REGULATIONS – 2013

DEPARTMENT OF
MECHANICAL ENGINEERING

CURRICULUM AND SYLLABI OF
I & II YEAR
B.E. – MECHANICAL ENGINEERING
COLLEGE VISION

• Transforming lives through quality Education and research with human values.

COLLEGE MISSION

• To maintain excellent infrastructure and highly qualified and dedicated faculty.

• To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit.

• To promote the values of ethical behavior and commitment to the society.

• To partner with academic, industrial and government entities to attain collaborative research.
DEPARTMENT OF MECHANICAL ENGINEERING

VISION
- Producing globally competitive Mechanical Engineers with social responsibilities.

MISSION
- Imparting quality education by providing excellent Teaching-learning environment.
- Inculcating qualities of continuous learning, professionalism, team spirit, communication skill and leadership with social responsibilities.
- Promoting leading edge research and development through collaboration with academia and industry.

Program Educational Objectives (PEO)

Programme educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Graduates of the programme will be able to

1. Get employment in the field of mechanical and allied engineering or pursue higher education or become an entrepreneur and maintain professional ethics.

2. Work in a team with effective communication skill, leadership quality, continuous learning attitude, social responsibility and human values.
Program Outcomes (PO)

At the time of graduation graduates of our mechanical engineering program are expected to have the ability to

a. Apply the knowledge of mathematics, science and engineering principles to solve mechanical engineering problems.

b. Identify, formulate, and solve thermal, fluid and mechanical problems by applying first principles, including open-ended problems.

c. Design thermal, fluid and mechanical systems and develop know how to analyze and interpret results.

d. Conduct experiments and interpret data to investigate and solve complex Mechanical Engineering problems

e. An ability to identify, formulate and solve the engineering problems using different modern engineering tools and techniques

f. Design thermal, fluid, mechanical and control systems to meet specifications within environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.

g. Understand the impact of Mechanical Engineering in a global, economic, environmental, and societal context.

h. Develop practical solutions for mechanical engineering problems under professional and ethical constraints.

i. Participate effectively in teams involving several disciplines.

j. Communicate effectively with written, oral, and visual means in a technical environment.

k. Ability for a lifetime self and continuing practice.

l. Ability to lead project team and successfully complete the task.
REGULATIONS 2013
CURRICULUM AND SYLLABI
B.E. MECHANICAL ENGINEERING

SEMESTER – I

<table>
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<tr>
<th>Sl. No.</th>
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**Total Number of Credits :** 27
## SEMESTER - II

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Total Number of Credits : 29
SEMESTER III

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NEC (An Autonomous Institution)
SH100 TECHNICAL ENGLISH – I
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
The Student will
• apply basic grammar in Writing and Speaking.
• prepare formal Letter Writings.
• come out with proper pronunciation.
• speak confidently in interactions.
• develop interest to read any article.

UNIT I
Language Focus: Technical Vocabulary, Word Formation, Concord, Tense (Present).
Writing: Leave Application Letter, Paragraph writing.
Listening: Listening to correct pronunciation of words.

UNIT II
Language Focus: Words often misspelled, Articles, Tense (Past)
Writing: Permission letters (In-plant training/Seminar/Workshop), Chart description.
Listening: Listening to the Sentences with correct stress and Intonation.
Speaking: Situational Conversations.

UNIT III
Language Focus: Compound nouns, Tense (Future), Preposition, Comparative Adjectives.
Listening: Listening to the conversations.
Speaking: One minute speech.

UNIT IV
Language Focus: Modal verbs, Gerund, Infinitives, Voice.
Writing: Writing Instructions, Letters to Editor.
Listening: Listening to the different Tonal Expressions.
Speaking: Giving Opinions.

UNIT V
Language Focus: ‘If’ Conditionals, ‘Wh’ questions, Question Tags.
Writing: Reading and Note - taking
Speaking: Group Discussion.
Reading: ERC, one word questions from the suggested book.

SUGGESTED ACTIVITIES
2. Exercises on gap filling and correction of errors on Concord (Subject – Verb Agreement).
3. Gap filling exercises using the appropriate Tense forms.
4. Exercises on transferring information from Graph to Text – Bar charts, Flow charts.
5. Making sentences using Modal verbs to express probability, compulsion, etc.
6. Exercises on Writing Instructions.
7. Exercises on framing Questions.
8. Other relevant classroom activities.

BOOK SUGGESTED FOR READING
REFERENCES

SH101 MATRICES AND DIFFERENTIAL CALCULUS (Common to all B.E. / B.Tech., Degree Programmes) 3 1 0 4

COURSE OUTCOMES

- Ability to find inverse and integral powers of matrices and to perform transformations of matrices.
- Ability to find the evolutes of various curves.
- Ability to solve ordinary and partial differential equations.
- Ability to obtain constrained maxima and minima.

UNIT I MATRICES 12
Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties (excluding proofs); Cayley – Hamilton theorem (excluding proof) – Inverse and integral powers of a matrix using Cayley – Hamilton theorem; Diagonalisation of a matrix by orthogonal transformation; Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 12
Curvature in cartesian, parametric and polar forms; Centre, radius and circle of curvature; Evolutes.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12
Partial derivatives; Total derivatives; Differentiation of implicit functions; Jacobians; Maxima and Minima - Method of Lagrangian multipliers.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12
Higher order linear differential equations with constant coefficients; Method of variation of parameters; Cauchy’s and Legendre’s linear equations; Simultaneous first order linear equations with constant coefficients.

UNIT V PARTIAL DIFFERENTIAL EQUATIONS 12
Formation of partial differential equations; Lagrange’s linear equations; Solutions of standard types of first order partial differential equations; Linear partial differential equations of second and higher order with constant coefficients.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
SH102  APPLIED PHYSICS
(Common to all B.E. / B.Tech., Degree Programmes)  L T P C  3 0 0 3

COURSE OUTCOMES
The students will be able to
- gain knowledge on the properties of matter and hydrodynamics.
- study and apply the ultrasonic methods for industrial and medical field.
- understand Lasers and to identify the appropriate Laser technique for industrial and medical field.
- understand the different types, fabrication, losses of optical fibers and the applications of fiber optics in communication and instrumentation.
- understand the physical properties of photons and electrons and to study the different Electron Microscopes.

UNIT I  PROPERTIES OF MATTER AND HYDRODYNAMICS  9
Properties of Matter
Stress, Strain, Hooke’s law; Types of moduli of elasticity; Torsional pendulum – Determination of Rigidity modulus of a wire; Bending of beams – Expression for bending moment – Measurement of Young’s modulus by uniform and Non- uniform bending – I Shaped girders.

Hydrodynamics
Stream line flow, Turbulent flow, Poiseuille’s formula for flow of liquid through a capillary tube, Determination of coefficient of viscosity of a liquid.

UNIT II  ULTRASONICS  9

UNIT III  LASERS  9
Principle of spontaneous emission and stimulated emission, Population inversion, Pumping, Einstein’s A and B coefficients – derivation; Types of Lasers - CO₂ Laser, Nd-YAG Laser, Semiconductor Laser (Homojunction); Determination of wavelength of Laser using grating and Particle size; Applications of Lasers: Industrial applications – Welding, Cutting and Heat treatment; Medical applications; Holography (construction and reconstruction).

