and transfer characteristics, Charge coupled device (CCD). [5L+2T]

**Power semiconductor devices:** construction, operation and characteristics of unijunction transistor (UJT), Shockley diode, semiconductor controlled rectifier (SCR) - forward and reverse characteristics and triggering methods, DIAC, TRIAC, SCS, programmable UJT (PUT), V-MOS, Insulated gate bipolar transistor (IGBT). [5L+1T]

**Basic optoelectronic devices:** Photoconductor, light emitting diode (LED), photodiode – PIN diode and Avalanche diode, phototransistor, solar cell, liquid crystal display (LCD), seven segment display, alphanumeric display, optocoupler. [3L+1T]

**Text Book:**

**Reference Book:**

**Course Outcomes for Module A:**

By the end of this course, students should be able to:

**CO1:** Describe basic semiconductor physics. (K1)

**CO2:** Explain fundamentals of metal-semiconductor junctions and semiconductor-semiconductor junction. (K1, A1)

**CO3:** Explain *I-V* characteristics of solid state devices. (K2, A1)

**CO4:** Choose appropriate solid state devices for various applications. (K3)

**CO-PO Mapping**

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Course code: ES/EM/T103A and ES/EM/T103B  
Category: Engineering Science Course  
Course title: Engineering Mechanics  
Module A: ES/EM/T103A  
Module B: ES/EM/T103B  
Scheme and Credits: L–T–P: 3-1-0; Credits: 4.0; Semester – I & II  

Syllabus

Module A (ES/EM/T103A)

Course Module 1: Introduction to Force System
Basic concepts; System of Forces, Moment, Couple (coplanar and spatial) and its applications for Engineering Configurations; Equivalent Force Systems and Resultants. [6L+2T]

Course Module 2: Equilibrium and Friction
Equilibrium of System of Forces; Free body diagrams; Equations of Equilibrium of Coplanar and Spatial Systems; Applications in Engineering Configurations. Types of friction, Limiting friction, Laws of Friction, Static and Kinetic Friction; Application to simple problems. [12L+4T]

Course Module 3: Centroid and Area Moment of Inertia
Centroid of simple figures, centroid of composite sections; Theorems of Pappus & Guldinus; Area moment of inertia of plane sections; Area Moment of inertia of standard and composite sections. [6L+2T]

Course Module 4: Particle Kinematics and Kinetics
Basic concepts; Rectilinear Motion; Plane Curvilinear motion of particles and description of different coordinate systems; Constrained motion involving pulleys. Newton's Law and its application to rectilinear motion and plane curvilinear motion. Work-energy principle, momentum principle and its application to particle dynamics. [15L+5T]

Text/Reference Books:

Course Outcomes (Engineering Mechanics – Module A)
The students of the course should be able to:

CO1: Describe various force systems (coplanar and spatial) and its resultants in relation with engineering configurations. (K1)

CO2: Describe the concepts to solve problems related to static equilibrium. (K2)

CO3: Solve problems related to centroid and area moment of inertia. (K2)

CO4: Describe the concepts to solve problems related to particle kinematics and kinetics. (K2)

Content Delivery Method (Engineering Mechanics – Module A)
- Course Module-1- Class room lecture (chalk and board) (D1), Tutorial (D3)
- Course Module-2- Class room lecture (chalk and board) (D1), Visual presentation (D2), Tutorial (D3)
- Course Module-3- Class room lecture (chalk and board) (D1), Tutorial (D3)
- Course Module-4- Class room lecture (chalk and board) (D1), Tutorial (D3)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Module B (ES/EM/T103B)

Course Module 1: Introduction to Force System
Basic concepts; System of Forces, Moment, Couple (coplanar and spatial) and its applications for Engineering Configurations; Equivalent Force Systems and Resultants including Wrench. [6L+2T]

Course Module 2: Equilibrium and Friction
Equilibrium of System of Forces; Free body diagrams; Equations of Equilibrium of Coplanar and Spatial Systems; Applications in Engineering Configurations-Truss, Frame, Cable.
Review of fundamental concepts of friction; Application to simple problems, wedge, screw and belt-pulley. [15L+5T]

