SYLLABUS

2024-2025

B. Tech. First Year

Department of Applied Sciences & Humanities
Faculty of Engineering & Technology
Jamia Millia Islamia
New Delhi-110025

COURSE STRUCTURE
1st Semester

Section A

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-103	Engineering Mathematics - I	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.		MES-101	Basics of Mechanical Engineering	03	0	0	03
8.	LABORATORIES	ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section B

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-103	Engineering Mathematics - I	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.	LABORATORIES	MES-101	Basics of Mechanical Engineering	03	0	0	03
8.		ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section C

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-103	Engineering Mathematics - I	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.	LABORATORIES	MES-101	Basics of Mechanical Engineering	03	0	0	03
8.		ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section D

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-103	Engineering Mathematics - I	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.	LABORATORIES	MES-101	Basics of Mechanical Engineering	03	0	0	03
8.		ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section E

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-103	Engineering Mathematics - I	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section F

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-103	Engineering Mathematics - I	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section G

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-103	Engineering Mathematics - I	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section H

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-101	Engineering Physics – I	02	01	0	03
2.		ASB-103	Engineering Mathematics - I	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-102	Engineering Physics Laboratory – I	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

COURSE STRUCTURE
2nd Semester

Section A

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-203	Engineering Mathematics - II	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section B

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-203	Engineering Mathematics - II	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section C

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-203	Engineering Mathematics - II	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section D

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-203	Engineering Mathematics - II	02	01	0	03
3.		ASB-104	Biology for Engineers (CBCS)	02	01	0	03
4.		ASB-105	Environmental Science	02	0	0	02
5.		EES-101	Basics of Electrical Engineering	02	01	0	03
6.		ECS-101	Basics of Electronics & Communication Engineering	03	0	0	03
7.		CSS-101	Fundamentals of Computing	02	01	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-104	Design Thinking & Idea Lab	0	0	02	01
10.		MEL-101	Engineering Graphics & Design	0	0	04	02
11.		MEL-103	Workshop Practice	0	0	04	02

Section-E

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-203	Engineering Mathematics - II	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.		MES-101	Basics of Mechanical Engineering	03	0	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section-F

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-203	Engineering Mathematics - II	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.		MES-101	Basics of Mechanical Engineering	03	0	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section-G

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-203	Engineering Mathematics - II	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.		MES-101	Basics of Mechanical Engineering	03	0	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

Section-H

S. No.	PAPER TYPE	PAPER CODE	TITLE OF PAPER	Lectures	Tutorials	Practical	CREDIT
1.	THEORY	ASB-201	Engineering Physics – II	02	01	0	03
2.		ASB-102	Engineering Chemistry	02	01	0	03
3.		ASB-203	Engineering Mathematics - II	02	01	0	03
4.		AST-101	Communication Skills	02	0	0	02
5.		ASM-101	Constitution of India	02	0	0	0
6.		CES-101	Basics of Civil Engineering	03	0	0	03
7.		MES-101	Basics of Mechanical Engineering	03	0	0	03
8.	LABORATORIES	ASL-202	Engineering Physics Laboratory – II	0	0	02	01
9.		ASL-103	Engineering Chemistry Laboratory	0	0	02	01
10.		ASL-101	Language Laboratory	0	0	02	01
11.		MEL-102	Engineering Mechanics Laboratory	0	0	02	01

ASB-101: ENGINEERING PHYSICS – I

Credit: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT- I: CLASSICAL MECHANICS:

Review of Newtonian Mechanics in rectilinear Coordinate system, Rigid body, Translational and Rotational motion, Moment of Inertia, Radius of Gyration, Kinematics of rotational motion about fixed axis (Parallel axis theorem Perpendicular axis theorem), Simple harmonic motion (SHM), phaser representation of SHM, Simple Pendulum and Compound Pendulum, Damped harmonic oscillator- heavy, critical and light damping, energy decay in damped harmonic oscillator, quality factor.

UNIT –II: ELECTROSTATICS:

Coordinate Systems: Cartesian, Cylindrical and Spherical, Transformation of coordinate systems, Gradient of a scalar, divergence and curl of a vector; line integral, surface integral and volume integral, Gauss Divergence Theorem and its applications, Stokes Theorem and its applications, Charge distribution along line, across surface and over volume, Gauss's law and its applications, Electric field due to uniformly charged infinitely long wire, Electric field due to thin infinite plane sheet, Electric field due to infinite parallel sheets, Electric field due to uniformly distributed charged spherical shell, Electric field due to non-conducting charged solid sphere, Working and principle of Potentiometer, Wheatstone bridge.

UNIT- III: MAGNETOSTATICS:

Bio-Savart law and its application, Magnetic field due to current carrying conductor, Magnetic field at the centre and at the axis of circular coil carrying current, Magnetic flux, Gauss`s law in magneto statics, Ampere`s circuital law and its application, Magnetic induction due to long linear conductor, Magnetic field due to long circular cylinder, Equation of Continuity, Concept of Displacement current, Modified Ampere circuital law.

UNIT-IV: QUANTUM IDEAS:

Prerequisite of Quantum theory, Concept of Black body radiation, Wein`s displacement law, Rayleigh Jeans Planck`s hypothesis, wave particle duality; Photoelectric effect; de-Broglie hypothesis; Experimental evidence of matter waves (Davisson-Germer experiment), Compton effect, Uncertainty principle and its applications.

UNIT-V: SOLID STATE PHYSICS:

Basic of semiconductors, Concept of doping in semiconductors, Intrinsic and Extrinsic semiconductors, p-type and n-type semiconductors. Effective mass and law of mass action, Carrier concentration, Electrical conductivity and mobility of charge carriers in intrinsic and extrinsic semiconductors. Classical free electron theory of metals and its failure, Explanation of electrical conductivity, thermal conductivity of metals, Weidmann Franz Law, Bose Einstein and Fermi Dirac statistical distribution function, Fermi energy of free electron in metal, concept of average energy and total energy of free electrons, relation between average energy and Fermi energy.

Text Books:

1. Fundamentals of Physics: Halliday and Resnick
2. Introduction to Electrodynamics: David J. Griffiths
3. Optics: AjoyGhatak
4. Concepts of Modern Physics: Arthur Beiser

Reference Books:

1. Elements of Electrodynamics, Mathew N. O. Sadiku
2. Electricity, magnetism and Light, W. Saslow
3. Fundamentals of Optics, Jenkins and White

Course Outcomes:

CO1	Introducing the basic theories of Mechanics and Kinematics.
CO2	Describing the concepts of coordinate systems and their transformation. Understanding the concept and applications of electric field intensity.
CO3	Describing the basic laws of magnetism, analysis and their practical applications.
CO4	Discussing the transition from classical to quantum mechanics, explaining quantum mechanics & related applications.
CO5	Recalling the basics of semiconductor, explaining various electrical parameter of semiconductors and different laws of distribution of particles. Introducing the concept of free electron theory, its success and failure.