UNIT IV  FIBER OPTICS AND ITS APPLICATIONS  9
Principle and propagation of light in optical fibers; Numerical aperture and Acceptance angle; Types of optical fibers – material, refractive index and mode; Double crucible technique of fiber drawing; Splicing – fusion splicing; Loss in optical fiber – attenuation, dispersion and bending; Fiber optical communication system (Block diagram); Advantages and Applications of optical fiber; Fiber optic sensors – temperature and displacement; Endoscope.

UNIT V  QUANTUM PHYSICS AND MICROSCOOPY  9
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and Rayleigh Jean’s Law from Planck’s theory; Photoelectric effect – Law of Photoelectric effect – Photoelectric equation; Matter Waves – De Broglie wavelength - Schrodinger’s wave equation – time independent and time dependent equations – Particle in one dimensional box; Heisenberg’s Uncertainty principle; Linear Harmonic oscillator; Electron microscope – scanning electron microscope – transmission electron microscope.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
SH103 ENGINEERING CHEMISTRY
(Common to all B.E. / B.Tech., Degree Programmes) L T P C 3 0 0 3

COURSE OUTCOMES
The students will be able to
- select suitable water treatment techniques for industrial and domestic purpose.
- acquire knowledge of electrochemistry.
- apply the contextual knowledge of adsorption techniques for industrial applications.
- synthesize polymers for domestic and industrial applications.
- understand the knowledge of nano materials for their applications in Science and Engineering.

UNIT I WATER TREATMENT 9

UNIT II ELECTRO ANALYTICAL TECHNIQUES 9
Electrode potential: definition, measurement of electrode potential, Nernst equation – problems; EMF: definition, measurement of EMF – Poggendorff’s method; reference electrode: standard hydrogen electrode, calomel electrode, glass electrode – measurement of pH using glass electrode; CO₂ sensing electrode; conductometric titrations: acid-base titration (HCl vs NaOH); potentiometric titrations: redox titration (Fe²⁺ vs K₂Cr₂O₇), precipitation titration (Ag⁺ vs NaCl).

UNIT III CATALYSIS AND SURFACE PHENOMENA 9
Types of catalysis – homogeneous catalysis – heterogeneous catalysis, mechanism of catalytic action - contact theory, catalytic promoters, catalytic poison; enzyme catalysis: Michaelis-Menton equation; adsorption: definition, types – physical adsorption – chemical adsorption – differences between physical and chemical adsorption; adsorption isotherms: definition, Freundlich and Langmuir adsorption isotherms, applications of adsorption.

UNIT IV ENGINEERING POLYMERS 9

UNIT V NANO MATERIALS 9
Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – fullerene; synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES
SH104        FUNDAMENTALS OF COMPUTING AND PROGRAMMING IN C            L T P C 
(Common to all B.E. / B.Tech., Degree Programmes)            3 0 0 3

COURSE OUTCOMES

• Learn the major components of a computer system.
• Formulate the algorithms and analyze their complexity.
• Identify the correct and efficient ways of solving problems.
• Acquire knowledge about dynamic memory allocation, modular programming and data organization.
• Develop real time applications using the power of C language features.

UNIT I     COMPUTER FUNDAMENTALS            10
Classification of Computers – Basic Computer organization – Number Systems – Problem Analysis –

UNIT II    BASIC C PROGRAMMING               9
Structure of C Program – Keywords, Constants, Variables and Data Types – Operators and

UNIT III   FUNCTIONS, ARRAYS AND POINTERS       9
Functions: User-defined functions – Definitions – Declarations - Call by reference – Call by value.
Arrays: Declaration – Definition – Multidimensional Arrays – Functions with array as arguments.
Pointers: Initialization – Pointers as Arguments – Pointers to Pointers – Dynamic Memory
Management Functions.

UNIT IV    STRUCTURES AND UNIONS                 9
Derived types – Structures: Declaration – Definition – Initialization of structures – Accessing
structures – Nested structures – Arrays of structures – Structures and functions – Pointers to
structures – Self-referential structures – Unions.

UNIT V     FILE HANDLING                         8

TOTAL: 45 PERIODS

TEXT BOOKS

   Kindersley (India), 2011.

REFERENCES

   Education Inc., 2005.
COURSE OUTCOMES

- Students will be able to use the drawing instruments effectively.
- An ability to draw the basic engineering curves and problems related to projections of points, straight lines, planes and solids.
- Able to apply the knowledge acquired on practical applications of sectioning and development of solids.
- Able to draw simple solids and its sections in isometric view and projections and also to draw its perspective views.

Drawing Instruments – IS specifications on lines – drawing sheets – Printing letters and dimensioning – scales (not for examination) – First angle projection should be followed.

UNIT I  PLANE CURVES  12
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids – Epi and Hypo cycloids - construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  12
Projection of points and straight lines located in the first quadrant – Traces – Determination of true lengths and true inclinations.
Projection of regular polygonal surfaces and circular lamina inclined to any one reference plane.

UNIT III  PROJECTION OF SOLIDS  12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV  SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES  12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinder and cone – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  12
Perspective projection of prisms, pyramids and cylinders by visual ray method and vanishing point method.

TOTAL: 60 PERIODS

Note: In end semester examination from each unit one question with either or pattern may be asked. No short questions.

TEXT BOOK

REFERENCES
SH106  C PROGRAMMING LABORATORY  L T P C  0 0 3 2
(Course Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
- Acquire logical thinking and problem solving skills.
- Implement the algorithms and analyze their complexity.
- Identify the correct and efficient ways of solving problems.
- Acquire hands on practice in dynamic memory allocation, modular programming and data organization.
- Implement real time applications using the power of C language features.

LIST OF EXPERIMENTS
1. Solve problems such as temperature conversion, student grading, interest calculation.
2. Finding the 2’s complement of a binary number.
3. Generation of the first ‘n’ terms of the Fibonacci sequence and prime sequence.
5. Given distance traveled by a vehicle as \( d = ut + \frac{1}{2}at^2 \), where ‘u’ and ‘a’ are the initial velocity and acceleration. Calculate the distance traveled for different time intervals.
6. Solving the roots of a quadratic equation.
7. Designing a simple arithmetic calculator. (Use switch statement)
8. Performing the following operations: (Use loop statement)
   i. Generate Pascal’s triangle.
   ii. Construct a Pyramid of numbers.
9. Performing the following operations to a string:
   i. To insert a sub-string into main string at a given position.
   ii. To delete ‘n’ characters from a given position in a string.
   iii. To replace a character of string either from beginning or ending or at a specified location.
10. Performing the following operations: (Use arrays)
    i. Matrix addition.
    ii. Transpose of a matrix.
    iii. Matrix multiplication by checking compatibility.
11. Performing the following operations: (Use recursive functions)
    i. To find the factorial of a given integer.
    ii. To find the GCD (Greatest Common Divisor) of two given integers.
    iii. To solve Towers of Hanoi problem.
12. Performing the Student Information Processing using File Handling concepts.

