

SCHEME – FIRST YEAR

SEMESTER - I						
S.No.	CODE	SUBJECT	L	T	P	CREDITS
1	MES-111	ENGINEERING MATHEMATICS - I	3	1	0	3
2	MES-112	CHEMISTRY FOR MECHANICAL ENGINEERING	3	1	0	3
3	MEH-113	COMMUNICATION SKILLS	3	1	0	3
4	MED-114	ENGINEERING MECHANICS AND STRENGTH OF MATERIALS	3	1	0	3
5	MED-115	ENGINEERING GRAPHICS	1	0	3	3
6	MES-116	CHEMISTRY LAB	0	0	3	1
7	MEH-117	COMMUNICATION LAB	0	0	3	1
8	MED-118	WORKSHOP PRACTICE – I*	1	0	3	2
TOTAL			H = 30			19

***WORKSHOP PRACTICE – I: CARPENTRY, WELDING, FITTING**

SEMESTER – II						
S.No.	CODE	SUBJECT	L	T	P	CREDITS
1	MES-121	ENGINEERING MATHEMATICS – II	3	1	0	3
2	MES-122	PHYSICS FOR MECHANICAL ENGINEERING	3	1	0	3
3	MES-123	BASIC ENVIRONMENTAL SCIENCE AND ENGINEERING	3	1	0	3
4	MED-124	BASIC ELECTRICAL ENGINEERING	3	1	0	3
5	MED-125	ENGINEERING THERMODYNAMICS	3	1	0	3
6	MES-126	PHYSICS LAB	0	0	3	1
7	MED-127	ELECTRONICS LAB	0	0	3	1
8	MED-128	WORKSHOP PRACTICE – II**	1	0	3	2
TOTAL			H = 30			19

****WORKSHOP PRACTICE – II: MACHINE SHOP, FOUNDRY, SMITHY**

L	T	P
3	1	0

1. MATRICES

Matrices, Related matrices, Complex matrices (Hermitian and skew-Hermitian matrices, Unitary matrix), Solution of linear system of equations, Rank of a matrix, Gauss-Jordan method, Normal form of a matrix, Vectors, Linear dependence, Consistency of a linear system of equations, Rouche's theorem, System of linear homogeneous equations, Linear and orthogonal transformations, Characteristic equation, Eigen values, Eigen vectors, Properties of Eigen values, Cayley-Hamilton theorem, Reduction to diagonal form, Quadratic form and their reduction to canonical form.

2. INFINITE SERIES

Convergence and divergence of infinite series, Geometric series test, Positive term series, pseries test, [Comparison test, D' Alembert's ratio test, Cauchy's root test (Radical test), Integral test, Raabe's test, Logarithmic test, Gauss's test] (without proofs), Alternating series and Leibnitz's rule, Power series, Radius and interval of convergence.

3. DIFFERENTIAL CALCULUS

Indeterminate forms, Partial Differentiation and its geometrical interpretation, Homogeneous functions, Euler's theorem and its extension, Total differentials, Composite function, Jacobian, Taylor's and Maclaurin's infinite series, Errors and increments, Introduction to limits and Indeterminate forms, Maxima and minima of functions of two variables, Method of undetermined multipliers. Curve tracing.

4. INTEGRAL CALCULUS

Quadrature, Rectification, Surface and Volume of revolution for simple curves, Double integrals and their applications, Change of order of integration, Change of variables, Triple integrals and their applications, Change of variables.

5. VECTOR CALCULUS

Differentiation of vectors, Curves in space, Velocity and acceleration, Relative velocity and acceleration, Scalar and vector point functions, Vector operator Del, gradient, divergence and curl with their physical interpretations, Formulae involving gradient, divergence and curl. Line, surface and volume integrals, Theorems of Green, Stokes and Gauss (without proofs) and their verifications and applications, Irrotational and Solenoidal fields.

TEXT BOOKS

1. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley and Sons, NC, New York.
2. Advanced Engineering Mathematics: by R. K. Jain & S. R. K Iyengar, Narosa Pub. House.

REFERENCE BOOKS

1. Advanced Engineering Mathematics: by C. R. Wylie & L. C. Barrett, McGraw Hill
2. Differential & Integral Calculus: by N. Piskunov, MIR Publications.

L	T	P
3	1	0

1. POLYMERS

Introduction, classification, tacticity, types of polymerization, coordination polymerization, mechanisms of polymerization, synthesis and applications of some important polymers Effect of polymer structure on properties, Molding of plastics into articles, Conducting polymers: preparation, types, properties and applications.