Course Module 3: Centroid and Area Moment of Inertia
Centroid of simple figures, centroid of composite sections; Theorems of Pappus & Guldinus; Area moment of inertia of plane sections; Area Moment of inertia of standard and composite sections; Product moment of inertia and coordinate transformation. [6L+2T]

Course Module 4: Particle Kinematics and Kinetics
Review of Rectilinear Motion; Plane Curvilinear motion of particles and description of different coordinate systems; Constrained motion of system of particles.
Newton's Law and its application to rectilinear motion and plane curvilinear motion.
Work-energy and momentum principles with applications to impact related problems. [12L+4T]

Text/Reference Books:

Course Outcomes (Engineering Mechanics – Module B)
The students of the course should be able to –
CO1: Describe various force systems (coplanar and spatial) and its resultants in relation with engineering configurations. (K1)
CO2: Describe the concepts to solve simple engineering problems related to static equilibrium and friction. (K2)
CO3: Solve problems related to properties of surfaces. (K2)
CO4: Describe the concepts to solve problems related to particle kinematics and kinetics in different coordinate systems. (K2)

Content Delivery Method (Engineering Mechanics – Module B)
- Course Module-1- Class room lecture (chalk and board) (D1), Visual presentation (D2), Tutorial (D3)
- Course Module-2- Class room lecture (chalk and board) (D1), Visual presentation (D2), Tutorial (D3)
- Course Module-3- Class room lecture (chalk and board) (D1), Visual presentation (D2), Tutorial (D3)
- Course Module-4- Class room lecture (chalk and board) (D1), Visual presentation (D2), Tutorial (D3)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Course code: ES/CM/TP104A and ES/CM/TP104B
Category: Engineering Science Course
Course title: Computer Programming & Numerical Method

Module A: ES/CM/TP104A
For CSE, ChE, EE, ETCE, FTBE, ME, MetE, ProdE, ConE, IEE, IT, PE, PrnE

Module B: ES/CM/TP104B
For CE

Scheme and Credits: L–T–P: 4–0–3; Credits: 5.5; Semester – I & II

Pre-requisites (if any)

Syllabus

Module A (ES/CM/TP104A)

C Programming


Expressions: Basic Data Types, Variables, Type Qualifiers, Variable Scopes, Constants, Assignment Statements, Operators, Operator Precedence, Expression Evaluation, Type Conversion in Expressions, Type Casting [2L]

Console I/O: Reading and Writing different data types [1L]

Control Statements: Selection Statements (if, switch-case), Loop Statements (for, while, do-while), Jump Statements (return, go to, break, exit, continue) [6L]

Arrays and Strings: Single Dimension Arrays, Double Dimension Arrays, Strings [4L]

Functions: General Form, Function Prototypes, Introduction to Pointer variables, Parameter Passing Mechanisms, Command Line Arguments [4L]

Structures, Unions: Structures, Arrays of Structures, Unions [2L]

File I/O: Introduction to File, File reading and writing [4L]

Numerical Methods

Approximations and Errors associated with numerical methods. [1L]

Solution of non-linear equations: Bisection method, method of false position, Newton-Raphson method [3L]

Solution of linear simultaneous equations: Direct methods: Gauss-Jordan elimination, matrix inversion using Gauss-Jordan elimination [3L]

Iterative methods: Jacobi’s method [1L]

Methods for interpolation: Newton’s forward difference formula, Newton’s backward difference formula, Lagrange’s formula. [3L]

Curve fitting: Method of least squared error [2L]

Methods for differentiation and Integration: Computation of derivatives using Newton’s forward/backward difference formulae. Trapezoidal method, Simpson’s method. [3L]

Solution of differential equations: Euler’s method, modified Euler’s method, Runge-Kutta 2nd and 4th order formulae [4L]

Solution of partial differential equations [3L]

Content Delivery Method

- Class room lecture (chalk and board) (D1)
- Visual presentation (D2)
Course Outcomes
The students of the course should be able to –

CO1: Model a problem logically. (A2)
CO2: Recognize correct syntax of the programming language. (A3)
CO3: Synthesize modular programs for application problems. (A4)
CO4: Solve algebraic and differential systems numerically. (K2)
CO5: Solve interpolation and regression problems numerically with applications. (K2)
CO6: Develop computer programs for numerical methods. (K3)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Module B (ES/CM/TP104B)

