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)

Course code	**BS/MTH/T111**
Category	Basic Science Course
Course title	**Mathematics I** (To be followed in Semester I)
Scheme and Credits	**L–T–P*: 3–1–0; Credits: 4.0;** Semester – I
Pre-requisites (if any)	

*** Contact hours per week; L – Lecture hour, T – Tutorial hour, P – Practical hour.**

Syllabus

Differential Calculus (Functions of one Variable): [7L+3T]
Rolle's theorem, Cauchy's mean value theorem (Lagrange's mean value theorem as a special case), Taylors 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): [9L+4T]
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: [7L+3T]
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: [9L+4T]
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 of 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.
2. G. B, Thomas and R. L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
3. H. Anton, I. Bivens and S. Davis, Calculus, 7th Ed. John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
4. Joseph A. Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa Publishing House, New Delhi.
5. I. N. Herstein, Topics in Algebra, Wiley Eastern Limited, India, 1975.
6. D. S. Malik, John M. Mordeson and M. K. Sen, Fundamentals of Abstract Algebra.
7. Stephan H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
8. Kenneth Hoffman, Ray Alden Kunze, Linear Algebra, 2nd Ed., Prentice Hall of India Pvt. Ltd.
9. E. Marsden, A. J. Tromba and A. Weinstein, Basic Multivariable Calculus, Springer (SIE), Indian reprint, 2005.
10. James Stewart, Multivariable Calculus, Concepts and Contexts, 2nd Ed., Brooks/Cole, Thomson Learning, USA, 2001.
11. Shanti Narayan & P. K. Mittal, Course of Mathematical analysis. S Chand, New Delhi:, 2016. ISBN 978-81-219-0472-8.
12. S. C. Malik & Savita Arora, Mathematical Analysis, 5th Ed., New Age International, New Delhi, 2017. ISBN 978-93-85923-86-9.
13. M. K. Sen, S. Ghosh & P. Mukhopadhyay, Topics in Abstract Algebra, Universites Press (India) Pvt. Ltd., Hyderabad, 2006.

14. Erwin Kreyszig, Advanced Engineering Mathematics, 5th Ed., New Age International, New Delhi, 1997.
15. R. K. Jain & S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa, New Delhi, 2016.
16. J. B. Fraleigh, A First Course in Abstract Algebra, Pearson, 2002.

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)*

MATHEMATICS -I		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	3	2	1									
	CO2	3	2	1									
	CO3	3	2										
	CO4	3	2	1									

Course code	**BS/MTH/T122**
Category	Basic Science Course
Course title	**Mathematics II** (To be followed in Semester II)
Scheme and Credits	**L–T–P: 3–1–0; Credits: 4.0;** Semester – II
Pre-requisites (if any)	

Syllabus

Integral Calculus: [13L+4T]
Fundamental theorem of integral calculus, mean value theorems, evaluation of definite integrals - reduction formulae. Convergence of improper integrals, tests of convergence, Beta and Gamma functions – elementary properties. Differentiation under integral sign, differentiation of integrals with variable limits - Leibnitz rule. Rectification, double and triple integrals, computations of area, surfaces and volumes, change of variables in double integrals - Jacobians of transformations, integrals dependent on parameters – applications.

