

II Year - I Semester

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<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

## METALLURGY & MATERIALS SCIENCE

**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 the society.

### 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<sub>3</sub>C.

### 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<sub>3</sub>C 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.

### 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 & Baalashubrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publications

## MECHANICS OF SOLIDS

Common to Mechanical, Aeronautical & Automobile Engineering.

**Objective:** *The students completing this course are expected to understand the basic terms like stress, strain, poissons 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 solving techniques.*

**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,

#### **Text Books:**

1. Strength of materials /GH Ryder/ Mc Millan publishers India Ltd
2. Solid Mechanics, by Popov
3. Mechanics of Materials/Gere and Timoshenko, CBS Publishers

#### **References :**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timoshenko
5. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

## THERMODYNAMICS

### 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 fraction 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, Ericsson 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.

#### Text Books :

1. Engineering Thermodynamics, PK Nag 4<sup>th</sup> Edn, TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles, 7<sup>th</sup> Edn - McGrawHill

#### References :

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics – J.P.Holman, McGrawHill
3. Basic Engineering Thermodynamics – A.Venkatesh – Universities press.
4. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
5. Thermodynamics – W.Z.Black & J.G.Hartley, 3<sup>rd</sup> Edn Pearson Publ.
6. Engineering Thermodynamics – D.P.Misra, Cengage Publ.
7. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

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**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**

**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-Profit Analysis.
- 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 Budgeting proposals.

**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 Outcome:**

- \*The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- \* One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- \*The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

## **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, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

### **References:**

- 1.Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7<sup>th</sup> Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Universities press, 2015



## FLUID MECHANICS & HYDRAULIC MACHINES

**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 and turbines.*

### 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, hydrostatic law.

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 gradient line.

### 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 and efficiency.

**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.

### Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.

### Reference Books:

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

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### COMPUTER AIDED ENGINEERING DRAWING PRACTICE

**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 of projection.

**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 , single option.

## **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.

### **Text Books :**

1. Engineering drawing by N.D Bhatt, Charotar publications.
2. Engineering Graphics, K.C. John, PHI Publications

### **References:**

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

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

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

**ELECTRICAL & ELECTRONICS ENGINEERING LAB**

**Section A: Electrical Engineering:**

**Learning Objectives:**

- To predetermine the efficiency of dc shunt machine using Swinburne's test.
- To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
- To obtain performance characteristics of DC shunt motor & 3-phase induction motor.
- To find out regulation of an alternator with synchronous impedance method.
- To control speed of dc shunt motor using speed control methods.
- To find out the characteristics of PN junction diode & transistor
- To determine the ripple factor of half wave & full wave rectifiers.

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 performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
  - a) Armature Voltage control
  - b) Field flux control method
6. Brake test on D.C. Shunt Motor.

**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 resistance calculations)
2. Transistor CE characteristics (Input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.
5. CE amplifiers.
6. OP- Amp applications (inverting, non inverting, integrator and differentiator)

**Learning Outcomes:**

- Able to find out the efficiency of dc shunt machine without actual loading of the machine.
- Able to estimate the efficiency and regulation for different load conditions and power factors of single phase transformer with OC and SC test.
- Able to analyse the performance characteristics and to determine efficiency of DC shunt motor & 3-phase induction motor.
- Able to pre-determine the regulation of an alternator by synchronous impedance method.
- Able to control the speed of dc shunt motor using speed control methods.
- Able to find out the characteristics of PN junction diode & transistor
- Able to determine the ripple factor of half wave & full wave rectifiers.

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**MECHANICS OF SOLIDS & METALLURGY LAB**

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) MECHANICS OF SOLIDS LAB :**

1. Direct tension test
2. Bending test on
  - a) Simple supported
  - b) Cantilever beam
3. Torsion test
4. Hardness test
  - a) Brinells hardness test
  - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

**(B) METALLURGY LAB:**

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.