TOTAL: 45 PERIODS

SOFTWARE REQUIREMENTS
- Turbo C/ ANSI C Compiler
- Gcc compiler
SH107  PHYSICS AND CHEMISTRY LABORATORY – I  L T P C
(Common to all B.E. / B.Tech., Degree Programmes)  0 0 3 2

PART A – PHYSICS LABORATORY – I

COURSE OUTCOMES
At the end of the Laboratory classes, the students are able to
• develop collaborative learning skills and to add some of their own ideas to the experiments and their explanations.
• understand the optical properties, mechanical properties and electrical properties.

LIST OF EXPERIMENTS
1.  (a) Particle size determination using Diode Laser.
    (b) Determination of Laser parameters – Wavelength, and angle of divergence.
    (c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2.  Determination of thickness of a thin wire – Air wedge method.
3.  Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
5.  Determination of Young’s modulus – Non-uniform bending method.
7.  Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.

• A minimum of FIVE experiments shall be offered.

PART B - CHEMISTRY LABORATORY – I

COURSE OUTCOMES
The student
• can estimate the amount of hardness and acidity present in the water sample.
• gain knowledge about the estimation of nickel in an alloy.
• quantify the electrolyte by measuring the conductance and pH.

LIST OF EXPERIMENTS
1.  Estimation of hardness of Water sample by EDTA method.
2.  Estimation of acidity of Water sample.
3.  Estimation of Nickel by EDTA method.
4.  Conductometric titration (HCl Vs NaOH).
5.  Conductometric titration (BaCl₂ Vs Na₂SO₄).
6.  pH metric titration (HCl Vs NaOH).
7.  Determination of molecular weight and degree of polymerization using Viscometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.

TOTAL: 45 PERIODS
SH108                  ENGINEERING PRACTICES LABORATORY  
(Common to all B.E. / B.Tech., Degree Programmes)  

COURSE OUTCOMES  
• Students will be able to prepare the pipe connections and identify the various components used in plumbing.  
• An ability to prepare simple wooden joints using wood working tools.  
• An ability to prepare simple lap, butt and tee joints using arc welding equipments.  
• An ability to prepare simple components using lathe and drilling machine.  

PART A – MECHANICAL AND CIVIL ENGINEERING PRACTICES  

I   PLUMBING WORKS:  5  
Study of components related to plumbing.  
Hands-on-exercise:  
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.  

II   CARPENTRY PRACTICES:  6  
Study of the joints in roofs, doors, windows and furniture.  
Hands-on-exercise:  
Wood work, joints by sawing, planning and cutting.  

III  WELDING:  5  
Study of the tools used in welding Gas welding practice.  
Preparation of butt joints, lap joints and tee joints using arc welding.  

IV  BASIC MACHINING:  7  
(a) Simple Turning and Taper turning.  
(b) Drilling Practice.  

REFERENCES  
PART B – ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

COURSE OUTCOMES

• An ability to develop familiarity with rudimentary measurement equipment – signal generators, oscilloscopes, multimeters and power supplies.

• Ability to demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) based on their physical parameters and dimensions.

• Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates.

• An ability to predict qualitatively and quantitatively compute the steady state AC responses of basic circuits using the phasor method.

• Gain experience in the documentation of measurements and procedures as well as the preparation of formal reports.

I ELECTRICAL ENGINEERING PRACTICE 10

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
5. Measurement of energy using single phase energy meter.

II ELECTRONICS ENGINEERING PRACTICE 12

1. Study of Electronic components and equipments – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO
2. Study of logic gates AND, OR, XOR and NOT.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES

13A20  TECHNICAL ENGLISH – II  
(Common to all B.E. / B.Tech., Degree Programmes)  

COURSE OUTCOMES  
The student will be able to  
• apply correct form of language while Speaking and Writing.  
• prepare his own Professional letter writings.  
• interpret any passage after listening.  
• interact at different situations fluently.  

UNIT I  
Language Focus: Homonyms, Different grammatical forms of the same word, correct usage of words / phrases.  
Writing: Recommendation writing.  
Listening: Interpreting Poetic lines.  
Speaking: Telephone English.  

UNIT II  
Language Focus: Cause and Effect, Phrasal Verbs.  
Listening: Conversations.  
Speaking: Asking questions.  

UNIT III  
Language Focus: Idioms and Phrases with animal names.  
Writing: Checklist, Process Description.  
Speaking: Presentations.  

UNIT IV  
Language Focus: Technical Definitions, Transformation of Sentences.  
Writing: Job Application Letter, Curriculum Vitae, Bio-data, Resume.  
Speaking: Mock Interview.  

UNIT V  
Language Focus: British and American Vocabulary, Numerical Expressions.  
Writing: E-mail Writing, Report Writing.  
Speaking: Group Discussion.  

SUGGESTED ACTIVITIES  
1. Making sentences using different grammatical forms of the same word.  
2. Exercises on combining sentences using Cause and Effect expressions.  
4. Writing exercises on Recommendations.  
5. Exercises on Idioms and Phrases.  
7. Exercises on British and American English words with meanings.  

TOTAL: 45 PERIODS  

BOOK SUGGESTED FOR READING  

REFERENCES
13A21 INTEGRAL CALCULUS AND TRANSFORMS  
(Common to all B.E. / B.Tech., Degree Programmes)  
L T P C  
3 1 0 4

COURSE OUTCOMES

• Ability to find area and volume of objects using double and triple integrals.
• Ability to analyze the concepts related to vector calculus and to apply them in engineering field.
• Ability to perform the ideas of Laplace transform and Z-transform in their respective engineering subjects.

UNIT I MULTIPLE INTEGRALS  
12
Double integration – Cartesian and polar coordinates; Change of order of integration; Change of variables between cartesian and polar coordinates; Triple integration in cartesian coordinates; Area as double integral; Volume as triple integral.

UNIT II VECTOR CALCULUS  
12
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields; Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III LAPLACE TRANSFORM  
12

UNIT IV INVERSE LAPLACE TRANSFORM  
12
Definition of Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transformation techniques and solution of simultaneous differential equations of first order with constant coefficients using Laplace transformation techniques.

UNIT V Z – TRANSFORM  
12

TEXT BOOKS

REFERENCES
13A22 MATERIALS SCIENCE
(Common to Mechanical and Civil)

COURSE OUTCOMES
The Student will

- identify the crystal lattices, their structures and how the structure influences its major properties at different levels.
- choose the major functional and structural properties required for specific applications of conducting materials
- check the parameters that satisfy the superconducting behaviours.
- relate technology to the physics of semiconductor devices.
- understand the physics underlying the magnetic behaviour of materials.
- Explain the mechanism by which electric field interacts with materials and their applications
- suggest materials based concepts to improve the properties and performance under given circumstances.