ASB-102: ENGINEERING CHEMISTRY

Credit: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I: BASICS OF MATERIAL SCIENCE AND SURFACTANTS:
Types of crystal system, Bravais lattices, Miller indices, Atomic packing factor, Planar atomic density, Crystal defects. Surface active agents: Soaps, Types and advantages. Detergents, Critical Micellar Concentration, Hydrophilic and Hydrophobic interactions, HLB values.

UNIT-II: INSTRUMENTAL METHODS OF ANALYSIS:
Chromatography: Definition and its types, Adsorption chromatography, Partition chromatography, High Pressure Liquid Chromatography. Fundamentals of Spectroscopy: Principles and Applications of UV-Visible, Infra-Red and Atomic Absorption Spectrometry.

UNIT-III: CHEMICAL METHODS OF ANALYSIS AND PHASE RULE:
Gravimetric Analysis: Digestion and its Importance, Favorable Conditions for Precipitation. Volumetric Methods of Analysis: Expression of concentration of solutions, Redox, Precipitation and Complexometric Titrations. Phase Rule and its applications to One and Multiple Component systems.

UNIT - IV: ELECTROCHEMISTRY:
Reversible and Irreversible cell: Electrolytic and Galvanic cell, Electrode Potential, Standard Electrode Potential, EMF series, Nernst Equation, Cell emf Measurement. Thermodynamic Overview of Electrochemical Processes. Conductance, Cell Constant and its determination.

UNIT - V: POLYMERS:
Fundamentals of polymer chemistry: Molecular weight, Glass transition temperature and Melting point. Methods of polymerization, Structure-property relationship, Thermoplastics and Thermosets. Fabrication of polymers by Compression, Injection, Extrusion and Transfer Moulding. Synthesis, properties and uses of common polymers , Conducting polymers and their applications.

Text Books:

1. V. Raghvan, "Material Science and Engineering: A first Course", Prentice Hall, 2006.
2. Jain and Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company.
3. Satyaprakash & Manisha Agrawal, "Engineering Chemistry", Khanna Book Publishing, Delhi.
4. V. R. Gowarikar: "Polymer science", New age international Publishers.

Reference Books:

1. William D. Callister, Jr and David G. Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition, Wiley, USA
2. Colin N. Banwell and Elaine M. McCash, Fundamentals of Molecular Spectroscopy, McGraw Hill Book Company Europe, England
3. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons
4. Atkins, P.W.; Paula, J.de. (2014),Atkin's Physical Chemistry Ed., 10th Edition, Oxford University Press.
5. Robert J. Young and Peter A. Lovell, Introduction to Polymers, CRC Press, Taylor & Francis

Course Outcome:

CO1	To understand basics of material science and surfactants.
CO2	To understand the fundamentals of instrumental methods of analysis.
CO3	To study and understand about chemical methods of analysis and phase rule.
CO4	To develop an understanding of basics of electrochemistry.
CO5	To understand about the fundamentals of polymers.

ASB-103: ENGINEERING MATHEMATICS - I

Credit: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

Unit –I: CALCULUS OF ONE VARIABLE AND ITS APPLICATIONS:
Successive differentiation (Leibnitz's theorem of nth derivative), Maclaurin's and Taylor's expansion of a function; Double point and its nature; Concavity, convexity and points of inflexion; Oblique and rectangular asymptotes, Curve tracing (Cartesian and polar forms), Curvature, Radius of curvature (Cartesian and polar forms)

Unit –II: CALCULUS OF SEVERAL VARIABLES AND ITS APPLICATIONS:
Partial derivatives and their geometrical interpretation, Total derivative, change ofvariables, Euler's Theorem on Homogeneous Function, Taylor's expansion of a function of two and more variables; Leibnitz's rule for differentiation under the sign of integration; Maxima and minima of a function of two and more variables including Lagrange's method.

Unit- III: INTEGRATION AND ITS APPLICATIONS:
Beta and Gamma Functions, Evaluation of multiple integrals by change of order of integration, applications of multiple integrals(Rectification, Volume and Surface of revolution)

Unit- IV: ORDINARY DIFFRENTIAL EOUATIONS AND ITS APPLICATIONS:
Linear Differential Equations, Exact Differential Equations, complementary function and particular integral, solution of ordinary linear differential equations of higher order with constant and variable coefficients (Cauchy and Legendre forms); Orthogonal and isogonal trajectories of a family of curves.

Unit –V: PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS:
Introduction to partial differential equations, Lagrange's method of undetermined multipliers for the solution of linear partial differential equations of first order, solution of nonlinear partial differential equations of first order by means of Charpit's methods.

Text/Reference Books

1. Quddus Khan; Advamced Engineering Mathematics, Tyrasons Publications, Delhi-110092, (2022)
2. B. V. Raman, Higher Engineering Mathematics, McGraw Hill Education India, 26th edition 2016.
3. R. K. Jain and S. R. K. Iyengar: Advanced Engineering Mathematicsl Narosa, 5tr Edition, 2018.
4. H. K. Dass; Advanced Engineering Mathematics, S. Chand Publishing, 22 edition,2018.

Course Outcomes:

CO1	Successive differentiation, expansion of functions, partial derivatives, double points and asymptotes.
CO2	Tracing of curve of two-dimensional, curvature, quadrature, rectification, volume and surface area of solids of revolutions.
CO3	Theory of two variable Calculus, Eigen values, Eigen vectors, consistency of system, vector space and linear transformations.
CO4	Solution of ordinary differential equations with its applications.
CO5	Learning the concepts of partial differential equations.

ASB-104: BIOLOGY FOR ENGINEERS

Credits:3	3Hours per week(L-T-P:3-0-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I: INTRODUCTION TO NANOTECHNOLOGY:
Introduction to Nanotechnology, Theoretical Basis of nanotechnology, Quantum confinement and size effect, Classification of Nanomaterials: Nanowires, QuantumWell and Quantum Dots, Properties of Nanomaterials, Carbonaceous Nanomaterials and their examples. Molecular Nanotechnology, Green Nanotechnology.

