Vision of the Institution

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

Mission of the Institution

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

Vision of Mechanical Engineering Department

To foster prosperity through technological development by means of education, innovation and collaborative research.

Mission of Mechanical Engineering Department

- To produce effective and responsible graduate and post-graduate engineers for global requirements by imparting quality education.
- To improve the Department's infrastructure to facilitate research productivity and success.
- To integrate teaching and research for preservation and effective application of knowledge and skills.
- To strengthen and expand collaboration and partnerships with industry and other organizations.
- To provide consultancy to the neighborhood and inculcate a spirit of entrepreneurship.
- To serve society through innovation and excellence in teaching and research.

Program Educational Objectives(PEOs)

PEO1: Graduates apply a deep working knowledge of technical fundamentals in areas such as Design, Thermal, Production, Industrial and related fields to address needs of the customer and society.

PEO2: Graduates pursue advanced education, Research and Development in Engineering, Technology and other professional careers.

PEO3: Perform themselves in a responsible, professional and ethical manner.

PEO4: Graduates participate as leaders in their fields of specialization and in activities that contribute to service and overall economic development of society.

Program Outcomes(POs) of Mechanical Engineering Department

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO's):

PSO1: Able to apply the knowledge learned as a part of the curriculum to provide solutions for problems related to Mechanical Engineering.

PS**O**2: Think innovatively, design and develop products with modern CAD/CAM tools and with optimized manufacturing processes.

II Year I Semester

COMPUTER AIDED ENGINEERING DRAWING PRACTICE

L	T	P	C
3	3	0	3

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modelling.

UNIT-I:

Objective: The knowledge of projections of solids is essential in 3D modelling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing ofprojection.

PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT-II:

The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

SECTIONS OF SOLIDS: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

UNIT-III:

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

INTERPENETRATION OF RIGHT REGULAR SOLIDS: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

PERSPECTIVE PROJECTIONS: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced.

UNIT IV:

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT V:

By going through this topic the student will be able to understand the paper-space environment thoroughly. **VIEW POINTS AND VIEW PORTS:** view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint , singleoption.

UNIT VI:

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.

COMPUTER AIDED SOLID MODELLING: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

Course Outcomes:

1	Draw projections on auxiliary planes
2	Draw projections for sections of solids and intersections of solids
3	Students will gain the knowledge on surface developments for different solid shapes
4	Introduction to CAD.
5	Creating various 2D and 3D objects using AutoCAD

Text Books:

1. Engineering drawing by N.D Bhatt, Charotarpublications.
2. Engineering Graphics, K.C. john, PHIPublications

References Books :

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura,Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDCPubl.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan,vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, NewAge
5. Engineering Drawing – RK Dhawan, SChand
6. Engineering Drawing – MB Shaw, BC Rana,Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah,Scitech
8. Engineering Drawing – Agarwal and Agarwal, McGrawHill
9. Engineering Graphics – PI Varghese, McGrawHill
10. Text book of Engineering Drawing with auto-CAD ,K.Venkata Reddy/B.S .publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/PearsonPublications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHIPublications

End Semester examination shall be conducted for **Four** hours with the following pattern:

a) Two hours-Conventional drawing
b) Two hours – Computer Aided Drawing

II Year I Semester

FLUID MECHANICS & HYDRAULIC MACHINES

L	T	P	C
4	0	0	3

Objective: The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps andturbines.

UNIT I

***Objective: After studying this unit student will know the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques*.**

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostaticlaw.
Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies.Calculation of metacenter height.Stability analysis and applications.

UNIT II
Objective: In this unit student will be exposed to the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.
Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.
Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.
Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradientline.

UNIT III

Objective: At the end of this unit student will be aware of the concepts related to boundary layer theory, flow separation, basic concepts of velocity profiles, dimensionless numbers and dimensional analysis.
Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.
Dimensional Analysis: Similitude and modelling – Dimensionless numbers

UNIT IV
Objective: In this unit student will know the hydrodynamic forces acting on vanes and their performance evaluation.
Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT V

Objective: At the end of this unit student will be aware of the importance, function and performance of hydro machinery.

Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation &NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

UNIT VI

Objective: After studying this unit student will be in a position to evaluate the performance characteristics of hydraulic turbines. Also a little knowledge on hydraulic systems and fluidics is imparted to the student.