UNIT I    CRYSTAL PHYSICS
Lattice, Unit cell, Bravais lattice, Lattice planes; Miller indices – d-spacing in cubic lattice; Calculation of number of atoms per unit cell, Atomic radius, Coordination number and Packing factor for SC, BCC, FCC and HCP structures; Crystal defects – point, line and surface defects; Burger vector.

UNIT II   CONDUCTING MATERIALS AND SUPERCONDUCTORS
 Conductors
 Superconductors
Superconductivity: Properties – Meissner effect – Isotopic effect; Types of superconductors – Type I and Type II superconductors; Applications of superconductors – Magnetic levitation.

UNIT III   SEMICONDUCTORS
Intrinsic semiconductor – carrier concentration derivation – Fermi level – variation of Fermi level with temperature – electrical conductivity – bandgap determination; Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration; Hall effect – Determination of Hall coefficient – Applications.

UNIT IV   MAGNETIC MATERIALS AND DIELECTRIC MATERIALS
 Magnetic materials
 Dielectric materials
Electrical susceptibility, dielectric constant, Types of Polarization – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarization; Internal field – Clausius-Mosotti relation (derivation); dielectric loss, dielectric breakdown, Uses of dielectric materials in capacitor and transformer.

UNIT V   NEW ENGINEERING MATERIALS
Metallic glasses: preparation, properties and applications; Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA; Nano materials: synthesis – chemical vapor deposition – sol-gels – ball milling; properties of nano particles and applications; Solar cell – PN junction solar cell – Conversion efficiency and solar concentration – Hetero junction solar cell; Classification of Biomaterials and its applications.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13A23 CHEMISTRY FOR MECHANICAL ENGINEERING

COURSE OUTCOMES
The students can
• apply thermodynamic concepts for the given thermal system.
• apply the concept of phase rule for the manufacture of engineering materials.
• extend and deepen the knowledge on different types of fuels and flue gas composition.
• select proper engineering materials for desired engineering application.
• choose proper analytical technique to analyse the engineering material.

UNIT I THERMODYNAMICS 9
Terminology; internal energy – zeroth law; first law of thermodynamics: mathematical form of first law – limitations; reversible isothermal expansion of an ideal gas; heat capacity: definition, relationship between $C_v$ and $C_p$; Kirchoff’s equation; enthalpy; entropy: entropy change in reversible and irreversible process; free energy: Gibbs free energy – Helmholtz work function; second law of thermodynamics: Gibbs-Helmholtz equation – derivation – problems; Van’t-Hoff isotherm: Derivation – Van’t-Hoff isocore – problems.

UNIT II PHASE RULE AND POWDER METALLURGY 9

UNIT III FUELS AND COMBUSTION 9

UNIT IV ENGINEERING MATERIALS 9
UNIT V ANALYSIS OF MATERIALS
Microscopic analysis: Scanning Electron Microscopy (SEM): principle – instrumentation (block diagram only) – applications; Tunneling Electron Microscopy (TEM): principle – instrumentation (block diagram only) – applications; thermogravimetry (TG): definition, instrumentation (block diagram only), characteristics of thermogram, factors influencing thermogravimetry, analyzing limestone thermogram, applications; Atomic Absorption Spectroscopy (AAS): principle – instrumentation (block diagram only), estimation of nickel by AAS; flame photometry: principle – instrumentation (block diagram only), estimation of sodium by flame photometry.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13A24

ENGINEERING MECHANICS
(Common to Mechanical and Civil)

L  T  P  C
3  1  0  4

COURSE OUTCOMES

• An ability to use the basic concept of force systems and solve problems.
• An ability to implement the knowledge acquired in supports, reactions, equilibrium of rigid bodies for solving problems.
• The students gain an ability to predict centre of gravity, moment and product moment of inertia of simple configurations.
• An ability to solve practical problems on Projectiles, Newton’s laws, work-energy and impulse momentum.
• An ability to apply the principles of friction and rigid body dynamics to analyze and solve problems.

UNIT I  BASICS AND STATICS OF PARTICLES


UNIT II  EQUILIBRIUM OF RIGID BODIES


UNIT III  PROPERTIES OF SURFACES AND SOLIDS

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section – Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem.

UNIT IV  DYNAMICS OF PARTICLES


UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS


L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOK


REFERENCES

13A25  BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to Mechanical and Civil)  L T P C
13A25  3 1 0 4

COURSE OUTCOMES
• Describe the basic concepts of electric circuits and measuring instruments.
• Discuss the principle of electrical machines.
• Summarize the concepts of semiconductor devices and electronic circuits.
• Solve basic binary operations and code conversion techniques using the logic gates.
• Explain the fundamentals of communication engineering.

UNIT I  ELECTRICAL CIRCUITS AND MEASUREMENTS  12
Ohm’s Law – Kirchoff’s Laws – Steady State Solution of DC Circuits – Introduction to AC
Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase
Balanced Circuits.
Operating Principles of Moving Coil and Moving Iron Instruments (Ameters and Voltmeters),
Dynamometer type Wattmeters and Energy meters.

UNIT II  ELECTRICAL MACHINES  12
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC
Motors, Single Phase Transformer, Single Phase Induction Motor.

UNIT III  SEMICONDUCTOR DEVICES AND APPLICATIONS  12
wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC

UNIT IV  DIGITAL ELECTRONICS  12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops –
Registers and Counters – A/D and D/A Conversion

UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING  12
Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of
Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave,
Satellite and Optical Fibre (Block Diagram Approach only).

L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13A26   COMPUTER PROGRAMMING LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to:
- Demonstrate how to use the UNIX Shell commands.
- Use the Shell programming constructs.
- Learn tracing mechanisms (for debugging), user variables, Shell variables, read-only variables, positional parameters, reading input to a Shell script.
- Test on numeric values, test on file type, and test on character strings using shell scripts.
- Write moderately complex Shell scripts and make them executable.

Execute programs written in C under UNIX environment.

LIST OF EXPERIMENTS

1. Study of UNIX OS, vi Editor.

2. Use of Basic UNIX Shell Commands:
   - ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.

3. Shell Programming:
   - i. Interactive shell scripts
   - ii. Positional parameters
   - iii. Arithmetic Operators
   - iv. if-then-fi, if-then-else-fi, nested if-else
   - v. Logical operators
   - vi. if - elif, case structure
   - vii. while, until, for loops, use of break
   - viii. Metacharacters

4. Shell scripts for the following:
   - i. Showing the count of users logged in
   - ii. Printing column wise list of files in your home directory
   - iii. To count lines, words and characters in its input (do not use wc)

5. C Programming on UNIX:
   - i. Dynamic Storage Allocation
   - ii. Pointers
   - iii. Functions
   - iv. File Handling

TOTAL: 45 PERIODS

SOFTWARE REQUIREMENTS
- UNIX/LINUX OS
- Gcc compiler
13A27  PHYSICS AND CHEMISTRY LABORATORY – II
(Common to all B.E. / B.Tech., Degree Programmes)

PART A - PHYSICS LABORATORY – II

COURSE OUTCOMES
At the end of the Laboratory classes, the students
• demonstrate and report the elastic behaviour of materials
• demonstrate the interference property of light waves
• demonstrate the diffraction property of light waves
• measure the thermal properties of conducting materials
• identify the substance that deforms continuously when subjected to shearing stress.