UNIT-II: FUNDAMENTALS OF AI, DATA SCIENCE, AND MACHINE LEARNING:
AI Introduction, Applications in Engineering, Types & Subfields, EthicalConsiderations. Data Science Overview, Significance in Engineering, Components, Data Types, Tools & Languages. Python Fundamentals: Variables, Data Types, Control Structures. Machine Learning Introduction, Types, Workflow, Popular Algorithms, Python for ML. Practical AI Applications in Engineering: Automation, Maintenance, Computer Vision, NLP, Optimization. Case Studies.

UNIT-III: INTRODUCTION TO BIOLOGICAL SCIENCES:
Darwinian evolution & molecular perspective; Introduction to phylogeny -Classification systems in biology and relationships; Cellular assemblies – From single cell to multi – cellular organisms: Geometry, Structure and Energetics; Comparing natural Vs human-made machines, Chromosomes and Cell Division. Basic Genetics-biological indicators, Mutation-causes. types and effect.

UNIT-IV: BASICS OF MICROBIOLOGY & IMMUNOLOGY:
Introduction to microbiology, Introduction to immunology, Immunology – A classic example of permutations and combinations in biology; Concept of Gene, Gene regulation, Infection, disease and evolution – synergy and antagonism; Cancer biology – Control and regulation; Stem cells – Degeneracy in biological systems; Engineering designs inspired by biology – Micro – to Macro – scales.

UNIT-V: BIOTECHNOLOGY:
Basic concepts of biotechnology: Totipotency and cell manipulation, Classifications of biotechnologies, Bio-Processing Technologies, Imaging techniques, Electrophysiology, Introduction to Nanobiotechnology, Regenerative medicine, Targeted drug delivery. Nanoimaging, Cancer treatment using Nanotechnology, Nanotoxicology: basics of cellular and organ level toxicity.

Text/Reference Books:

1. B. S. Murthy, P. Shankar, B. Raj , J. Murday, " Text Book of Nanoscience& Nanotechnology", Universities Press Springer.
2. Tom Taulli, "Artificial Intelligence Basics: A Non-technical Introduction", Apress.
3. Mark Lutz "Learning Python", OŔeilly Media publishers, 5th Edition.

Course Outcomes:

CO1	Understanding the concept of nanotechnology
CO2	Learning the applications of nanotechnology in multiple disciplines
CO3	Understanding the concepts of biological sciences, genetics, biological indicators and biosensors
CO4	Exploring the field of advanced biological sciences and biotechnology
CO5	Exploring nano-biotechnology and its various applications

ASB-105: ENVIRONMENTAL SCIENCE

Credit: 2	2 Hours per week (L-T-P:2-0-0)	End Semester Examination: Internal Assessment:	30 Marks 20 Marks

UNIT - I: WATER TREATMENT:
Hardness, types of hardness and its Units. Determination of hardness by EDTA method. Alkalinity of water & its significance, Numerical problems. Problems with boiler feed water and its treatment; Scale & Sludge formation, Boiler corrosion, Caustic Embrittlement, Priming & foaming, Softening methods; Lime-soda, Zeolite & Ion Exchange processes, Numerical problems.

UNIT- II: CORROSION AND ITS PROTECTION:
Corrosion; Definition and its scope, Chemical Corrosion, Electrochemical Corrosion, Types of Corrosion; Intergranular Corrosion, Soil Corrosion, Waterline Corrosion, Differential Aeration Corrosion, Galvanic and Concentration Cell Corrosion, Factors affecting corrosion, Protection of corrosion.

UNIT - III: ENVIRONMENTAL CHEMISTRY:
Environment and its Segments, Zones of Atmosphere, Air Pollution: Air pollutants and their resources; Aerosol and its Types, RSPM, SPM, Acid rain, Green House Effect, Global warming, Ozone Layer Depletion, Water Pollution: sewage Treatment, Determination and Significance of COD, BOD, TOC.

UNIT- IV: WASTE MANAGEMENT:
Definition, types and sources of hazardous waste (Municipal, industrial and biomedical). Need for solid and hazardous waste management. Physical, chemical and biological properties of wastes. Elements of integrated waste management (waste minimization and disposable methods).

UNIT-5: ENVIRONMENTAL BIOTECHNOLOGY:
Biotechnology and its applications, Fermentation, Production of alcohol and vitamins, Biological indicators, Biosensors, Bioremediation, Bio-fertilizers, Bioreactors, Biodiversity and its conservation.

Reference Books:

1. S.C. Sharma, "Environmental Engineering", Khanna Publishing House
2. R.C. Gaur, "Basic Environmental Engineering", Newage Publications
3. P.N. Modi, "Water Resources Engineering", Standard Publishers
4. Dr. A.K. Jain, "Environmental Engineering", (ISBN: 978-93-86173560), Khanna Publishers

Course Outcome:

CO1	To develop an understanding of water, its quality, properties and treatment in industries
CO2	To understand the chemistry of corrosion, its types and protection from it.
CO3	To study and understand about the basics of environment and pollution.
CO4	To study and understand about various hazardous wastes in the environment and their management.
CO5	To develop knowledge and understanding of biotechnology.

AST-101: COMMUNICATION SKILLS

Credit: 2	2 Hours per week (L-T-P:2-0-0)	End Semester Examination: Internal Assessment:	30 Marks 20 Marks

Unit-1: Communication Skills and its various aspects:

Communication Skills: theoretical perspectives. Reading, Writing, Listening, Speaking and Pragmatics, Identification of Communication Barriers and ways to overcome them, Technology, Humanities & Communication

Unit-2: Grammar:

Subject-verb agreement, Use of tense & sequence of tenses, Use of verbs, repositions & articles, Use of idioms & phrases, Discourse markers, Word vocabulary- synonym, antonym, homonym & one word substitution

Unit-3: Writing:

Formal & informal letters & Email correspondences, Report, Resume, Reviews (Book & Scientific) & Expansion, Essay & Article writing

Unit 4: English Phonetics:

Speech Mechanism, Organs of Speech, Vowels & Consonants, Place of Articulations, Manner of Articulation, Vowel diagram, IPA symbols, Phonetic Transcription, Word , tress (Primary Accent)

Unit 5: Literature:

Road Not Taken (Poem by Robert Frost), The Express (Poem by Stephan Spender), Of Studies (Essay by Francis Bacon), Pygmalion (by George Barnard Shaw)

Text Books:

1. The Joy of Reading: Orient Blackswan Pvt. Ltd, New Delhi
2. Fluency in English: Macmillan Publishers, New Delhi
3. Intermediate Grammar Usage and Composition : M.L.Tikoo and Subramanian , Orient Blackswan Pvt. Ltd, New Delhi
4. A Text Book of English Phonetics for Indian Students: T. Balasubramanian, Macmillan Publishers, New Delhi.
5. Practical English Usage: Michael Swan, Oxford University Press.