2. SCIENCE OF COMPOSITE MATERIALS

Introduction, Classification, constituents of composites, Fiber reinforced composites, unidirectional fiber reinforced composites, short fiber reinforced composites, particle reinforced composites, important types and failures of fiber reinforced composites, Advantages and applications of composites.

3. CHARACTERIZATION TECHNIQUES

Introduction to spectroscopy; UV-Visible spectroscopy- Absorption laws, Instrumentation, formation of absorption bands, Theory of electronic spectroscopy, Chromophore and auxochrome concept, fluorescence & phosphorescence, application of UV-Visible spectroscopy ; IR spectroscopy- Principle, theory of molecular vibrations, selection rules, spectral features of some classes of compounds, important features of IR spectroscopy and applications; NMR- Principle, relaxation processes, Instrumentation, shielding-de-shielding effects, spin- spin coupling, coupling constant, applications of NMR; MS spectroscopy- Basic principle, Instrumentation, determination of molecular formulae, important features of mass spectroscopy; Chromatography- Introduction, types, gas chromatography ; thermal method- instrumentation, fundamental principles and applications of TGA, DTA and DSC.

4. NANOCHEMISTRY

Introduction to nanochemistry, synthesis, characteristics and applications of carbon nanostructures fullerenes, carbon nanotubes and graphene.

5. FUELS AND COMBUSTION

What is fuel, types of fuel, thermodynamics of combustion, stoichiometry, thermochemistry, adiabatic flame temperature, chemistry of combustion, elementary reactions, chain reactions, multistep reaction mechanism, quantification of emissions, emission control methods.

6. CORROSION AND ITS CONTROL

Introduction, Types of corrosion – chemical and electrochemical, Mechanisms of corrosion, factors affecting corrosion and different protection techniques for corrosion control.

7. LUBRICANTS

Introduction, Mechanisms of lubrication, Types and selection of lubricants, synthetic lubricants, properties and different methods for testing of lubricating oils and greases.

TEXT BOOKS

1. Engineering Chemistry: by P C Jain & Monika Jain
2. A Text Book of Engineering Chemistry: by Shashi Chawla

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COURSE OBJECTIVES

1. To increase the student's ability to improve and utilize the skills necessary to be a competent interpersonal communicator.
2. To increase the student's understanding of his or her own communication behavior.
3. To increase the student's understanding of others communication behaviors.
4. To improve the student's communication skills in both social and professional contexts. 5. To improve the student's ability to demonstrate effective conflict resolution skills.

1. ESSENTIALS OF COMMUNICATION

The process of communication, Communication competence, Communication and the self-concept, Personal SWOT Analysis, Role of emotion In communication, Interpersonal Communication, Nonverbal communication.

2. WRITTEN COMMUNICATION

Enriching vocabulary, Using vocabulary in different contexts, Essentials of strong writing skills, Language and style, Logical reasoning, Paragraph Writing, Developing perspective.

3. SPEAKING

Public speaking, Fear of Public speaking and remedies, Elocution, Extempore Speeches, Group Discussions, Multi-perspective debates, How to write and present papers.

4. READING COMPREHENSION

Precis Writing, Comprehension, and Discussion on the basis of reading of novel/story.

5. TECHNICAL COMMUNICATION

Analyzing audience, Report Writing, Importance, structure, style and drafting of reports.

ASSIGNMENTS

1. *Questionnaires/Surveys*: You will be asked to complete questionnaires, Questionnaires are designed to assess your communication skills, you will be asked to write a review on each questionnaire assignment.
2. *Self-Concept Paper*: A paper to assess your self-concept (approximate length 5 pages).
3. *Class Seminar*: Extempore/ Pre-decided.
4. *Survey Report/ Project Reports*:

TEXT BOOKS

1. An Approach to Communication Skills : Indrajit Bhattacharya
2. Business Correspondence and Report Writing : R. C. Sharma and Krishna Mohan
3. Technical Communication : Meenakshi Raman and Sangeeta Sharma
4. Developing Communication Skills: Krishna Mohan and Meera Bannerji

1. FORCE, MOMENT, C. G & MOMENT OF INERTIA

Idealization of Mechanics, Concept of Rigid Body and Elastic Body, Laws of Mechanics, Forces & System of Forces, Composition, Resolution & resultant of Forces, Laws of Forces, Lami's Theorem, Moment & Couples, Varignon's Theorem, Free Body Diagram, Centre of Gravity of a Lamina, Centroids of various Geometric Shapes, Moment of Inertia, Radius of Gyration, Parallel and Perpendicular Axis Theorem.