LIST OF EXPERIMENTS
1. Determination of Young’s modulus – Uniform bending method.
2. Determination of Band Gap of a semiconductor material.
3. Determination of Hall Co-efficient.
5. Determination of wavelength of mercury spectrum using spectrometer and grating
7. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.

• A minimum of FIVE experiments shall be offered.

PART B - CHEMISTRY LABORATORY – II

COURSE OUTCOMES
The student
• can estimate the amount of alkalinity and Dissolved Oxygen (DO) present in the water sample.
• gain knowledge in the estimation of copper in an alloy and iron in rust.
• quantify electrolyte and ion by measuring the conductance and emf.

LIST OF EXPERIMENTS
1. Estimation of copper in brass by EDTA method.
2. Determination of Dissolved Oxygen (DO) in water (Winkler’s method)
3. Estimation of alkalinity of Water sample
4. Estimation of Fe^{2+} ion in rust by Dichrometry
5. Conductometric titration (Mixture of acids vs NaOH)
6. Potentiometric Titration (Fe^{2+} vs K_2Cr_2O_7)
7. Estimation of Fe^{2+} ion by spectrophotometry.

TOTAL: 45 PERIODS

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.

13A28  COMPUTER AIDED DRAFTING AND MODELING LABORATORY
(Common to Mechanical and Civil)

L T P C
0 1 2 2
COURSE OUTCOMES

- An ability to use software for constructing curves, solids.
- An ability to create orthographic views and sectional view of the solids.
- An ability to create plan of residential building.
- An ability to draw isometric and pictorial views.

List of exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola involutes using Bspline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL: 45 PERIODS

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students

1. Pentium IV computer or better hardware with suitable graphics facility – 30 Nos.
2. Licensed software for Drafting and Modeling – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 Nos.
13A29 ENGLISH LANGUAGE SKILL LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)  

L T P C
0 0 3 2

COURSE OUTCOMES
The Student will
• improve their pronunciation skill.
• gather information from any speech.
• imbibe the stress and intonation of the native speakers’ accent.

1. Micro Skills
- Spotting the Homonyms / Silent letter words / mispronounced words
- Identifying the missing words in native speech
- Finding the cluster words
- Marking correct punctuation
- Marking word chunks
- Identification of sentences

2. Content Comprehension and making inferences
- Listening to audio files of Speech, Poetry, Recent Issues, News clippings, etc
  a. True / False
  b. Multiple Choice Questions
  c. Filling the blanks
  d. Filling the charts

3. Listen and Act
- Drawing the map using audio
- Picture completing task
- Transferring data to Graph

4. Interpreting the video clippings

5. Listening to Conversations

TOTAL: 30 PERIODS
13ME31        FOURIER TRANSFORMS AND COMPLEX ANALYSIS        L T P C
                                                        3 1 0 4

COURSE OUTCOMES
On successful completion of the course, the students should be able to
• Perform Fourier series analysis of the functions.
• Implement the properties of Fourier transforms and Compute the Fourier transforms of
  various functions.
• Calculate the Fourier series solution of Wave and Heat equations.
• Grasp analytic functions and their properties and be introduced to the host of conformal
  mappings with suitable examples that have direct applications.
• Understand the basics of complex integration and the concept of contour integration
  encountered in practice.

UNIT I       FOURIER SERIES
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range Sine series –
Half range Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic analysis.

UNIT II      FOURIER TRANSFORMS
Fourier Integral theorem (without proof) – Fourier transform pair – Fourier Sine and Cosine
transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s
identity.

UNIT III     APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Solutions of one dimensional wave equation – One dimensional equation of heat conduction– Steady
state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier
series solutions in Cartesian coordinates.

UNIT IV      ANALYTIC FUNCTIONS
Functions of a complex variable – Analytic functions – Necessary and Sufficient conditions
(excluding proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate
– Construction of analytic functions – Conformal mapping: w= z+c, cz, 1/z and bilinear
transformation.

UNIT V       COMPLEX INTEGRATION
Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral
formula (excluding proofs) – Taylor’s and Laurent’s expansions – Singular points – Residues –
Residue theorem (excluding proof) – Application of residue theorem to evaluate real integrals – Unit
circle and semi-circular contour(excluding poles on boundaries).

TEXT BOOK

REFERENCES
New Delhi, 2007).
13ME32 ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common to all B.E./B.Tech. Degree Programmes)

COURSE OUTCOMES
Upon successful completion of course the student will be able to
- Understand the various ecosystem and biodiversity
- Classify the different types of natural resources and identify the role of individual in conservation of resources
- Identify and analyse the causes, effects and control measures of environmental pollution
- Identify the different types of environmental hazards and their management
- Analyse the social issues related to the environment and how human population affect the environment

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers– energy flow in the ecosystem – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic (pond) ecosystems. Field study of simple ecosystems –pond and forest. Introduction to biodiversity: definition - genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –India as a mega-diversity nation – hot spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation. Field study of common plants, insects, birds.

UNIT II NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide Problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, case studies – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT III ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – e-Waste: Definition-dimension of the problem - source-toxic Substances in e-waste - risks related to toxic substances–environmental problems-role of an individual in prevention of pollution.

UNIT IV ENVIRONMENTAL HAZARDS
Environmental hazards: Definition – Hazard- Types-Natural and man-made hazards – Natural hazards: Causes, effect and management of Earthquake, Flood, Landslide, Cyclones and Tsunami; Man-made Hazards: Hazards due to dams and reservoirs, hazards due to nuclear power plant, Industrial hazards. Case study: Chernobyl disaster, Bhopal gas tragedy.

UNIT V SOCIAL ISSUES, HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
13ME33                      ENGINEERING THERMODYNAMICS                      L T P C
                                                                 3 1 0 4

COURSE OUTCOMES
On successful completion of this course, the student will be able to
- State and illustrate the first and second laws of thermodynamics.
- Identify and explain the concepts of entropy, enthalpy, specific energy, reversibility, and
  irreversibility.
- Apply the first and second laws of thermodynamics to formulate and solve engineering
  problems for (i) closed systems, (ii) open systems under steady state and transient
  conditions and (iii) power cycles.
- Use thermodynamic tables, charts, and relations to obtain appropriate property data to solve
  thermodynamics problems.

UNIT I   BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS                  12
Continuum - microscopic and macroscopic approach - thermodynamic system (closed and open
system) - thermodynamic properties and equilibrium.  
Point and Path functions - different modes of work - concept of temperature – heat - First law applied
to systems and control volumes - steady and unsteady flow analysis.

UNIT II   SECOND LAW OF THERMODYNAMICS                            12
Kelvin-Planck and Clausius statements - reversible and irreversible processes - Carnot theorems
- thermodynamic temperature scale, Clausius inequality and concept of entropy, principle of increase of
entropy; availability and irreversibility.