References Books

1. The Oxford Guide to effective Writing and Speaking Skills: John Seely, Oxford University Press
2. English Pronouncing Dictionary: Daniel Jones, Cambridge University Press.
3. Technical communication Principles and Practice: Meenakshi Raman and Sangeeta Sharma, Oxford

Course Outcomes:

CO1	Gaining proficiency in English
CO2	Developing personality, communication fluency & accuracy
CO3	Inculcating ideation and exposition skills
CO4	Honing the interpretative, logical, creative and imaginative skills.
CO5	Creating human sensibilities and forge convergences of technology with larger humanity.

ASM-101: CONSTITUTION OF INDIA

Credit: 0	2 Hours per week (L-T-P:2-0-0)	End Semester Examination: Internal Assessment:	00 Marks 00 Marks

Course Description

Introduction

Constitution of India: Sources, interpretation and constitutional history, salient features of the constitution

FEATURES AND PREAMBLE OF THE CONSTITUTION OF INDIA

The Preamble of the constitution, socialism, secularism, democracy, republican charter, justice, liberty, equality, fraternity, dignity of the individual, unity and integrity of the nation.

CITIZENSHIP AND THE FUNDAMENTAL RIGHTS OF THE CITIZENS OF INDIA.

Citizenship, fundamental rights of a citizen: right to equality, right to freedom, right against exploitation, right to freedom of religion, cultural and educational rights, right to constitutional remedies, fundamental duties of a citizen.

THE UNION AND STATE LEGISLATURES AND THE JUDICIARY

The union executives: The President, The Vice President, Council of Ministers, The Prime Minister, Attorney General of India. The Union Legislature: the Parliament and Parliamentary proceedings. The Judiciary - The Supreme Court, The High Court and the sub ordinate courts: its powers and functions. The states and union territories, Union-State relations.

ELECTIONS, FUNCTIONS AND ROLE OF ELECTION COMMISSION.

Elections: electoral reforms. The Election Commission – role of chief election commissioner, power and functions of the Election Commission of India. Amendment of the Constitution. Panchayti Raj. Working of the Constitution.

Text Books:

1. Subhash C Kashyap, Our Constitution, National Book Trust, India 2012

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi 2014
2. J.A. Siwach, Dynamics of Indian Government & Politics, 2nd Edition 2016

Course Outcomes

CO1	Understanding the history and structure of the Indian Constitution and its important parts.
CO2	Understanding the features and preamble of constitution of India.
CO3	Developing an awareness of the fundamental rights and duties as a responsible citizen of India.
CO4	Exploring how different parts of the government like the President, the Prime Minister, Parliament, State Governments and Judiciary work together to govern the country.
CO5	Developing the knowledge of elections and activities of Elections Commission of India.

EES-101: BASICS OF ELECTRICAL ENGINEERING

Credits: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I:
Kirchoff's laws, node voltage and mesh current methods, delta-star and star-delta conversion, classification of network elements, superposition principle, Thevenin's and Norton's theorems.

UNIT-II:
Single phase AC circuits, average and effective values of sinusoids, solution of R,L,C series circuits, the j operator, complex representation of impedances, phasor diagram, power factor, power in complex notation, solution of parallel and series-parallel circuits, resonance. Introduction to balance three phase AC circuits.

UNIT-III:
Introduction to magnetic circuits, analogy between electrical and magnetic circuit, Simple magnetic circuit with DC and AC excitations-Faraday's laws, induced emfs and inductances, magnetic leakages, B-H curve, hysteresis and eddy current loss, magnetic circuit calculations, mutual coupling.

UNIT-IV:
Single Phase Transformers- Principle of operation, construction, e.m.f. equation, ratings, phasor diagram for no-load and full load, equivalent circuit, power losses, regulation and efficiency calculations, open circuit and short circuit tests. Introduction to auto-transformer.

UNIT-V:
Types of electrical machines, working principle and construction of DC and AC machines, domestic and industrial applications of various types of electrical machines.

Text Books:

1. V. Del Torro, Electrical Engineering Fundamentals, Second Edition, Prentice Hall of India Pvt. Ltd
2. R. L. Boylestad, Introductory Circuit Analysis, Pearson
3. I. J. Nagrath, Basic Electrical Engineering, McGraw-Hill Education (India) Pvt Limited

Reference Books:

1. S.S. Parker, Problems in Electrical Engineering, Asia Publishing House.
2. H. Cotton, Advanced Electrical Technology, Pitman, London
3. T. L. Floyd, Principles of Electric Circuits, Pearson
4. E. Hughes, Electrical & Electronic Technology, Revised by John Hiley, Keith Brown and Ian Mckenzie Smith, Pearson

Course Outcomes:

CO1	To solve electrical circuits applying KCL, KVL and network theorems.
CO2	To understand the concept of phasors, waveforms and behaviour of basic electric circuit components.
CO3	To analyze the various types of losses in magnetic circuits.
CO4	To understand the construction, operation and applications of DC machines and single phase induction motors.
CO5	To introduce various types of electrical machines and its applications

ECS-101: BASICS OF ELECTRONICS & COMMUNICATION ENGINEERING

Credits: 3	3 Hours per week (L-T-P:3-0-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT I : SEMICONDUCTOR DIODES:
P-N Junction diode, V-I characteristics, static and dynamic resistance, linear and non-linear applications of diodes, half wave, full wave and bridge rectifiers, Zener diode, characteristics and its use as a voltage regulator. AND, OR, NAND, NOR and Ex-OR gates.

UNIT II : TRANSISTORS (BJT & JFET):
Bipolar junction transistor (BJT), biasing and amplifier action, load line analysis of transistor amplifier, BJT amplifier configurations, Junction field effect transistor (FET), biasing and amplifier action.

UNIT III : OPERATIONAL AMPLIFIER:
Op-amp basics, practical op-amp circuits, inverting and non-inverting amplifier, summing amplifier, integrators and differentiators.

UNIT IV : FEEDBACK AND ELECTRONIC INSTRUMENTS:
Feedback concept, Barkhausen Criteria of oscillation, Wein bridge and phase shift oscillator, cathode ray oscilloscope (CRO), electronics multi meters.

UNIT V : COMMUNICATION SYSTEMS:
Introduction to modulation, amplitude modulation, generation of AM waves, demodulation of AM waves, introduction to FM.