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.
2. G. B, Thomas and R. L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005
3. H. Anton, I. Bivens and S. Davis, Calculus, 7th Ed. John Wiley and Sons (Asia) P. Ltd., Singapore, 2002
4. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, 8th Ed., McGraw-Hill International Edition, 2009.
5. Joseph Bak and Donald J. Newman, Complex Analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.
6. I. N. Sneddon, Use of Integral Transform, McGraw-Hill, 1972.
7. I. N. Sneddon, Fourier Transform, McGraw-Hill, 1951.
8. L. C. Andrews and B. K. Shivamoggi, Integral Transform for Engineers, Prentice Hall, 2007.
9. L. Debnath and D. Bhatta, Integral Transforms and their Applications, 3rd Ed., Chapman and Hall/CRC, USA, 2014.
10. Murray R. Spiegel and others, Complex Analysis, Schaum's Outlines Series. Tata McGraw Hill,New Delhi, 2013. ISBN 9780-07-008538-1.
11. S. Ponnusamy, Foundation of Complex analysis, 2nd ed. Narosa, New Delhi, 2013. ISBN 978-81-7319-629-4
12. Erwin Kreyszig, Advanced Engineering Mathematics, 5th Ed., New Age International, New Delhi , 1997.
13. Baidyanath, Patra, An Introduction to Integral Transforms, CRC Press, London, 2017.
14. R. K. Jain & S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa, New Delhi, 2016.

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)*

MATHEMATICS - II		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	3	2	1									
	CO2	3	2	1									
	CO3	3	2	1									
	CO4	3	2	1	1								
	CO5	3	2	1									
	CO6	3	2	1	1								

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. **Stereochemistry**: 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
10. Radiochemistry and Nuclear Chemistry, 1995 by G. Choppin, J. Rydberg, J.O. Liljenzin:
11. Engineering Chemistry by P. C. Jain & Monica Jain
12. Engineering Chemistry by R. K. Agarwal

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.
6. Preparation: preparation of 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 nano-particles. (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)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CHEMISTRY	**CO1**	**3**											
	CO2	**3**											
	CO3	**3**											
	CO4	**3**											
	CO5	**3**											
	CO6	**3**											
	CO7	**2**			**3**								
	CO8	**2**			**3**								

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 I: 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.

[12 L]

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.

[08 L]

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)

[08 L]

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.

[12 L]

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
6. Ghosh, Principles of 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)*

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Physics	**CO1**	**3**	**2**										
	CO2	**3**	**1**										
	CO3	**3**	**2**										
	CO4	**3**	**2**										

Course code	**ES/EE/T101A** and **ES/EE/T101B**
Category	Engineering Science Course
Course title	**Basic Electrical Engineering**
Module A: **ES/EE/T101A**	For ChE, CE, CSE, ETCE, FTBE, ME, MetE, ProdE, ConE, IEE, IT, PrnE
Module B: **ES/EE/T101B**	For EE, PE
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]

Electrostatics: Introduction to Electrostatics, Gauss' theorem, Concept of capacitance. Different types of capacitors – parallel plate and cylindrical electrode arrangement. Stored energy in capacitors. Series-parallel combination of capacitors. [4L+2T]

Electromagnetism: Review of fundamental laws of electromagnetism, Force on current carrying conductors, Magnetic circuits, permeance, reluctance, BH loop, Hysteresis and eddy current losses, Inductance, Introduction to electromagnetic induction. [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. [6L+2T]

Electrical Measurements: Electrical indicating instruments- PMMC and Moving iron type instruments, ammeters and voltmeters. Principle of operation of electrodynamic type wattmeters. Principles of ohmmeters and Meggers. [4L+1T]

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]

Bulk Power Supply Systems: Introduction to Power Generation, Transmission and Distribution Systems. [4L+1T]

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)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Basic Electrical (Module A)	**CO1**	**3**	**2**										
	CO2	**3**	**1**										
	CO3	**3**	**1**	**1**									
	CO4	**2**	**3**	**2**									

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

Electrostatics – Introduction to Electrostatics, Gauss theorem, Concept of capacitance, Different types of capacitors – parallel plate, cylindrical, spherical capacitors with homogeneous and composite dielectric. Stored energy in capacitors, Series-parallel combination of capacitors. [4L+ 2T]

Electromagnetism- Introduction to Electromagnetism, Magnetic circuit, Permeability, Reluctance and Permeance, Leakage and fringing. Concept of inductance, Stored energy, Lifting power of magnets. Magnetisation curve, Hysteresis loop and hysteresis loss, Eddy current loss.Properties of permanent magnets. [4L+2T]