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube- theory- functions andefficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Course Outcomes:

1	Learnt the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques.
2	Learnt the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.
3	Learnt the concepts related to boundary layer theory, flow separation, basic conceptsof velocity profiles, dimensionless numbers and dimensional analysis.
4	Learnt about concepts of the hydrodynamic forces acting on vanes and their performance evaluation.
5	Understood the importance, function and performance of hydro machinery.
6	Is able to evaluate the performance characteristics of hydraulic turbines and also got idea about the general concept on hydraulic systems and fluidics are imparted to the student.

Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI andSETH.

2. Fluid Mechanics and Hydraulic Machines byRajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P)Ltd.

References Books :

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria&Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New AgeInternational.
3. Hydraulic Machines by Banga& Sharma, KhannaPublishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley ,John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid FlowMeasurements)
5. Fluid Mechanics and Hydraulic Machines by Domkundwar&Domkundwar, Dhanpatrai&Co.

II Year I Semester

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

L	T	P	C
4	0	0	3

Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-ProfitAnalysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.

- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgetingproposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:

Production and Cost Analysis:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

UNIT – IV:

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

UNIT – V:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow

method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

1	Gain knowledge in basic economic tools in managerial economics and demand analysis.
2	Understandandestimatethedemandelasticityanditsrelationshiptopricingandrevenue and markets
3	Analyze the production, cost concepts and organization forms and financial status
4	Understand the expenditure and capital budgeting in big industries.

Text Books:

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi –2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

References Books :

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House,2014.
2. V. Maheswari: Managerial Economics, SultanChand.2014
3. Suma Damodaran: Managerial Economics, Oxford2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications2011.
5. Sanjay Dhameja: Financial Accounting for Managers,Pearson.
6. Maheswari: Financial Accounting, VikasPublications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers,2012
8. Ramesh Singh, Indian Economy, 7thEdn.,TMH2015
9. PankajTandon A Text Book of Microeconomic Theory, Sage Publishers,2015
10. ShailajaGajjala and UshaMunipalle, Universities press,2015

II Year I Semester

MECHANICS OF SOLIDS

L	T	P	C
4	0	0	3

Objective: The students completing this course are expected to understand the basic terms like stress, strain, poisons ratio…etc and different stresses induced in beams, thin cylinders, thick cylinders, columns. Further, the student shall be able to understand the shear stresses in circular shafts.

UNIT – I

***Objective: After studying this unit student will know the basic terms like stress, strain poissons ratio…etc and stresses in bars of varying cross sections, composite bars, thermal stress in members, stresses on inclined planes with analytical approach and graphical approach, strain energy under different loadings and also problem solvingtechniques*.**

SIMPLE STRESSES &STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress– strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

Objective: After studying this unit student will know the construction of shear force diagrams and bending moment diagrams to the different loads for the different support arrangements and also problem solving techniques.

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Objective: After studying this unit student will know the bending and shear stress induced in the beams which are made with different cross sections like rectangular, circular, triangular, I, T angle sections and also problem solving techniques.

FLEXURAL STRESSES : Theory of simple bending – Assumptions – Derivation of bending equation: M/ I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT –IV

Objective: After studying this unit student will know how to finding slope and deflection for different support arrangements by Double integration method, Macaulay's method and Moment-Area and also problem solving techniques.

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams, Statically Indeterminate Beams and solution methods.

UNIT – V

Objective: After studying this unit student will know how a cylinder fails, what kind of stresses induced in cylinders subjected to internal, external pressures and also problem solving techniques.

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

THICK CYLINDERS: –lame's equation – cylinders subjected to inside & outside pressures –compound cylinders.

UNIT –VI

Objective: After studying this unit student will know shear stresses induced in circular shafts, discussing columns in stability point of view and columns with different end conditions.

TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

COLUMNS:

Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula,

COURSE OUTCOMES:

1 Student will know the basic terms like stress, strain, thermal stress, principal stresses, Strain energy, poissons ratio…etc and how these parameters varying across the uniform

and varying sections, composite bars, and relation between elastic constants.

2 Students can draw the SF and BM diagrams for various beams at different loading conditions & determine flexural stresses, shear stresses and section modulus of

rectangular, circular, triangular, I, T angle sections.