Text Books:

1. J. Millman and A. Grabel, 'Microelectronics' 2nd Edition, McGraw Hill, International Edition, 1988.
2. Robert boylestad and Louis Nashlesky, 'Electronic Devices and Circuit Theory' 5th Edition, PHI, 1992.

Reference Books:

1. Schilling and Beloved, 'Electronic Circuits-Discrete and Integrated', McGraw Hill International Edition, 1988.
2. Simon Haykin, 'Communication Systems', 2nd Edition, Wiley Eastern Ltd, New Delhi, 1992

Course Outcomes:

CO1	Becoming familiarize with the semiconductor diodes and various logic gates
CO2	Analyzing biasing, load line and amplifier action of transistor
CO3	Designing various operational amplifier circuits
CO4	Explaining oscillators, CRO and electronics multi-meters
CO5	Becoming familiarize with various schemes of modulation

CES-101: BASICS OF CIVIL ENGINEERING

Credits: 3	3 Hours per week (L-T-P:3-0-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

1. **Overview** - Introduction to Civil Engineering; Broad Civil Engg. Disciplines; Different Civil Engineering structures (Only Types): Buildings, Bridges, Aqueducts and viaducts, Towers and Chimneys, Tunnels, Dams, Retaining Walls, Tanks, Coastal defences.

2. **Infrastructure** – Roadways, Railways, Airports, Distance and Elevation Measurements, Water Supply Systems, Sewage Systems, Solid Waste Management Systems, Power Supply Systems, Emergency Systems.

3. **Civil Engineering Materials and Equipments** - Materials: Cement, Steel, Stone, Bricks, Timber, Mortar, Concrete; Equipments: Excavator, Bulldozer, Road Rollers, Concrete Mixer, Needle Vibrator, Non-destructive Testing Equipment.

4. **Building components & Services** - Types of Foundations: Isolated, Combined, Strap, Mat/ Raft, Piles, Well, Piled-Raft; Super-structure: Plinth, Floor, Wall, Column, Beam, Slab, Ceiling, Cantilever, Stairs; Lifts, Sanitary and Plumbing appurtenances.

5. **Material Properties and Uniaxial Deformation** - Uniaxial Tension Test: Stress-Strain Diagrams for Different Materials, Elasticity, Yielding, Plasticity, Work Hardening; Normal Stress & Strain, shear Stress & Strain, Stress-Strain Relationship; Elastic Constants and their inter-relationships, Uniaxial Deformations in uniform x-sections.

Text/ Reference Books:

- Basic Civil Engineering by Satheesh Gopi, Pearson
- Basic Civil Engineering by Punmia, Jain & Jain, Laxmi Publication
- Basic Civil Engineering by S. S. Bhavikatti, New Age International Publishers
- Building Materials by S. K. Duggal, New Age Press
- Mechanics of Solid by Abdul Mubeen, Pearson, Pearson Education
- Infrastructure Engineering and Construction Techniques by Lad, Kulkarni, Patil, Minde, Apte, Phadke, Nirali Prakashan

Course Outcomes

CO1	Understanding various disciplines of civil engineering and different types of structures.
CO2	Understanding various systems of Infrastructure.
CO3	Recognizing different materials and equipment used in Civil Engineering.
CO4	Understanding different components of buildings.
CO5	Explaining various material properties and calculate uniaxial deformations.

MES-101: BASICS OF MECHANICAL ENGINEERING

Credits: 3	3 Hours per week (L-T-P:3-0-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I: THERMODYNAMICS:

Introduction to Thermodynamics, Concepts of systems, control volume, state, properties, Equilibrium, quasi-static process, reversible & irreversible process, cyclic process. Zeroth Law and Temperature Heat and Work, First Law of Thermodynamics for closed & open systems. Non-Flow Processes, numerical based on the above concepts Energy Equation. Steady Flow Energy Equation. Numerical based on SFEE. Second Law of Thermodynamics-Kelvin and Plank's and Clausius Statement.

UNIT-II: FLUID MECHANICS:

Introduction, fluid properties, basic equation of fluid statics pressure variation in a static fluid, hydro-static force on submerged surfaces buoyancy and stability fluids in rigid-body motion Introduction to fluid dynamics

UNIT-III: HEAT TRANSFER:

Heat Transfer: What and how?

Application areas of heat transfer, historical background, Physical origin and heat transfer mechanism/Modes of heat transfer: Conduction, Convection and Radiation, Fourier's law of heat conduction, Thermal conductivity of materials Thermal resistance, General heat conduction equation, Newton's law of cooling, Surface emission properties: absorptivity, reflectivity and transmissivity, Concept of a black body, The Stefan-Boltzmann law and Kirchhoff 's law, problems

UNIT-IV: DYNAMICS OF RIGID BODIES:

Angular momentum of a rigid body in three dimensions, Application of the principle of impulse and momentum to the three-dimensional motion of a rigid body, Kinetic energy of a rigid body in three dimensions, Motion of a rigid body in three dimensions, Euler's equations of motion, Motion of a rigid body about a fixed point, Rotation of a rigid body about a fixed axis, Motion of a gyroscope. Eulerian angles, Steady precession of a gyroscope

UNIT-V: BASIC CONCEPT OF MECHANISMS AND MACHINES:

Link, kinematic pairs and their classifications, Kinematic chain, Mechanism and their inversions. Degree of Freedom of a mechanism, Four bar chain and its inversions, Single and double Slider-crank chains, Quick return motion mechanisms, Mobility of four bar linkage (Grashof criterion), Power Transmission systems: Gear Drives, belt drives, chain drives, friction drives

Text books:

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw-Hill 2005
2. Vijay Gupta & Santosh K Gupta, Fluid Mechanics and ItsApplications, Third Edition, New Age International, 2017
3. Sachdeva, R.C., Fundamentals of Heat and Mass Transfer, 4th ed.,New Age International, 2012
4. Ferdinand P. Beer, E. Russell Johnston, Jr., David F. Mazurek, Phillip J. Cornwell, Brian P. Self, Vector Mechanics For Engineers: Statics And Dynamics, Twelfth Edition, McGraw Hill Education.
5. Ghosh & Mallick, Theory of Mechanisms and Machines, EWP

Reference books:

1. Fundamentals of Classical Thermodynamics, G. J. Van Wylen and R. E. Santag
2. Fox & McDonald, Introduction to Fluid Mechanics, Fifth Edition, John Wiley & Sons, Inc. 2004

Course Outcomes:

CO1	The students will be able to apply the basic laws of thermodynamics in engineering system for analysis.
CO2	After finishing this unit, a student should be able to understand the concepts of Fluid Mechanics and recognize the various types of problem when the fluid is at rest or in motion.
CO3	At the end of the unit, students will be able to analyze the real time applications of heat transfer and describe the fundamental modes of heat transfer.
CO4	The student will be able to apply the principle of impulse and momentum to solve three-dimensional rigid body kinetics problems including gyroscopic motion.
CO5	The student will be able to determine the inversions of kinematic chain and degrees of freedom of a mechanism.