A.C. Fundamentals - Periodic waves and Sinusoids. Average and RMS values.Phasor concepts of sinusoids.Impedance and Admittance. Active Power, Reactive Power (VAR) and Apparent Power (VA). Series, parallel and series-parallel RLC circuit analysis. Locus Diagrams. Series and parallel resonance. [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]

Three -phase A.C. circuits – Three phase A.C. balanced circuits, Balanced supply with three wire and four wire. Three phase power measurement. Unbalanced system, Definition of power factor for unbalanced systems, Symmetrical Components and its application for analysis of unbalanced systems. [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 – 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 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)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Basic Electrical (Module B)	**CO1**	**3**	**2**										
	CO2	**3**	**1**										
	CO3	**3**	**1**	**2**									
	CO4	**2**	**3**	**2**									

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]
6. **Transistor Circuits:** *CE, CB, CC* configurations, Input – output characteristics, biasing, loadline, Q-point analysis, Analysis of an amplifier using simplified *h*-parameter model.

   Direct coupled, RC coupled and transformer coupled amplifiers.

   Feedback Circuits and Oscillators: General theory of feedback, negative feedback and its advantages, requirement for oscillation, oscillators. [8L+2T]
   Transistorised voltage regulator.
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:

1. *Solid State Electronic Devices* by Ben G. Streetman and Sanjay K. Banerjee, *Pearson* Prentice Hall, 7th Edition, 2014.

Reference Book:

1. Electronic Circuits: Discrete and Integrated by D. L. Schilling and C. Belove, McGraw-Hill, 1989. Electronics
2. Fundamentals and Applications by D. Chattopadhyay and P. C. Rakshit, New Age International, 10th Edition, 2010
3.Digital Principles and Applications by A. P. Malvino and D. P. Leach, Tata McGraw-Hill, 7th edition, 2006
4. Electronic Principles by Albert Malvino and David Bates, Tata McGraw-Hill, 7th edition, 2017
5. Electronic Instrumentation by H. S. Kalsi, Tata McGraw-Hill, 3rd edition, 2017
6. Electronic Instrumentation and Measurement Techniques by William D. Cooper and Albert D. Helfrick, Pearson, 2015

***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)

Basic Electronics Module A		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	3											
	CO2	3											
	CO3	2	3	1									
	CO4	3											
	CO5	3	1										

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 ofoperation, 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, alpha-numeric display, optocoupler. [3L+1T]

Text Book:

1. *Solid State Electronic Devices* by Ben G. Streetman and Sanjay K. Banerjee, *Pearson* Prentice Hall, 7th Edition, 2014.

Reference Book:

1. *Semiconductor Physics and Devices* by Donald A. Neamen, Tata McGraw-Hill, 4th Edition, 2012.

2. *Physics of semiconductor devices* by S. M. Sze and K. K. Ng, John Wiley & Sons, 2007.
3. *Principles of Electronic Materials and Devices* by S.O. Kasap, Tata McGraw-Hill, 3rd Edition, 2007.
4. *Semiconductor Devices – Basic Principles* by Jasprit Singh, John Wiley & Sons. 2000.

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

Basic Electronics Module B		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	3	1	1									
	CO2	3	2		1								
	CO3	2	3	1									
	CO4	1	2	3	1								

Course code	**ES/EM/T103A** and **ES/EM/T103B**
Category	Engineering Science Course
Course title	**Engineering Mechanics**
Module A: **ES/EM/T103A**	For CSE, ETCE, FTBE, IT, PrnE
Module B: **ES/EM/T103B**	For ChE, CE, EE, ME, MetE, ProdE, ConE, IEE, PE
Scheme and Credits	L–T–P: 3-1-0; Credits: 4.0; Semester – I & II
Pre-requisites (if any)	

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:

1.Meriam, J. L., &Kraige, L. G. Engineering Mechanics: Statics, Wiley India Pvt. Ltd.
2.Meriam, J. L., &Kraige, L. G. Engineering Mechanics: Dynamics, Wiley India Pvt. Ltd.