FORTRAN Programming (26 L)


Expressions: Basic Data Types, Variables, Constants, Assignment Statements, Operators, Operator Precedence, Expression Evaluation, Type Conversion [4L]

Console I/O: Reading and Writing different data types [1L]

Control Statements: Conditional Statements, Loop Statements, Jump Statements [5L]

Arrays and Strings: Single Dimension Arrays, Double Dimension Arrays, Strings [4L]

Pointers, Functions and Subroutines: [6L]

File I/O: Introduction to File, File reading and writing [2L]

Numerical Methods (26 L)

Approximations and Errors associated with numerical methods. [1L]

Solution of non-linear equations:
Bisection method, method of false position, Newton-Raphson method [3L]

Solution of linear simultaneous equations:

Direct methods:
Gauss-Jordan elimination, matrix inversion using Gauss-Jordan elimination [3L]

Iterative methods:
Jacobi’s method [1L]

Methods for interpolation:
Newton’s forward difference formula, Newton’s backward difference formula, Lagrange’s formula, Finite Difference Method [4L]
Curve fitting:
Method of least squared error [2L]

Numerical differentiation and Integration: [2L]

Solution of differential equations:
Euler’s method, modified Euler’s method, Runge-Kutta 2\textsuperscript{nd} and 4\textsuperscript{th} order formulae [3L]

Solution of partial differential equations [2L]
Eigen value analysis [4L]

**Content Delivery Method**
- Class room lecture (chalk and board) (D1)
- Visual presentation (D2)
- Tutorial (D3)
- Active learning (D4)
- Blended learning (D5)
- Discussion (D7)

**Course Outcomes**
The students of the course should be able to

**CO1:** Model a problem logically. (A2)

**CO2:** Recognize correct syntax of the programming language. (A3)

**CO3:** Synthesize modular programs for application problems. (A4)

**CO4:** Solve algebraic and differential systems numerically. (K2)

**CO5:** Solve interpolation and regression problems numerically with applications. (K2)

**CO6:** Develop computer programs for numerical methods. (K3)

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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<th>Computer Programming &amp; Numerical Methods</th>
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Basic Electrical Engineering Laboratory Experiments

(Departments are to select any five experiments from the following set)

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Name of Experiments</th>
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<tbody>
<tr>
<td>1</td>
<td>Verification of Thevenin's Theorem &amp; Maximum Power Transfer Theorem</td>
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<td>2</td>
<td>Measurement of Resistance of various electrical equipment</td>
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<td>3</td>
<td>Study of behavior of R-L, R-C and R-L-C circuit with AC and DC supply</td>
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<td>Power &amp; Power factor characteristics of Fluorescent Lamp</td>
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<td>5</td>
<td>Study of motor control elements</td>
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<td>6</td>
<td>Study of DC and AC Machines</td>
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<td>7</td>
<td>Measurement of three phase power by two wattmeter method</td>
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</tbody>
</table>

**Content Delivery Method**
- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)

**Course Outcomes**
The students will be able to:

CO1: Identify the instruments required to perform a particular experiment (K1, S1)
CO2: Select the ranges and ratings of the instruments identified (K2, S1)
CO3: Comprehend the objective of the experiment and relate that with the acquired theoretical knowledge.
CO4: Realize the electrical circuit duly connecting selected instruments and other apparatus (K2, S2)
CO5: Interpret the experimental data and prepare a detailed report having graphs, charts etc. (K2)

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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**BASIC ELECTRONICS LAB**

**Module A (ES/EL/P105A)**

List of experiments:

1. (a) Familiarization of various electronic components and devices,
   (b) Verification of Ohm’s law using Multimeter,
   (c) Measurement of frequency of Sinusoidal and Square waves using CRO.

2. (a) \( I-V \) characteristics of semiconductor diodes (Si and Ge) under forward and reverse biased conditions.
(b) \( I-V \) characteristics of Zener diode under reverse biased condition.
3. Study of diode rectifier circuits with capacitor filter.
5. Verification of: (a) Truth table of basic logic gates, (b) NAND gate as a Universal logic gate.