CSS-101: FUNDAMENTAL OF COMPUTING

Credits: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I: BASICS OF COMPUTERS:
Computer fundamentals, Bits and Bytes, CPU, Memory, Types of memory, Input and output devices, Operating system, application software, system software, generation of computer, classification of computer Number system: decimal number system, binary number system, octal number system, hexadecimal number system.

UNIT-II: INTRODUCTION TO C PROGRAMMING:
Introduction to Programming Language, Compiler, Interpreter, Algorithms, flow chart, C character set, C-tokens: constants, variable, keywords, Data types, operator and expressions. Decision controls: if-else, if-else ladder, nested if-else, conditional operator, switch case.

UNIT-III: LOOP AND ARRAY:
For loop, while loop and do-while loop, continue and break statement, Function: inbuilt and user defined functions, call by value and call by reference, Array: Single dimensional array. 2D array, multidimensional array, Operations on array.

UNIT-IV: SEARCHING AND SORTING:
Pointers, searching and sorting, Searching techniques: linear search, binary search, Sorting techniques: bubble sort, selection sort, Strings, library string functions.

UNIT-V: OPERATING SYSTEM & NETWORKING:
OS definition, role of OS in computer system, multi programming, time sharing OS, multitasking OS, multiprocessing OS, real time system OS, client server computing, distributed OS, functions of OS. Computer Network, transmission media, network topologies, LAN, WAN, MAN, Internet, ISP, WWW, Email, URL, Web browsers, websites, intranet. Latest technologies in IT.

References / Text Books:

1. Herbert Schildt C-The Complete Reference., Tata McGraw Hill Edition
2. Ritchie, D. M., Kernighan, B. W., & Lesk, M. E. (1988). The C programming language. Englewood Cliffs: Prentice Hall.
3. Kamthane, A. N. (2011). Programming in C, 2/e. Pearson Education India.
4. Doja, M. N. (2005). Fundamentals of Computers and Information Technology
5. Yashwant, K. Let us C. 8th edition, BPB publication.
6. Balagurusamy, E. (2012). *Programming in ANSI C*. Tata McGraw-Hill Education.

Course Outcomes:

CO1	Students will be able to understand the basics of computer, generation and types of computer and Number system.
CO2	Student will be able to understand the concept of algorithms, flowchart and C programming basics.
CO3	Student will be able to implement loops and array in C programming.
CO4	Students will be able to apply the concepts of searching and sorting techniques in C programming.
CO5	Students will be able to describe different types of operating systems and its functions and they will understand basics of computer networking and internet.

ASB-201: ENGINEERING PHYSICS - II

Credit: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

UNIT-I: SPECIAL THEORY OF RELATIVITY:

Inertial and Non-inertial frame of reference, Galilean transformations of position, velocity and acceleration and it`s invariance, Concept of Ether, Michelson Morley Experiment,Postulates of special theory of relativity, Lorentz transformations of position, Time Dilation, Length contraction, Einstein velocity addition theorem, Relativistic mass, momentum and energy.

UNIT-II: OPTICS &LASERS:

Introduction of interference and diffraction, Interference in Thin film (Interference due to reflected and transmitted light), Interference in Wedge-Shaped film, Newton`s Rings experiment, Newton`s rings by reflected and transmitted light, Determination of wavelength of sodium light using Newton`s Rings.Introduction of Laser, General characteristics of lasers, Applications of Lasers. Principle of Lasing action, Concept of Population Inversion, Einstein's transition probabilities, Basic idea of Optical resonator, Working and Principle of Ruby Laser, He-Ne laser.

UNIT-III: ELECTROMAGNETISM:

Maxwell`s equation: Integral and differential form and their physical significance, Wave equation in terms of Electric and Magnetic field, Propagation of Electromagnetic waves (EM) in free space and its transverse characteristic, Flow of energy, Poynting vector, Energy density in electromagnetic waves.

UNIT-IV: QUANTUM MECHANICS:

Wave function and its significance, properties of wave function, Normalization, Orthogonal, Orthonormal and probabilistic interpretation. Position operator, momentum operator and energy operator, Eigen values and eigen functions, Expectation value of position, momentum and energy. Derivation of Schrodinger time dependent and independent equation for wave function. One-dimensional problem- confinement of particle in a box, wavefunction, energy eigenvalues.

UNIT-V: PHYSICS OF MATERIALS:

Quantum free electron theory, Sommerfeld Model, Merits of Quantum free electron theory, Density of states, Wavefunctions and Energy of free electrons in metals, Electrons in periodic potential, Bloch theorem, Kronig Penney model, Band theory of solids, Origin of Energy band gap in solids, Quantum aspect of Hall's Effect.

Text Books:

1. Concepts of Modern Physics: Arthur Beiser
2. Qunatum Mechanics, Concept and Applications: NouredineZettili.
3. Introduction to Electrodynamics: David J. Griffiths
4. Optics, A. Ghatak
5. Electronic Fundamentals and Applications: J. Milliman and Christos C. Halkias

Reference Books:

1. Principles of Lasers: O. Svelto
2. Fundamentals of Physics: Halliday and Resnick
3.

Course Outcomes:

CO1	Conceptualizing two frames. Applying the theory relativity in describing the motion of high speed objects.
CO2	Understanding the phenomena of light. Introducing Lasers and its working principle for various applications.
CO3	Discussing the theories of electromagnetism, validating maxwell's equations and applying these equations to verify the properties of EM wave
CO4	Introducing wave functions, its properties and applications. Understanding Schrodinger equations and solving related problem.
CO5	Applying quantum ideas to solids. Discussing the origin of energy gap and applying quantum mechanical approach to free electron theory and band theory of solids.

ASB-203: ENGINEERING MATHEMATICS - II

Credit: 3	3 Hours per week (L-T-P:2-1-0)	End Semester Examination: Internal Assessment:	45 Marks 30 Marks

Unit –I: SOLID GEOMETRY AND APPLICATIONS OF MULTIPLE INTEGRALS:
Formation of equations of cylinder and cone under the given geometrical conditions. Applications of multiple integrals in finding mass, centre of gravity, centre of pressure, moment of inertia, product of inertia, curved surface area and volume.