3	After the completion of this unit students can find the slope and deflection for different support arrangements by Double integration, Macaulay's and Moment area methods.
4	Students will identify when and how a cylinder fails subjected to internal and external pressures.
5	Students are able to calculate shear stress induced in circular shafts and buckling and stability of columns at different support conditions.
6	Students will have the ability to design structural members given the dimensions, material properties such as force-displacement relationships, boundary conditions, loading, allowable stresses, and factor of safety and Perform structural analysis

Text Books:

1. Strength of materials /GH Ryder/ McMillan publishers IndiaLtd
2. Solid Mechanics, byPopov
3. Mechanics of Materials/Gere and Timoshenko, CBSPublishers

ReferenceBooks:

1. Strength of Materials -By Jindal, UmeshPublications.
2. Analysis of structures by VaziraniandRatwani.
3. Mechanics of Structures Vol-III, byS.B.Junnarkar.
4. Strength of Materials byS.Timoshenko
5. Strength of Materials by Andrew Pytel and FerdinondL. SingerLongman.

II Year I Semester

METALLURGY & MATERIALS SCIENCE

L	T	P	C
4	0	0	3

Course Objective*: To understand the basic fundamentals of Material science and Physical metallurgy. The basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of thesociety.*

UNIT – I

Learning Objectives: *To know the basic concepts of bonds in metals and alloys. To understand the basic requirements for the formation of solid solutions and other compounds.*

Structure of Metals and Constitution of alloys: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT –II

Learning objectives: *To understand the regions of stability of the phases that can occur in an alloy system in order to solve the problems in practical metallurgy.*

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd and Fe-Fe_3C.

UNIT –III

Learning objectives: *To study the basic differences between cast irons and steels, their properties and practical applications.*

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Learning objectives: *To study the affect of various alloying elements on iron-iron carbide system. To understand the various heat treatment and strengthening processes used in practical applications.*

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe_3C system, Annealing,

normalizing, hardening, TTT diagrams, tempering , hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – V

Learning objectives: *To study the properties and applications of widely used non-ferrous metals and alloys so as to use the suitable material for practical applications.*

Non-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – VI

Learning objectives: To study the properties and applications of ceramic, composite and other advanced materials so as to use the suitable material for practical applications.

Ceramic and composite materials: Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials – definition, properties and applications of the above.

Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Course Outcomes:

1	Identify the properties of materials with respect to crystal structure, atomic bonding and grain size
2	Understand the construction and identification of phase diagrams and various reactions
3	Classify and distinguish different types of ferrous materials, their properties and applications
4	Understand how to improve the properties of all materials by applying different heat treatment processes
5	Classify and distinguish different types of non-ferrous materials, their properties and applications
6	Understand the properties and applications of advanced materials likenanomaterials, ceramics and composite materials

Text Books:

1. Introduction to Physical Metallurgy - Sidney H. Avener -McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland -Cengage.

References :

1. Material Science and Metallurgy – Dr.V.D.Kodgire.
2. Materials Science and engineering - Callister&Baalasubrahmanyam
3. Material Science for Engineering students – Fischer – ElsevierPublishers
4. Material science and Engineering - V.Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRCPress
6. Material Science and Metallurgy – A V K Suryanarayana – B SPublications
7. Material Science and Metallurgy – U. C. Jindal – PearsonPublications

II Year I Semester

THERMODYNAMICS

L	T	P	C
4	0	0	3

Course Objectives:

To impart the knowledge of the thermodynamic laws and principles so as to enable the student to prepare an energy audit of any mechanical system that exchange heat and work with the surroundings.

UNIT – I

Objectives: The student should be able to understand the basic concepts like thermodynamic system, its boundary and related fundamental definitions. Distinction between point function and path function shall be made with respect to energy, work and Heat.

Introduction: Basic Concepts : System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry –Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I

UNIT II

Objectives: To learn the first law of thermodynamics, which is also the energy conservation principle, and should be able to apply to different thermodynamic systems.To understand the concept of equality of temperature and the principle of operation of various temperature measuring devices.To learn the applications of steady flow energy equation to the various mechanical components.

Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation. PMM-I, throttling and free expansion processes – deviations from perfect gas model – Vander waals equation of state – compressibility charts – variable specific heats – gas tables.

UNIT – III

Objectives: To understand the second law statements and the associated terms and should be able to apply the principles to heat engines. Should be able to analyse the concepts of Carnot cycle, entropy, availability and irreversibility. Should be able to understand the use of Maxwells relations and thermodynamic functions.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV

Objectives: should understand the process of steam formation and its representation on property diagrams with various phase changes and should be able to calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.

Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT – V

Objectives: Should be able to use Psychrometric chart and calculate various psychrometric properties of air.