UNIT III   PROPERTIES OF PURE SUBSTANCES                              12
Thermodynamic properties of pure substances in solid, liquid and vapour phases - phase-change
processes of pure substances - thermodynamic property tables and charts for steam - use of
compressibility chart.

UNIT IV   THERMODYNAMIC CYCLES                              12
Carnot cycle – Ideal Rankine cycle – Reheat and Regenerative cycles. Air standard Cycles – Otto,
Diesel, Dual and Brayton cycles. Vapour compression refrigeration cycle.

UNIT V     PSYCHROMETRY                   12
Dry and atmospheric air – specific and relative humidity – dew point temperature – adiabatic
saturation- wet bulb temperature – psychrometric chart – psychrometric processes.

L: 45    T: 15    TOTAL: 60 PERIODS

TEXT BOOK
1. Yunus A. Cengel and Michael A. Boles, “Thermodynamics – An Engineering Approach”, 7th

REFERENCES
   India Private Limited, 2010.
   http://nptel.ac.in/video.php?subjectId=112105123
13ME34 MECHANICS OF MATERIALS L T P C
3 1 0 4

COURSE OUTCOMES
On successful completion of this course, the student will be able to
- Understand and design simple load carrying members subjected to an axial, shear and thermal loading.
- Understand stress tensor and to analyze Bi-axial stresses using Mohr’s circle.
- Assess stresses and deformations in beams and columns subjected to different loadings.
- Analyze and design springs, thin pressure vessels and shafts subjected to simple loadings.
- Design simple load carrying elements for engineering applications.

UNIT I STRESS STRAIN DEFORMATION OF SOLIDS 12

UNIT II ANALYSIS OF STRESSES IN TWO DIMENSIONS 12
Stress tensor, Bi-axial stresses at a point – Stresses on inclined plane, Principal planes and stresses, Mohr’s circle for biaxial stresses – Maximum shear stress. Evaluation of hoop stress and longitudinal stress in thin cylindrical and spherical shells.

UNIT III BEAMS 12
Shear force and Bending Moment diagrams for Cantilever, Simply supported and Overhanging beams under point load and UDL. Theory of simple bending and assumptions. Section Modulus – Flitched beams.

UNIT IV DEFLECTION OF BEAMS AND COLUMNS 12

UNIT V TORSION 12

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13ME35 MANUFACTURING TECHNOLOGY – I  L  T  P  C
3  0  0  3

COURSE OUTCOMES:

Upon successful completion of this course, the student will be able to
• Gain the knowledge about the various methods of casting and specific products fabrication
• Get the ability to identify and select respective metal joining process for the on hand task.
• Get aware on the metal forming methods and the respective machineries which are involved on those processes
• Gain knowledge on the process of sheet metal processing and its commercial applications
• Get aware on the polymer processing for various industrial and domestic applications.

UNIT I METAL CASTING PROCESSES  9

UNIT II JOINING PROCESSES  9

UNIT III BULK DEFORMATION PROCESSES  9

UNIT IV SHEET METAL PROCESSES  9

UNIT V MANUFACTURING OF PLASTIC COMPONENTS  9

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES
13ME36  ELECTRICAL DRIVES AND CONTROLS  L  T  P  C
3  1  0  4

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Describe the concept of basic concepts of different types of electrical machines and their performance.
- Discuss the construction, working Principle, characteristics and applications of single phase and three phase induction motor.
- Illustrate the various types of D.C. motor starters.
- Identify the importance of Speed control of DC series and shunt motors.
- Discriminate the various methods of speed control of A.C. Drives.

UNIT I  INTRODUCTION  12
Basic Elements – Types of Electric Drives – factors influence the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

UNIT II  DRIVE MOTOR CHARACTERISTICS  12
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

UNIT III  STARTING METHODS  12
Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNIT IV  CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES  12
Speed control of DC series and shunt motors – Armature and field control, Ward - Leonard control system - Using controlled rectifiers and DC choppers – applications.

UNIT V  CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES  12
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13ME37 MATERIALS TESTING LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Evaluate elastic constants experimentally for different materials subjected to direct, shear and bending
- Enumerate hardness and impact resistance of the materials before and after heat treatment
- Analyze, strength and stiffness of helical coil springs
- Examine the materials for engineering applications.

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Single shear and Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen: Charpy and Izod Test
5. Hardness test - Brinnell, Rockwell and Vickers Hardness Test.
6. Deflection test on Timber beams
7. Test on open coil and closed coil springs
8. Effect of hardening- Improvement in hardness and impact resistance of steels.
9. Tempering- Improvement Mechanical properties Comparison
   (i) Unhardened specimen
   (ii) Water quenched Specimen

LIST OF EQUIPMENTS (for a batch of 30 students)
1. Universal Tensile Testing machine – 1 No
2. Shear attachment – 1 No
3. Torsion Testing Machine – 1 No
4. Impact Testing Machine – 1 No
5. Brinell hardness Testing Machine – 1 No
6. Rockwell Hardness Testing Machine 1 No
7. Vickers hardness Testing Machine – 1 No
8. Spring Testing Machine for tensile and compressive loads – 1 No
9. Muffle Furnace – 1 No

TOTAL: 45 PERIODS
13ME38  ELECTRICAL ENGINEERING LABORATORY  

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Describe the load characteristics of different DC machines
- Analyze the characteristics of AC rotating machines
- Illustrate the various types of starters for DC and AC machines
- Describe the characteristics of transformer
- Demonstrate the speed control practices associated with DC and AC machines

LIST OF EXPERIMENTS
1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load Characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor
11. Study of DC & AC Starters

TOTAL: 45 PERIODS
13ME39 COMMUNICATION SKILLS AND TECHNICAL SEMINAR (Common to all B.E./B.Tech. Degree Programmes) 0 0 3 2

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Express themselves fluently and appropriately in social and professional contexts.
- Develop the sub-skills required for paper presentations and group discussions.
- Acquire the soft skills and interpersonal skills which will help them to excel in their workplace.

A) LANGUAGE FUNCTIONS (15 hrs)
1. Compare and contrast
2. Giving reasons
3. Reporting
4. Expressing agreement and disagreement
5. Evaluating different standpoints
6. Analyzing a problem and giving solution.
7. Describing daily routines, events, and weather
8. Describing Objects
9. Defending a point of view
10. Talking about future plans and intentions

Language Functions:
The teacher should build micro activities to develop the use of language required to handle these Sub-functions of communication. In the process, the learners should get used to the linguistic Elements needed for these functions.

B) SPEECH PRACTICE (15 hrs)
The themes are:
1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Nano Technology
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines
21. Indian space missions
22. Converting agricultural wastes for useful purposes
23. Developments in transportation
24. Scientific Farming
25. Impact of global warming
26. Desalination of water
27. Technology for national security
28. Industrial development and ecological issues
29. Recent trends in Automobiles
30. Hazards of E-waste
31. Mobile Jammer
32. Touch Screen Technology
33. Tidal Power
34. 3G Technology
35. Tsunami Warning System
36. Blue Tooth Technology

Seminar presentation on the themes allotted:
Each student should collect materials from Books, Internet, Journals and Newspapers for his/her theme and prepare a short Seminar Paper for 4 to 5 Pages. The presentation should be for 10 minutes using power point frames. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate.