Unit –II: SERIES SOLUTION AND APPLICATIONS OF P.D.E.:
Ordinary point, regular singular point, series solutions of ordinary differential equations of second order, Frobenius method for the solution of O.D.E.

Unit- III: COMPLEX ANALYSIS AND ITS APPLICATIONS:
Complex function, Analytical function, C-R equations (Cartesian and polar forms), Milne - Thomson method and related problems; Evaluation of complex integrals using Cauchy's integral theorem, Cauchy's integral formula, conformal mapping, Zeros, singularities and residues of an analytic function; Application of Cauchy's residue theorem in solving contour integrals and evaluation of real definite integrals using residue method.

Unit- IV: LAPLACE TRANSFORM AND ITS APPLICATIONS
Notion of Laplace transform and its properties, Laplace transform (some well-known elementary functions and Special functions) , Inverse Laplace transforms and its properties (some well-known elementary functions and Special functions), Laplace transforms of Derivative, Integral, Convolution theorem. Applications of Laplace and inverse Laplace transform in finding the particular solutions of ordinary linear differential equations with constants and variables coefficients, system of differential equations, integral equation, Integro-differential equations.

Unit –V: TENSOR ANALYSIS AND ITS APPLICATIONS:
Notion of tensors, operations on tensors (Addition, subtraction, multiplication and contraction), Types of tensors (reciprocal tensors, Fundamental tensors, Relative tensors, symmetric and skew symmetric tensors), Christoffel symbol and its properties.

Text/ Reference Books

1. Quddus Khan; Advamced Engineering Mathematics, Tyrasons Publications, Delhi-110092, (2022)
2. B. V. Raman, Higher Engineering Mathematics, McGraw Hill Education India, 26th edition 2016.
3. R. K. Jain and S. R. K. Iyengar: Advanced Engineering Mathematicsl Narosa, 5tr Edition, 2018.
4. H. K. Dass; Advanced Engineering Mathematics, S. Chand Publishing, 22"" edition,2018.

Course Outcomes:

CO1	Tracing of 3D curves, evaluation of multiple integrals by change of order of integration, change of variables.
CO2	Series solution and applications of partial differential equations.
CO3	Study of analytical functions, expansion of complex functions, zeros and singularities of functions, theory of residues, evaluation of contour integrals and conformal mappings.
CO4	Laplace transform and is applications in solving differential and integral equations.
CO5	Learning of theory and applications of Fuzzy mathematics.

ASL-101: LANGUAGE LABORATORY

Credits: 1	2 Hours per week (L-T-P: 0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

Activities:

Self-Introduction, Presentation Skills, Group Discussions, Personal Interviews, Formal Conversation & Chit-Chat, Topic Expressions/ Oration, Word Games, Debates, Simulated discussion, Personality Development, Resume writing, Book Reviews, Affirmative body language/gestures, Voice modulation.

Note:

language lab Classes are meant to complement Communication Skills classes with a practical insight. The study material and teaching aid for the purpose would be devised by the Language Lab instructor/teacher as per the specific need of the batch/section.

Course Outcomes:

CO1	Gaining proficiency in English
CO2	Developing personality
CO3	Inculcating ideation and exposition skills
CO4	Honing the interpretative, logical, creative and imaginative skills.
CO5	Creating human sensibilities and forge convergences of technology with larger humanity.

ASL-102: ENGINEERING PHYSICS LABOARATORY– I

Credit: 1	2 Hours per week (L-T-P:0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

List of Experiments

1. To determine the acceleration due to gravity (g) and to determine radius of gyration (K) of a bar pendulum.
2. To determine the value of acceleration due to gravity (g) using Kater's pendulum (by plotting graph).
3. To calculate the moment of inertia (M.I) of M.I. table using solid metallic objects such as cube, cone, cylinder, sphere.
4. To verify parallel axis theorem using M.I. table.
5. To determine the M.I. and energy lost per revolution of the given fly wheel by measuring time interval.
6. To determine the spring constant (k) of a given spring by static
7. To determine the spring constant (k) of a given spring by dynamic method.
8. To convert Galvanometer into Ammeter (range: 0-100 mA).
9. To convert Galvanometer into Voltmeter (range: 0-250 mV).
10. To compare the emf's of two cells using Potentiometer.
11. To verify series combination of two cells using Potentiometer.
12. To determine the resistance per unit length (R/1) of Potentiometer wire.
13. To determine the internal resistance of a cell using Potentiometer.
14. To determine spring constant, effective mass, damping constant using damped harmonic oscillator.

Course Outcomes:

CO1	Introducing the concept of data analysis & .its application in experimental physics
CO2	Understanding the practical application of mechanics & kinemetics.
CO3	Developing the skills of data analysis & its interpretation.
CO4	Inculcating the skills of writing of scientific reports.
CO5	Emphasizing on developing the spirit of team work.

ASL-103: ENGINEERING CHEMISTRY LABORATORY

Credit: 1	2 Hours per week (L-T-P:0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

List of Experiments

1. To determine the percentage composition of a given mixture of NaCl and NaOH.
2. To determine the percentage composition of a given mixture of KCl and KOH.
3. To determine the amount of copper in the given copper ore solution by titrating it against standard sodium thiosulphate solution.
4. To prepare urea formaldehyde, a thermosetting resin.
5. To determine the rate constant of the acid catalyzed hydrolysis of ethyl acetate.
6. To determine the amount of total chlorine residual in a given water sample by Iodometric method
7. To determine chloride ions in a given water sample by Argentometric method (Mohr's method)
8. To determine temporary, permanent and total hardness of the given water sample by Versenate method.
9. To determine alkalinity of a given water sample by acid titration using phenolphthalein and methyl orange.
10. To determine dissolved oxygen contents of the given water sample using Winkler's method.
11. To determine moisture, volatile & ash contents in a given coal sample by proximate analysis.

Text Books:

1. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989),Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.

Reference Books:

1. Laboratory manuals

Course Outcome:

CO1	Determination of concentration of analyte by volumetric analysis.
CO2	Preparation of thermosetting polymer.
CO3	Determination of rate constant of 1st order reaction.
CO4	Understanding importance of use of water in industries, softening methods and problems on water treatment.
CO5	Understanding basis of fuel analysis and their combustion.