2. FRAMES AND TRUSSES

Introduction, Perfect Frame, Redundant Frame, Reactions of Supports, Plane Trusses, Space Trusses, Method of Joints, Method of Section, Graphical Method- Maxwell Diagram.

3. SHEAR FORCE AND BENDING MOMENT

Introduction, Types of Load – Concentrated, uniformly distributed, uniformly varying load and Combination of loads. Types of beams – Cantilever beam, simply supported beam, overhanging beam; Shear force and bending moment diagrams for the above beams with one type of loading and combination of loading. Point of contra flexure, Relationship between load, Shear force and bending moment.

4. SIMPLE STRESSES AND STRAINS

Stress & strain; Types of stresses and strains Elastic limit; Hooks law; Stress – strain diagram for ductile and brittle material, Factor of safety; Poisson's Ratio; Elastic constants; Young's modulus, Shear modulus & Bulk modulus. Relationship between elastic constants-Derivation, Thermal Stress & Strain, Stresses induced due to uniaxial stress, stresses induced by state of simple shear, stresses induced due to biaxial stress, Principal stresses, Mohr's circle and its construction.

5. BENDING STRESSES

Pure bending of beams, Bending Equation, moment of resistance, section modulus & neutral axis. Stress distribution diagram for Cantilever & simply supported beam, Concept of direct & transverse shear Stress, Concept of axial load, eccentric load, direct stresses, bending stresses, maximum and minimum stresses. Stress distribution diagram.

6. TORSION OF CIRCULAR SHAFT

Pure Torsion, Theory of Pure torsion, Derivation of Torsion equation for a circular shaft subject to torsion, assumptions, Maximum torque transmitted by a Solid shaft and hollow shaft-derivations, Polar modulus, torsion rigidity, Shear stress produced in the members, Comparison of hollow and solid shaft, Power transmitted by a shaft, Close coiled helical spring subjected to axial load and axial torque.

7. STRESSES IN THIN CYLINDERS

Thin cylinders subjected to internal pressures, Concept of stresses & strains, Hoop stress, Longitudinal stress, in a cylinder, effects of joints, change in diameter, length and internal volume; principal stresses in sphere and change in diameter and internal volume.

TEXT BOOKS

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| 1. Engineering Mechanics : Timoshenko & Young,
Mc Graw Hill | 4. Strength of Materials : R.K.Bansal |
| 2. Engineering Mechanics : Bhavikatti &
Rajshekhappa. | 5. Mechanics of Materials : E. J. Hearn |
| 3. Engineering Mechanics : Meriam | 6. Strength of Materials : Sadhu Singh |
| | 7. Engineering Mechanics : Basu -Tata Mc Graw
Hill |

L	T	P/D	Cr
1	0	3	3

1. INTRODUCTION

Sheet layout, Border lines, Title block, Type of lines, Lettering, Dimensioning

2. PROJECTION OF POINTS AND STRAIGHT LINES

A point situated in first quadrant, A point situated in second quadrant, A point situated in third quadrant, Line parallel to one or both the planes, Line contained by one or both the plane, Line perpendicular to one of the plane, Line inclined to one plane and parallel to the other, Line inclined to both the planes.

3. PROJECTIONS OF PLANES AND SOLIDS

Types of planes (perpendicular to both the references planes, perpendicular to one plane and parallel to the other plane, perpendicular to one plane and inclined to the other plane), Projections of planes parallel to one of the reference of planes (when the plane is parallel to the HP, when the plane is parallel to the VP), Projections of planes inclined to one reference plane and perpendicular to the other. Types of solids [Polyhedra, solids of revolution (cylinder, cone, sphere, frustum, truncated)], Projections of solids in simple positions (axis perpendicular to the HP, axis perpendicular to the VP, axis parallel to both the HP and VP), Projections of solids with axes inclined to one of the reference planes and parallel to the other.

4. DEVELOPMENT OF SURFACES

Methods of developments, Developments of lateral surfaces of right solids (Cube, Prism, Cylinder, Pyramid, Cone), Spheres (Zone method, Lune method).

5. ORTHOGRAPHIC PROJECTIONS

Definitions- Planes of projection, Reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), Projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle.

6. ISOMETRIC PROJECTIONS

Isometric axes, Isometric lines, Isometric planes, Isometric drawing or isometric view, Isometric drawing of objects.

7. INTRODUCTION TO AUTO-CAD

Introduction to Auto-CAD software, drawing different two-dimensional and three dimensional objects.