C) GROUP DISCUSSION / DEBATE
(10hrs)
Grouping (each group consisting of 12 members)
Topics (12 topics – 3 topics to be selected by each group - to be practiced in cycles)

Group Discussion / Debate Topics:
1. Advertising is a legalized form of lying- Discuss.
2. Communicative competency in English is the golden key for success in the Global arena.
3. Is it just to force people to retire?
4. Attitude decides one’s attitude in life.
5. Should an aspiring student go for a course which is in demand or for a course which he/she likes?
6. Is westernization a cultural degradation or enrichment?
7. Is Brain drain a threat to India?
9. Do Mobile phones spoil the youth?
10. No two generations see eye to eye- Discuss.
11. Is scientific advancement a boon or a bane?
12. Does ragging develop friendship?

D) SPEAKING ON THE GIVEN PICTURE/DIAGRAM/CHART/TABLE
(5 hrs)

Every student has to maintain a record in which he/she has to incorporate the following details.

- First page containing learner details and the topic of specialization
- Use of appropriate Language used in Language Function should be listed.
- Three newspaper cuttings or journal or internet sources related to the specialized theme.
  (To be pasted on the pages)
- 10 Quiz questions of the specialized topic with expected answers.
- The seminar paper presented by the learner (to be pasted).
- Notes of observation - Lab. (Details about Interview skills – GD – Soft skills)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practical.

TOTAL: 45 PERIODS

REFERENCES:
13ME41 PROBABILITY, STATISTICS AND NUMERICAL METHODS  L  T  P  C  
3  1  0  4

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Understand the concepts of probability, random variables and their distributions.
- Apply the concepts of estimation (confidence intervals) and hypothesis testing for population averages and percentages.
- Analyze the appropriate tabular for displaying design of experiments.
- Use numerical techniques for solving linear system of equations and numerical integration problems.
- Demonstrate the utility of numerical techniques of ordinary differential equations.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES AND ITS DISTRIBUTIONS  12
Discrete and continuous random variables –Moments, Moment generating functions and their properties - Discrete distributions: Binomial and Poisson – Continuous distribution: Normal distribution.

UNIT II TESTING OF HYPOTHESIS  12
Sampling distributions - Tests for single mean, Proportion, Difference of means (for large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes.

UNIT III DESIGN OF EXPERIMENTS  12
Completely randomized design – Randomized block design – Latin square design.

UNIT IV SOLUTION OF EQUATIONS AND NUMERICAL INTEGRATION  12

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  12

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13ME42        FLUID MECHANICS AND MACHINERY     L T P C
                        3 1 0 4

COURSE OUTCOMES:
On Successful completion of the course, the students will be able to

• Use Euler’s and Bernoulli’s equations and the conservation of mass to determine velocities, pressures, and accelerations for incompressible fluids.
• Determine flow rates, pressure changes, minor and major head losses for viscous flows through pipes, ducts.
• Apply dimensional analysis techniques in fluid mechanics problems.
• Evaluate the performance of axial and radial turbines.
• Evaluate the operation and performance of centrifugal and reciprocating pumps.

UNIT I      INTRODUCTION                        12
Units and Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equation, energy equation, momentum equation and moment of momentum equation. Bernoulli’s equation – applications - Venturi meter, Orifice meter, Pitot tube

UNIT II     FLOW THROUGH CIRCULAR CONDUITS         12

UNIT III    DIMENSIONAL ANALYSIS                              10
Dimension and units: Buckingham’s II theorem. Discussion on dimensionless parameters. Models and similitude - Applications of dimensionless parameters.

UNIT IV     HYDRAULIC TURBINES                    13

UNIT V      HYDRAULIC PUMPS                       13
Pumps: definition and classifications - Centrifugal pump: classifications, working principles, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principles, indicator diagram and work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13ME43 KINEMATICS OF MACHINERY

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
- Understand the concept of machines, mechanisms and related terminologies.
- Analyse a mechanism for displacement, velocity and acceleration at any point in a moving link
- Understand the role of friction in drives and brakes.
- Understand the theory of gears, gear trains and cams

UNIT I BASICS OF MECHANISMS
Definitions – Link, Kinematic pair, Kinematic chain, Mechanism, and Machine - Degree of Freedom – Mobility - Kutzbach criterion (Gruebler’s equation) - Grashoff’s law- Kinematic Inversions of four-bar chain and slider crank chain - Mechanical Advantage- Transmission angle. Description of common Mechanisms - Offset slider mechanism as quick return mechanisms, Pantograph, Straight line generators (Peaucellier and Watt mechanisms), Steering gear for automobile.

UNIT II KINEMATIC ANALYSIS
Displacement, velocity and acceleration analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism) - Graphical Methods for relative velocity and acceleration polygons - Coincident points – Coriolis acceleration - Approximate analytical expression for displacement, velocity and acceleration of piston of reciprocating engine mechanism.

UNIT III FRICTION DRIVES
Belt and rope drive – Open and cross belt drive – Belt materials – Creep and slip - Ratio of tensions – Effect of centrifugal force – condition for maximum power – Friction in Journal Bearing - Flat pivot bearing - Friction clutches – Single plate -Multi plate -Brakes - Shoe brake and Internal Expanding brake only.

UNIT IV KINEMATICS OF CAMS
Types of cams and followers - Displacement diagrams - Parabolic, Simple harmonic and uniform acceleration and retardation motions - Graphical construction of displacement diagrams and layout of plate cam profiles for reciprocating and oscillating motions with Knife-edge, roller and flat- faced followers - circular arc and tangent cams - Pressure angle and undercutting.

UNIT V GEARS
Types - Spur gear terminology and definitions – Pressure angle and undercutting - Law of gearing – Length of path of contact and contact ratio - Gear profiles (involute and cycloid) – Interference and undercutting – Minimum number of teeth to avoid interference - Gear trains – Simple, compound and Epicyclic gear trains - Differentials.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS
REFERENCES

BIS Codes of Practice/Useful Websites
1. IS 2458 : 2001, Vocabulary of Gear Terms – Definitions Related to Geometry
13ME44 MANUFACTURING TECHNOLOGY – II  

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
• Gain the basic knowledge about the metal removal process and respective industrial standards
• Gain the knowledge about the centre lathe, its accessories and relative operations which are performed in machine shop.
• Aware on the constructional features and operating methods of various special purpose machine tools
• Gain knowledge on surface machining processes, design and fabrication of important machine elements
• Gain knowledge on CNC machining, respective equipment and its parts also will get ability to develop CNC programs for machining of materials

UNIT I THEORY OF METAL CUTTING  

UNIT II CENTRE LATHE AND SPECIAL PURPOSE LATHES  
Centre lathe, constructional features, various operations, taper turning and thread cutting methods, machining time and power estimation. Capstan and turret lathes – Turret Indexing mechanism, bar feeding mechanism. Single spindle automatic lathes- Introduction to copying systems and transfer machines.