ASL-104: DESIGN THINKING & IDEA LAB

Credit: 1	2 Hours per week (L-T-P:0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

Course Description:
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry. Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development. Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications.
An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Startups. Design thinking in various sectors: Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results.

Text Books:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking in the Class Room by David Lee, Ulysses press

Reference Books:
1. Design the Future , by Shrrutin N Shetty , Norton Press
2. Universal principles of design- William Lidwell, Kritina Holden, Jill Butter.
3. The era of open innovation – chesbrough. H
4. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall.

Course Outcomes

CO1	Understanding basic concept of design thinking and innovation and learning elements of design.
CO2	Knowing of the design process and its implementation in driving inventions.
CO3	Understanding tools of design thinking. Knowing the implementation of design thinking.
CO4	Understanding design thinking for startups.
CO5	Gaining the knowledge of machine learning in different sectors. Apply the design thinking techniques for solving problems in various sectors.

MEL-101: ENGINEERING GRAPHICS & DESIGN

Credits: 2	4 Hours per week (L-T-P:0-0-4)	Practical Examination: Internal Assessment:	20 Marks 30 Marks

UNIT-I: ORTHOGRAPHIC PROJECTION:
Conversion of pictorial/ isometric views into orthographic views of machine block. Identification of surface in orthographic views. Some practice on auto-Cad package.

UNIT-II: ISOMETRIC PROJECTION:
Isometric scale, isometric projection of solids, missing line and missing views. Isometric view of simple objects when their orthographic views are given. Preparation of isometric views using, Auto-Cad package.

UNIT-III: SECTIONING:
Conventional representation in section of engineering materials. Methods of sectioning, sectional views of machine components, brackets, bushed bearing and foot step bearing.

UNIT-IV: FASTENERS:
Sketches of different types of threads, permanent fasteners (riveted and welded joints), temporary fasteners (nut and bolt assembly, studs, keys. etc.)

UNIT-V: BUILDING DRAWINGS:
Symbols of electrical and sanitary items. Terminology used in building drawing, plan and elevation of 2/3- rooms building using Auto-CAD package, from corrosion, refractories, their manufacturer and properties: neutral, acid and basic refractors; glass its types and manufacture.

Text/Reference Books:

1. A.N. Siddiqui, Z.A. Khan and Mukhtar, Engineering Graphics with Primer on Auto-cad
2. N.D. Bhutt, Engineering Drawing

Course Outcomes:

CO1	Student will able to understand basics of drawing and design of engineering components
CO2	Student will able to understand scaling of designs
CO3	Student will able to understand the different view of any object
CO4	Student will able to understand detail construction of any object
***C*O5**	Student will able to understand sheet metal work

MEL-102: ENGINEERING MECHANICS LABORATORY

Credits: 1	2 Hours per week (L-T-P:0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

List of Experiments

1. To determine the co-efficient of friction between various surfaces on an Horizontal plane apparatus.
2. To determine the co-efficient of friction between various surfaces on an inclined plane apparatus.
3. To determine the mechanical advantage, Velocity ratio and efficiency of the Differential wheel and Axle apparatus.
4. To determine the mechanical advantage, Velocity ratio and efficiency of Double purchase winch crab apparatus and plot the curves (i) Effort VS Load (ii) Efficiency VS Load
5. To determine the mechanical advantage, Velocity ratio and efficiency of Worm & worm wheel apparatus and plot the curves (i) Effort VS Load (ii) Efficiency VS Load
6. To determine the mechanical advantage, Velocity ratio and efficiency of Screw jack and plot the curves (i) Effort VS Load (ii) Efficiency VS Load
7. To determine the beam reactions in Simply supported beams for different loads using parallel beam apparatus.
8. To verify the law of moments using Bell crank lever.
9. To verify the triangular law of forces using polygon law of Forces apparatus.

MEL-103: WORKSHOP PRACTICE

Credits: 2	4 Hours per week (L-T-P:0-0-4)	Practical Examination: Internal Assessment:	20 Marks 30 Marks

List of Experiments

FITTING SHOP:

To make a job of mild steel plate according to the given drawing by using Fitting shop's tools and operations.

PATTERN MAKING SHOP

To make a job of soft wood according to the given drawing by using Pattern making shop's tools and operations

.

FOUNDRY SHOP

To prepare a mould with given pattern by using Foundry shop's tools and operations.

WELDING SHOP

To make a job by joining mild steel plates according to the given drawing by using ElectricArc welding.

LATHE MACHINE (MACHINE SHOP)

To make a job according to the given drawing by machining of work piece on the LatheMachine.

SHAPER MACHINE (MACHINE SHOP)

To make a job according to the given drawing by machining of work piece on the shaperMachine.

Course Outcomes:

CO1	To instill fundamentals of materials, properties, various tools and their specifications employed in various shops/trades
CO2	To understand science and engineering of every task and tool employed in each shop/trade
CO3	To understand the drawing and specification of various tasks/jobs; plan, operate and acquire tools to make jobs as per specifications
CO4	Encourage student to use web/computing resources and relate the completed task with real life processes
CO5	Educate them for safety and security while performing assigned tasks in group of small size, prepare the record of tasks and submit

ASL-202: ENGINEERING PHYSICS LABORATORY -II

Credit: 1	2 Hours per week (L-T-P:0-0-2)	Practical Examination: Internal Assessment:	10 Marks 15 Marks

List of Experiments

1. Measurement of the diameter (d) of hair using the phenomenon of diffraction and to measure the divergence of a laser beam.
2. To determine temperature coefficient of junction voltage and energy band gap (E_g) of PN junction diode.
3. To determine the energy band gap (E_g) of a semiconducting material using 4-probe method.
4. To study the characteristics of a pnp/npn transistor in Common Emitter (CE) configuration.
5. To determine Hall Coefficient (R_H) and numbers of charge carriers per unit volume (n) in a semi conducting sample.
6. To determine the value of Planck's constant (h) by LED.
7. To determine the wavelength of sodium light by Newton's rings arrangement.
8. To plot the I-V characteristics of a Zener diode, PN diode and LED.
9. To determine the refractive index of the material of a prism for the given wavelength of light
10. To verify the Malus law.
11. To determine the dielectric constant of given material.

Course Outcomes:

CO1	Understand the fundamental concepts and theory behind any experiments for physics laboratory.
CO2	Employ the proper use of equipment, utilize experimental techniques and setting the apparatus to collect data, and apply the tools.
CO3	Develop skills in the recording and analyzing of data, and produce problem solving skills.
CO4	Appraise the skills for writing of scientific reports.
CO5	Work on multidisciplinary team's report writing.