TEXT BOOKS

1. Engineering Drawing by N.D. Bhat. & V. M. Panchal
2. Engineering Drawing by TVS Aruna murthy
3. Engineering Drawing by P.S. Gill
4. Engineering Drawing by M.B. Shah & B.C. Rana
5. Engineering Drawing by Basant Aggarwal & B.C. Rana
6. Engineering Drawing and Graphics+ AutoCAD K. Venugopal

L	T	P/D	Cr
3	1	0	3

1. FOURIER SERIES

Euler's formula, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Odd and even periodic functions, Expansion of odd and even periodic functions, Half-range series, Typical wave-forms, Parseval's formula, Practical harmonic analysis.

2. ORDINARY DIFFERENTIAL EQUATIONS

Brief review of first order ordinary differential equations, Exact equations, Equations reducible to exact equations, Equations of the first order and higher degree, Clairaut's equation, Applications of differential equations of first order (Orthogonal trajectories). Linear differential equations with constant co-efficients, Complimentary functions and particular integral, Method of variation of parameters, Equations reducible to linear equations with constant co-efficients (Cauchy's and Legendre's linear equations), Simultaneous linear equations with constant co-efficients, Applications of linear differential equations in engineering.

3. COMPLEX NUMBERS

Applications of De Moivre's theorem, Exponential, Circular, Hyperbolic and Logarithmic functions of a complex variable, Inverse Hyperbolic functions, Real and imaginary parts of Circular and Hyperbolic functions, Summation of the series-'C+iS' method.

4. FUNCTIONS OF COMPLEX VARIABLE

Limit and derivative of complex functions, Cauchy-Riemann equations, Analytic functions and its applications, Geometrical representation of complex function, Conformal mapping and standard transformations, Complex integration, Cauchy's theorem, Cauchy's integral formula, Series of complex terms, Taylor's and Laurent's series, Cauchy's residue theorem and its application for the evaluation of real definite integrals.

5. INTEGRAL TRANSFORMS

Laplace Transforms of standard functions and their properties, Inverse Laplace Transforms, General Properties of inverse Laplace transforms and Convolution Theorem, Laplace Transforms of periodic functions, Bessel functions, Error function, Dirac-delta Function, Heaviside's Unit Function, Applications to linear simultaneous differential equations.

TEXT BOOKS

1. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley New York.
2. Advanced Engineering Mathematics: by R. K. Jain & S. R. K Iyengar, Narosa Pub.

REFERENCE BOOKS

1. Advanced Engineering Mathematics: by C. R. Wylie & L. C. Barrett, McGraw Hill.
2. Vector Calculus: by C. E. Weatherburn. John Wiley and Sons, NC, New York.
3. Complex variables and Applications: by R. V. Churchill, T. J. Brown & R. F. Verhey, McGraw Hill.

L	T	P/D	Cr
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1. LASERS

Concept of masers and laser, spontaneous and stimulated emission, elementary idea about lasers, basic principles involved in laser, three and four level laser system, coherence, characteristics of laser light, types of lasers: Ruby, He-Ne, CO₂ and semiconductor lasers, application of lasers.

2. FIBER OPTICS

Optical fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, sources and sensors for optical fibers, applications of optical fibers in communication.

3. ELECTROSTATICS AND ELECTRODYNAMICS

Gauss's law in dielectric medium, Equation of continuity, displacement currents, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector, Vector potential, Lorentz gauge.

4. MECHANICS AND THEORY OF RELATIVITY

Displacement, velocity and acceleration in polar and spherical coordinate systems, inertial and non-inertial frames, Michelson and Morley experiment, postulates of special theory of relativity, Lorentz's space - time transformations and their consequences, velocity transformations, mass variation with velocity, mass energy equivalence, momentum and energy transformations.

5. QUANTUM MECHANICS

Need of quantum mechanics, Compton effect, Born's concept of wave function, Eigen function and Eigen values, operators in quantum mechanics, expectation values, time independent and time - dependent Schrodinger's wave equations and its applications viz., particle in one dimensional potential well, particle in three dimensional well, rectangular potential barrier, quantum mechanical tunneling and its applications

6. SUPERCONDUCTIVITY

Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type-I and type-II superconductors, Isotope effect, theory of superconductivity, flux quantization, SQUIDS, applications of superconductivity.

7. ULTRASONIC

Ultrasonic waves, methods of their generation & detection, properties and applications of ultrasonic waves.