**Content Delivery Method**
- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)

**Course Outcomes**
By the end of this lab, students should be able to:

**CO1**: Recognize electronic components and get acquainted with handling of Multi meter, Function Generator, CRO. (A1)

**CO2**: Operate diodes under different biasing conditions. (K3, S2)

**CO3**: Illustrate the measurements related to basic ICs. (K3, S2)

**CO4**: Develop a comprehensive idea on data collection, analysis and presentation. (K3, A4)

**CO5**: Appraise the observational and measurement errors associated with experiments. (K4)

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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**BASIC ELECTRONICS LAB**

**Module B (ES/EL/P105B)**

Extended List of Experiments (at least 5 experiments are to be done):

1. (a) Familiarization of various electronic components and devices.
   (b) Verification of Ohm’s law using multimeter.
   (c) Measurement of frequency of sinusoidal and square waves using CRO.
2. (a) I-V characteristics of semiconductor diodes (Si and Ge) under forward and reverse biased conditions.
   (b) I-V characteristics of Zener diode under reverse biased condition.
3. Input and output characteristics of BJT in CE configuration.
4. Output and transfer characteristics of JFET in CS configuration.
5. (a) Study of LDR characteristics.
   (b) I-V characteristics of UJT.
6. (a) Study of 7-segment display
   (b) Transfer characteristics of CMOS inverter

**Content Delivery Method**
- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)
**Course Outcomes**

By the end of this lab, students should be able to:

- **CO1:** Recognize electronic components and get acquainted with handling of Multi meter, Function generator, CRO. (A1)

- **CO2:** Operate solid state devices under different biasing conditions. (K3, S2)

- **CO3:** Illustrate the measurements related to basic ICs. (K3, S2)

- **CO4:** Develop a comprehensive idea on data collection, analysis and presentation. (K3, A4)

- **CO5:** Appraise the observational and measurement errors associated with experiments. (K4)

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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Course code | ES/ED/P106A and ES/ED/P106B  
Category | Engineering Science Course  
Course title | Engineering Drawing  
Module A: ES/ED/P106A | For CSE, CE, ChE, ETCE, FTBE, ProdE, ConE, IEE, IT, PE, PrnE  
Module B: ES/ED/P106B | For EE, ME, MetE  
Scheme and Credits | L–T–P: 0–0–4; Credits: 2; Semester – I & II  
Pre-requisites (if any) |  

**Syllabus**

**Module A (ES/ED/P106A)**

1) Introduction and use of drawing instruments including use of diagonal scales, types of lines, IS conventions [BIS SP 46: 1988], Engineering Lettering, scales & dimensioning \[8P\]  
2) Geometrical Constructions: Regular polygons, conic sections, spirals, Sine Curve, Involutes, Rolling Curves \[4P\]  
3) Principles of orthographic projection: planes of projection, object & viewer, lines of projection etc., angles of projection. Projections of points & lines \[12P\]  
4) Orthographic projection drawing of simple objects: prisms, pyramids & sphere, combination of objects \[12P\]  
5) Isometric projection: Isometric scale, Isometric drawings, third view development \[8P\]  
6) Sectional views \[8P\]  


**Course Outcomes**

The students should be able to  

**CO1:** Explain the significance of Engineering drawing with reference to Indian Standard (K2, A1)  
**CO2:** Construct different geometrical shapes (K2, S1, A1)  
**CO3:** Apply the concepts of orthographic projections (K3, S2, A2)  
**CO4:** Understand the concepts of sectional views and isometric projections of Engineering Objects (K2, S2, A2)  

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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**Module B (ES/ED/P106B)**

1) Introduction and use of drawing instruments including use of diagonal scales, types of lines, IS conventions [BIS SP 46: 1988], Engineering Lettering, scales & dimensioning \[8P\]  
2) Geometrical Constructions: Regular polygons, conic sections, spirals, Sine Curve, Involutes, Rolling Curves \[4P\]  
3) Principles of orthographic projection: planes of projection, object & viewer, lines of projection etc., angles of projection. Drawing of orthographic projections of simple objects: prisms, pyramids, cone & sphere, combination of objects \[20P\]
4) Orthographic projection of points, lines & planes. True length of a line and its angles with planes of projection – revolution & auxiliary view methods. True shape & angle of a plane. Intersection of line & line, line & plane, plane & plane, line & solid, plane & solid and solid & solid [12P]