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

UNIT - VI

Objectives: To understand the concept of air standard cycles and should be able to calculate the efficiency and performance parameters of the systems that use these cycles.

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericcson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles : Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell- Coleman cycle, Vapour compression cycle-performance Evaluation.

Course Outcomes:

1	Students are able to understand the basic concepts like thermodynamic system, its boundary,point,pathfunctionandrelatedfundamentaldefinitionswithrespecttoenergy, work andHeat.
2	Students are able to understand the fundamental of the first, second and third laws of thermodynamics and their application to a wide range of systems.
3	Students are able to analyse the concepts of Carnot cycle, entropy, availability, irreversibility, use of Maxwells relations and thermodynamic functions.
4	Students are able to understand the process of steam formation and its representation on property diagrams with various phase changes and calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.
5	StudentsareabletousePsychometricchartsandcalculatevariouspsychometricproperties ofair.
6	Students are able to understand the concept of air standard, Refrigeration cycles and calculate the efficiency of the systems.

Text Books:

1. Engineering Thermodynamics , PK Nag 4thEdn ,TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel&M.A.Boles , 7thEdn -McGrawHill

ReferencesBooks :

1. Engineering Thermodynamics – Jones &DuganPHI
2. Thermodynamics – J.P.Holman ,McGrawHill
3. Basic Engineering Thermodynamics – A.Venkatesh – Universitiespress.
4. An Introduction to Thermodynamics - Y.V.C.Rao – Universitiespress.
5. Thermodynamics – W.Z.Black&J.G.Hartley, 3rdEdn PearsonPubl.

II Year I Semester

ELECTRICAL & ELECTRONICS ENGINEERING LAB

L	T	P	C
0	0	3	2

Section A: Electrical Engineering:

Learning Objectives:

- To predetermine the efficiency of dc shunt machine using Swinburne'stest.
- To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.Ctests.
- To obtain performance characteristics of DC shunt motor &3-phase inductionmotor.
- To find out regulation of an alternator with synchronous impedancemethod.
- To control speed of dc shunt motor using speed controlmethods.
- To find out the characteristics of PN junction diode &transistor
- To determine the ripple factor of half wave & full waverectifiers.

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C.Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performancecharacteristics)
4. Regulation of alternator by Synchronous impedancemethod.
5. Speed control of D.C. Shunt motorby

   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. ShuntMotor.

Section B: Electronics Engineering.

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistancecalculations)
2. Transistor CE characteristics (Input andoutput)
3. Half wave rectifier with and with outfilters.

4. Full wave rectifier with and with outfilters.
5. CEamplifiers.
6. OP- Amp applications (inverting, non inverting, integrator anddifferentiator)

Course Outcomes:

1	To learn the application of electrical law's and superposition theorem
2	To understand the tests and speed control methods of a DC machines.
3	To understand the tests of a transformer.
4	To learn the operation and characteristics of PN junction diode, half wave, full wave rectifier
5	To learn the operation and characteristics of a transistor
6	To learn the operation and characteristics of CE amplifier

II Year I Semester

MECHANICS OF SOLIDS & METALLURGY LAB

L	T	P	C
0	0	3	2

Course Objective: To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.

NOTE: Any 6 experiments from each section A and B.

(A) MECHNICS OF SOLIDS LAB:

1. Direct tensiontest
2. Bending teston
a) Simplesupported
b) Cantileverbeam
3. Torsiontest
4. Hardnesstest
a) Brinells hardnesstest
b) Rockwell hardnesstest
5. Test onsprings
6. Compression test oncube
7. Impacttest
8. Punch sheartest

(B) METALLURGYLAB:

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu andAl.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – Csteels.
3. Study of the Micro Structures of CastIrons.
4. Study of the Micro Structures of Non-Ferrousalloys.
5. Study of the Micro structures of Heat treatedsteels.
6. Hardenability of steels by Jominy End QuenchTest.
7. To find out the hardness of various treated and untreatedsteels.

Course Outcomes:

1	By conducting various experiments on materials students will able to understand basic engineering properties of materials like stress, strain, hardness and toughness.
2	Students will able to understand behavior of material under different types of loads like tensile, compressive and shear. And springs under different load conditions.
3	Students will understand will understand behavior of beams and shafts under bending and torsion loads respectively.
4	Students will able to know the procedure of specimen preparation for the purpose of performing micro structure study.
5	Students will able to study and draw the microstructures of various metals.
6	Understanding the influence of heat treatment on micro structure and hardness of various materials.