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)

- CourseModule-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)*

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Engineering Mechanics – Module A	CO1	3	2										
	CO2	3	2										
	CO3	3	2										
	CO4	3	2										

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:

1. Meriam, J. L., & Kraige, L. G. Engineering Mechanics: Statics, Wiley India Pvt. Ltd.
2. Meriam, J. L., & Kraige, L. G. Engineering Mechanics: Dynamics, Wiley India Pvt. Ltd.
3. Shames, I.H. Engineering Mechanics: Statics and Dynamics, PHI.

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)*

Engineering Mechanics – Module B		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	3	2										
	CO2	3	2	1									
	CO3	3	2										
	CO4	3	2										

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

Introduction: History of Computing, Evolution of Programming Languages, Compilers, Interpreter, Algorithms and Flowcharts, Structure of a C Program **[2L]**

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 2^{nd} and 4^{th} order formulae **[4L]**

Solution of partial differential equations **[3L]**

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)*

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Computer Programming & Numerical Methods	**CO1**	**2**	**3**	**1**	**1**	**1**				**2**			
	CO2	**3**	**1**	**1**	**1**	**2**							
	CO3	**2**	**2**	**3**	**2**	**1**				**1**			
	CO4	**3**	**1**	**1**	**2**								
	CO5	**3**	**1**	**1**	**2**								
	CO6	**2**	**1**	**3**		**2**				**1**			

Module B (ES/CM/TP104B)

FORTRAN Programming (26 L)

Introduction: History of Computing, Evolution of Programming Languages, Compilers, Interpreter, Algorithms and Flowcharts, Structure of a FORTRAN Program **[1L]**

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 2nd and 4th 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)*

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Computer Programming & Numerical Methods	**CO1**	**2**	**3**	**1**	**1**	**1**				**2**			
	CO2	**3**	**1**	**1**	**1**	**2**							
	CO3	**2**	**2**	**3**	**2**	**1**				**1**			
	CO4	**3**	**1**	**1**	**2**								
	CO5	**3**	**1**	**1**	**2**								
	CO6	**2**	**1**	**3**		**2**				**1**			

Course code	**ES/EL/P105A** and **ES/EL/P105B**
Category	Engineering Science Course
Course title	**Electrical & Electronics Laboratory**
Module A: **ES/EL/P105A**	For CSE, CE, ChE, FTBE, ME, MetE, ProdE, ConE, IT, PE, PrnE
Module B: **ES/EL/P105B**	For EE, ETCE, IEE
Scheme and Credits	**L–T–P: 0–0–3; Credits: 1.5;** Semester – I & II
Pre-requisites (if any)	

Basic Electrical Engineering Laboratory Experiments

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

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

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)*

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Basic Electrical Engineering Laboratory	CO1	3	2	1						2			
	CO2	1	3	2						2			
	CO3	1	3	2						2			
	CO4	1	2	3						2			
	CO5	1	1	2	3					2			

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.
4. Basic OPAMP circuits: Adder, Subtractor, Inverting amplifier, Noninverting amplifier, Buffer.
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)*

Basic Electronics Lab Module A		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	2	3	1	1					2			
	CO2		2		3					2			
	CO3			3	2	1				1			
	CO4				3		1		1	2			
	CO5		1		3				1	1			

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)*

Basic Electronics Lab Module B		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	CO1	2	3	1	1					2			
	CO2		2		3					2			
	CO3			3	2	1				1			
	CO4				3		1		1	2			
	CO5		1		3				1	1			

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]

Ref. Books: Engineering Drawing by N. D. Bhatt, Engineering Drawing by Pal & Bhattacharyya

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)*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3							1				1
CO2	3	1										1
CO3	3	2						1				1
CO4	3	2						1				1

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]

Ref. Books: Engineering Drawing by N. D. Bhatt, Engineering Drawing by Pal & Bhattacharyya, Schaum's Outline of Descriptive Geometry by M. C. Hawk.