5) Development of surfaces: simple objects (both right angled and oblique): cylinders, prisms, pyramids and cones [8P]


**Content Delivery Method**

- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)

**Course Outcomes**

The students should be able to

- **CO1:** Explain the significance of Engineering drawing with reference to Indian Standard (K2, A1)
- **CO2:** Construct different geometrical shapes (K2, S1, A1)
- **CO3:** Apply the concepts of orthographic projections (K3, S2, A2)
- **CO4:** Apply the concepts of surface developments (K3, S2, A2)

**CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)**

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Course code: ES/WS/P107A and ES/WS/P107B
Category: Engineering Science Course
Course title: Workshop

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<th>Module B: ES/WS/P107B</th>
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<td>For CSE, CE, ChE, EE, ETCE, FTBE, MetE, ConE, IEE, IT, PrnE</td>
<td>For ME, ProdE, PE</td>
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Scheme and Credits: L–T–P: 0–0–3; Credits: 1.5; Semester – I & II

Pre-requisites (if any)

Syllabus

**MODULE-A (ES/WS/P107A)**

**Fitting:** Introduction to fitter's tools, gauges and measuring instruments; marking, chipping, filing, sawing, drilling; use of taps and dies. [6P]

**Welding:** Introduction to welding and gas-cutting and their applications; demonstration of different welding and gas-cutting processes. [6P]

**Carpentry:** Introduction to types of Indian woods used for engineering purposes and carpenter's tools; use of wood working machines; making of selected joinery. [6P]

**Machine Shop:** Introduction to machine tools and cutting tools - study and demonstration of basic machining processes. [9P]

**Forging:** Introduction to forging tools, furnaces and forging machines; to practice basic forging operations, drawing out, upsetting, necking etc. [6P]

**Moulding:** Introduction to moulding practice preparation of moulding sand and use of moulder's tools; making of moulds by using selected pattern(s). [6P]

**Content Delivery Method**

- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)

**Course Outcomes**

The students of the course should be able to:

**CO1:** Recognise the tools and techniques of fitting, carpentry, forging, moulding and welding (K2, A1)

**CO2:** Translate basic concepts of (a) fitting, wood working, forging, moulding into simple engineering operations and (b) welding for joining simple engineering components. (K2, S1)

**CO3:** Recognise some sources of welding defects and remedies to overcome them. (K2, A1)

**CO4:** Study different operations of lathes and shaping machines. (K2, A2)

**CO-PO Mapping** (3 - Strong, 2 - Moderate and 1 - Weak)

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**MODULE-B (ES/WS/P107B)**

**Fitting:** Introduction to fitter’s tools, gauges and measuring instruments; hands-on marking, chipping, filing, sawing, drilling; use of taps and dies. [9P]

**Welding:** Introduction to welding and gas-cutting and their applications; hands-on resistance welding; demonstration of different welding and gas-cutting processes. [9P]
Carpentry: Introduction to types of Indian woods used for engineering purposes and carpenter's tools; use of wood working machines; making of selected joinery; Introduction to different phenomena arising out of shrinkage of castings and pattern maker's rule; making of wooden patterns.

Forging: Introduction to forging tools, furnaces and forging machines; to practice basic forging operations, drawing out, upsetting, necking, etc.

Moulding: Introduction to moulding practice preparation of moulding sand and use of moulder's tools; making of moulds by using selected pattern(s).