8. Specific cases of Applications to mechanical engineering**TEXT BOOKS**

1. A Text Book of Engineering Physics : M. N. Avadhanulu & P. G. Kashirsagar
2. Engineering Physics : Satya Prakash and Vibhav Saluja
3. Modern Engineering Physics : A. S. Vasudeva
4. Optical Electronics : AK Ghatak and Thyagarajan
5. Electromagnetic Theory and Electrodynamics : Satya Prakash
6. Introduction to Electrodynamics : David J Griffithsi
7. Concepts of Modern Physics : Arthur and Beiser
8. Optical Fibers Communication and Technology : D.K.Mynbaev and L.L.Scheiner

L	T	P/D	Cr
3	1	0	3

1. ENVIRONMENTAL MANAGEMENT, RESOURCES AND LEGISLATION

Environmental disturbance, quantification of environmental issues, soil resources and their classification, equitable use of resources, natural resource management, food chain and trophic levels environmental impacts of energy, development, legislation.

2. GLOBAL ATMOSPHERIC CHANGE

The atmosphere of earth, global temperature, greenhouse effect, radiative forcing of climate change, global warming potential, carbon cycle, carbon emissions from fossil fuels, regional impacts of temperature change, global initiatives

3. PHYSICAL ,CHEMICAL AND BIOLOGICAL PROCESSES

Particle dispersion, methods of expressing particle concentrations, stoichiometry, chemical equilibria, solubility of gases in water, carbonate system, organic chemistry, nuclear chemistry, nuclear fission and fusion, basic atmospheric properties, fundamentals of microbiology.

4. POPULATION AND ECONOMIC GROWTH

The nature of human population growth, population parameters, industrialization, urbanization, sustainable development, sustainable consumption, resettlement and rehabilitation issues, health and environmental impacts.

5. SOLID AND HAZARDOUS WASTE MANAGEMENT

Integrated solid waste management, hazardous waste management, biomedical waste treatment technologies and disposal options, e-waste management, waste minimization for sustainability, waste management- Indian scenario

6. POLLUTION AND MONITORING

Water resources, characteristics of water, water pollutants, oxygen demanding waste, surface water quality, ground water quality, water and wastewater treatment systems.

Air quality standards, emission standards, criteria pollutants, air pollution and meteorology, atmospheric dispersion, emission controls. Effect of noise on people, rating systems, community noise and criteria, traffic noise prediction, noise control.

TEXT BOOKS

1. Mackenzie L. Davis and David A. Cornwell.2010. Introduction to Environmental Engineering, 4e. Tata McGraw Hill Education Private Limited New Delhi
2. Gilbert M. Masters2007. Introduction to Environmental Engineering and Science, 2e.Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Delhi J. Glynn Henry and Gary W. Heinke.2004. Environmental Science and Engineering, 2e Pearson Education (Singapore) Pte. Ltd

L	T	P/D	Cr
3	1	0	3

1. BASIC CONCEPT

Review of basic concepts, energy-kinetic, potential and internal, heat and work, zeroth law, concept of temperature, temperature scale, definition of ideal gas, laws and properties of ideal Gas, non-ideal gas behavior.

2. PROPERTIES OF STEAM

Phase transformation, phase diagram, generation of steam, condition of steam- saturated steam, dry-saturated steam, wet steam, superheated steam, dryness fraction, property of steam, steam tables, methods of determination of dryness fraction of steam, use of Mollier charts, process of vapors and various process.

3. LAWS OF THERMODYNAMICS

First law for control mass (closed system), internal energy, enthalpy, specific heats, non-flow processes of ideal gases, cyclic process, first law for control volume (open system), general energy equation, one dimensional steady flow, Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements, their equivalence, reversible processes, reversible cycles, and Carnot cycle, corollaries of the second law, thermodynamics temperature scale, Clausius inequality, entropy, principle of increase of entropy, isentropic efficiency .

4. ENERGY ANALYSIS

Energy, Reversible work and irreversibility, Second law efficiency, energy of closed and open system, energy transfer by heat, work and mass, Decrease of energy principle.

5. GAS and VAPOUR CYCLES

Review, Rankine cycle, Vapor power cycle, Deviation of vapor cycle from ideal case, combined gas vapor cycle.

6. THERMODYNAMIC PROPERTY RELATIONS

Maxwell relations, Clapeyron Equation, general relations for change in internal energy, enthalpy, entropy and specific heats, Joule Thomson coefficient.

TEXT BOOKS

1. Engineering Thermodynamics : P.K. Nag
2. Engineering Thermodynamics : Yunus Cengel
3. Engineering Thermodynamics : Van Wylen