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)*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3							1				1
CO2	3	1										1
CO3	3	2						1				1
CO4	3	2						1				1

Course code	**ES/WS/P107A** and **ES/WS/P107B**
Category	Engineering Science Course
Course title	**Workshop**
Module A: **ES/WS/P107A**	For CSE, CE, ChE, EE, ETCE, FTBE, MetE, ConE, IEE, IT, PrnE
Module B: **ES/WS/P107B**	For ME, ProdE, PE
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 -

C01: Recognise the tools and techniques of fitting, carpentry, forging, moulding and welding **(K2, A1)**

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3								2		1	
CO2	3	1						2	2			
CO3	3	2				1			1		1	
CO4	3	1								2	1	

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 pattern s. **[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 -

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)*

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3								2		1	
CO2	3	1						2	2			
CO3	3	2				1			1		1	
CO4	3	1								2	1	

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** **[5L]**

Readings:

'The prehistory of science and technology studies' in Sismondo, Sergio , *An Introduction to Science and Technology Studies*, Wiley Blackwell. Second Edition)

'The Kuhnian revolution' in Sismondo, Sergio, *An Introduction to Science and Technology Studies*, Wiley Blackwell, Second Edition)

2. **Civilization and approaches in society and technology** **[8L]**

Readings:

'Indigenous Medicine and Medical Science' in P K Bose , *Health and Society in Bengal*, Sage.

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

3. **Science and technology revolution** **[4L]**

Readings:

'Industrial Revolution and Scientific and Technological Progress' Rainer Fremdling

4. **Emergence of industrial society** **[6L]**

Readings:

'The Industrial Revolution' in Eric Hobsbawm. The *Age of Revolution 1789-1848*

5. **Development of occupation and profession** **[4L]**

Readings:

'Technological change and life on the job' in Volti R, *Society And Technological Change*, World Publishers, 6th edition)

'Occupations and society' in Watson T, *Sociology, Work and Industry* Fourth edition, Routledge

Gendering of Technology

Feminism Confronts Technology by Judy Wajcman

6. **Post-industrial society** **[10L]**

Readings:

'Post-industrial society' in Webstar Frank, *Theories of the information society*, Routledge, third edition, 2006

'What is an information society' in Webstar Frank, *Theories of the information society*, Routledge, third edition, 2006)

'Network society' in Webstar Frank, *Theories of the information society*, Routledge, third edition, 2006)

'Information and post modernity' in Webstar Frank, *Theories of the information society*, Routledge, third edition, 2006)

Consumer society

Peter Corrigan, *The Sociology of Consumption: An Introduction, 1997.* Chapters 1 and 2.

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

Ecology

Ghosh Ashish, T*echnology 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

Chapters -'A Comprehensive View of the 21st century City: Smartnessas Technologies and Innovation in Urban Contexts' and 'Rethinking Learning in the Smart City: Innovating Through Involvement, Inclusivity, and Interactivities with Emerging Technologies' in Gil-Garcia, Pardo, Nam (eds.). *Smarter as the New Urban Agenda: A Comprehensive View of the 21st Century City*.

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)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Humanities & Sociology	**CO1**						**2**						**3**
	CO2						**2**						**3**
	CO3						**2**						**3**
	CO4						**2**						**3**
	CO5						**2**		**1**				**3**
	CO6						**1**	**2**					**3**

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)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Technical Communicative English & Soft Skill	**CO1**									**2**	**3**		
	CO2									**2**	**3**		
	CO3									**2**	**3**		
	CO4									**2**	**3**		
	CO5									**2**	**3**		
	CO6									**2**	**3**		

**** The contact hours are indicative only.**