Content Delivery Method

- Class room lecture (chalk and board) (D1)
- Demonstration (D2)
- Active learning (D3)

Course Outcomes

The students of the course should be able to:

C01: Recognise the tools and techniques of fitting, carpentry, forging, moulding and welding (K2, A 1)

C02: Translate basic concepts of (a) fitting, wood working, forging , moulding into simple engineering operations and (b) welding for joining simple engineering components. (K2, S1)

C03: Recognise some sources of welding defects and remedies to overcome them. (K2, A1)

C04: Study of different manufacturing processes. (K2, A2)

CO-PO Mapping (3 - Strong, 2 - Moderate and 1 - Weak)

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Course code  | HSMC/HS/T101
---|---
Category  | Humanities, Social Science & Management Course
Course title  | Humanities & Sociology
Scheme and Credits  | L–T–P: 3–0–0; Credits: 3.0; Semester – I & II
Pre-requisites (if any)  | 

**Syllabus**

1. **Evolution of science and technology**

Readings:


2. **Civilization and approaches in society and technology**

Readings:


‘Introduction: Science as a Reason of State’ in Ashis Nandy, (ed.) *Science, Hegemony and Violence A Requiem For Modernity*

3. **Science and technology revolution**

Readings:

‘Industrial Revolution and Scientific and Technological Progress’ Rainer Fremdling

4. **Emergence of industrial society**

Readings:

‘The Industrial Revolution’ in Eric Hobsbawm, *The Age of Revolution 1789-1848*

5. **Development of occupation and profession**

Readings:


Gendering of Technology

*Feminism Confronts Technology* by Judy Wajcman

6. **Post-industrial society**

Readings:


Consumer society


Consumption practices of youth: Fashion, Dressing, and Tattooing.

Ecology
Ghosh Ashish, Technology and Environment
S. Erkman, Industrial Ecology: an historical view

Smart City
R H Holland, Critical Interventions into the Corporate Smart City, Cambridge Journal of Regions, Economy and Society, 2015, 8, 61-77


N. Jayaram, Revisiting the City: The Relevance of Urban Sociology Today. Springer

Content Delivery Method
- Class room lecture (chalk and board) (D1)
- Demonstration (D2)

Course Outcomes
The students of the course should be able to:

CO1: Recognise the evolution of science and technology. (K1)
CO2: Relate civilization and approaches in society and technology. (K2)
CO3: Discuss science and technology revolution. (K2)
CO4: Explain the emergence of industrial society. (K2)
CO5: Examine the concept of development of occupation and profession. (K2)
CO6: Locate the nature of post-industrial society. (K2)

CO-PO Mapping (3 – Strong, 2 – Moderate and 1 – Weak)

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Course code  |  MC/TS/P101
---|---
Category  |  Mandatory Course
Course title  |  Technical Communicative English & Soft Skill
Scheme and Credits  |  L–T–P: 0–0–3;  Credits: 0.0; Semester – I & II
Pre-requisites (if any)  |  

**Syllabus**

I. UNDERSTANDING COMMUNICATION

Meaning of Communication
The Communication Process/Basic Elements of Communication (Sender, Message, Receiver, Channel)
Purpose/Importance of Communication
Channels of Communication (Upward, Downward, Horizontal/Lateral, Diagonal/Spiral)
Different Forms of Communication (Verbal and Non-verbal, Interpersonal, Intrapersonal, Extrapersonal)
Barriers to Effective Communication and their Possible Remedies

II. SPOKEN COMMUNICATION

Non-verbal Communication (Body Language, Paralinguistic features, Proxemics/Space Distance, Haptics)
Dynamics of Professional Presentations (Individual and Group)
Group Discussions
Job Interviews

III. LISTENING SKILLS

Types of Listening
Implications of Effective Listening
Barriers to Effective Listening
Effective Listening Strategies

IV. WRITTEN COMMUNICATION

The Art of Condensation – Steps to Effective Precis Writing
Job Application Letters and Resumes
Writing a Report
Writing a Technical Proposal
Planning business messages (Email, Memo, Notice, Agenda, Minutes, Circulars)

**Content Delivery Method**

• Class room lecture (chalk and board) (D1)
• Demonstration (D2)
• Active learning (D3)

**Course Outcomes**

The students of the course should be able to

CO1: Comply basic form of communication through development of positive personal attitude. (A2)

CO2: Present effectively in group discussions and mock interviews. (A2)

CO3: Recreate reports in different forms like first draft, final draft, planning business messages. (S2)

CO4: Show proficiency in oral presentation through motivational speeches, effective presentation skills and positive body-languages. (A2, S3)

CO5: Respond to discussion through effective listening. (A2)

**CO-PO Mapping (3 = Strong, 2 = Moderate and 1 = Weak)**

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** The contact hours are indicative only.**