UNIT III SPECIAL MACHINE TOOLS  

UNIT IV ABRASIVE PROCESSES AND GEAR CUTTING  

UNIT V CNC MACHINE TOOLS AND PART PROGRAMMING  

L: 53  T: 07  TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
On Successful completion of the course, the students will be able to
• Attain the knowledge on structure and properties of materials.
• Attain skill to use phase diagrams and know presence of various phases with the addition of alloying elements.
• Attain the capability to test various properties of materials. Also obtain knowledge to select appropriate materials for different applications and environmental conditions.
• Obtain knowledge on different heat-treatment procedures for various materials.
• Acquire knowledge about plastics, ceramics and composites which are replacing metallic materials in several machineries.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS

UNIT II MECHANICAL PROPERTIES AND TESTING

UNIT III HEAT TREATMENT

UNIT IV FERROUS AND NON FERROUS METALS

UNIT V NON-METALLIC MATERIALS

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
13ME46          ELECTRONICS AND MICROPROCESSOR          L  T  P  C  
                                                                3  0  0  3 

COURSE OUTCOMES  
On Successful completion of the course, the students will be able to  
• Summarize the fundamental concepts of Rectifier & Power Supply Circuits  
• Acquire knowledge about transistor biasing, amplifiers and negative feedback concepts  
• Demonstrate Boolean functions using K-map, counter using flip flop  
• Generalize the Architecture of 8085 Microprocessors  
• Illustrate the concept of Assembly language and interfacing programs  

UNIT I  RECTIFIERS AND POWER SUPPLY CIRCUITS  9  
Half wave and Full wave rectifier analysis - Inductor filter – Capacitor filter – Series voltage regulator  
– Switched mode power supply  

UNIT II  TRANSISTORS AND AMPLIFIERS  9  
Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits - Class A,B and C amplifiers - Configuration and characteristic of FET and SCR - Concept of Negative feedback-Voltage / current, series/shunt feedback  

UNIT III  DIGITAL ELECTRONICS  12  
Basic digital circuits AND - OR - NAND - NOR - EX-OR - EX-NOR operations- Representation and simplification of logic functions using K Map - Four variable -Don’t care conditions - Flip-flops - SR, JK, D, T, and Master-Slave JK – Characteristic table and equation , Realization of one flip flop using other flip flops Asynchronous and Synchronous Up/Down counter  

UNIT IV  8085 MICROPROCESSOR  9  
Block diagram of microcomputer-Architecture of 8085 - Pin configuration - Instruction set-Addressing modes - Simple programs using arithmetic and logical operations  

UNIT V  INTERFACING AND APPLICATIONS OF MICROPROCESSOR  6  
Basic interfacing concepts - Interfacing of Input and Output devices - Applications of microprocessor Temperature control, Stepper motor control and Traffic light control  

TOTAL: 45 PERIODS  

TEXT BOOKS  

REFERENCES:  
13ME47 FLUID MECHANICS AND MACHINERY LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES
On Successful completion of the course, the students will be able to
• Apply Bernoulli’s equations in flow experiments to determine the coefficient of discharge.
• Determine flow rates, pressure changes, and minor and major head losses for viscous flows through pipes.
• Evaluate the performance of turbines.
• Evaluate the operation and performance of different types of pumps

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of losses in pipes.
5. Conducting experiments and drawing the characteristic curves of single and multi stage Centrifugal pump.
6. Conducting experiments and drawing the characteristic curves of Reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel turbine.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
11. Study on Bernoulli’s theorem apparatus.

LIST OF EQUIPMENTS
1. Orifice meter setup
2. Venturi meter setup
3. Rotameter setup
4. Pipe Flow analysis setup
5. Centrifugal pump/submergible pump setup
6. Reciprocating pump setup
7. Gear pump setup
8. Pelton wheel setup
9. Francis turbine setup
10. Kaplan turbine setup
11. Bernoulli’s theorem apparatus

Quantity: One each.

TOTAL: 45 PERIODS
COURSE OUTCOMES

On Successful completion of the course, the students will be able to

• Gain hands on experience on working of general purpose machine tools and on various manufacturing processes.
• Gain practical hand on exposure to students in the various metal cutting operations using commonly used machine tools.

(Atleast minimum of 2 exercises in each section and put together 12 exercises)

UNIT I   LATHE
1.1. Facing, plain turning and step turning.
1.2. Taper turning using compound rest, Tailstock set over, etc.
1.3. Single and Multi-start V thread, cutting and knurling.
1.4. Boring and internal thread cutting.

UNIT II   WELDING AND SHEET METAL WORK EXCERCISES
2.1. Horizontal, Vertical and overhead welding.
2.2. Gas Cutting, Gas Welding.
2.3. Fabrication of sheet metal tray/ funnel.

UNITIII   PREPARATION OF SAND MOULD
3.1. Mould with solid, split patterns.
3.2. Mould with loose-piece pattern.

UNIT IV SPECIAL MACHINES PART - I
4.1. Two or More Measurements in Metal Cutting Experiment (Example: Shear Angle, Cutting Force, Tool Wear etc.)
4.2. One or More Exercises in Shaper, Slotter, Planner, Drilling, Milling Machines (Example: Round to Square, Dovetail in shaper, Internal keyway cutting in Slotter, Round to square in Planner, Drilling, reaming and tapping in Drilling machine, Gear Milling and Keyway milling in Milling machine.)
4.3. Two or More Exercises in Grinding / Abrasive machining (Example: Surface Grinding, cylindrical Grinding.)

UNIT V SPECIAL MACHINES PART - II
5.1. Two or More Exercises in Assembly of Machined Components for different fits. (Example: Parts machined using Lathes, Shapers, Drilling, Milling, and Grinding Machines etc.)
5.2. One or More Exercises in Capstan or Turret Lathes.
5.3. One or More Exercises in Gear Machining (Example: Gear Milling, Gear Hobbing etc.)

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS
1. Centre Lathe with accessories 15

2. Welding
   2.1 Arc welding machine 04
   2.2 Gas welding machine 01
   2.3 Brazing machine 01
3. **Sheet Metal Work facility**
   - 3.1 Hand Shear 300mm 01
   - 3.2 Bench vice 05
   - 3.3 Standard tools and calipers for sheet metal work 05

4. **Sand moulding Facility**
   - 4.1 Moulding Table 05
   - 4.2 Moulding boxes, tools and patterns 05

5. **Plastic Moulding**
   - 5.1 Injection Moulding Machine 01

6. **Special Machines Part I and II**
   - 6.1. Turret and Capstan Lathes 01
   - 6.2. Horizontal Milling Machine 01
   - 6.3. Vertical Milling Machine 01
   - 6.4. Surface Grinding Machine 01
   - 6.5. Cylindrical Grinding Machine 01
   - 6.6. Shaper 02
   - 6.7. Slotter 01
   - 6.8. Planner 01
   - 6.9. Radial Drilling Machine 01
   - 6.10. Tool Dynamometer 01
   - 6.11. Gear Hobbing Machine 01
   - 6.12. Tool Makers Microscope 01