

**S.E. Mechanical S/W 2008 Structure (w.e.f. July – 2009)**

**FIRST TERM**

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME				
		Lect.	Pract/Dwg	Paper	TW	Or	Pr	Total
202042	Metallurgy *	4	2	100	25	-	-	125
202043	Fluid Mechanics*	4	2	100	25	50	-	175
207002	Engineering Mathematics III	4	-	100	-	-	-	100
202051	Strength of Machine Elements *	4	-	100	-	-	-	100
202061	Thermal Engineering -I	4	2	100	25	25	-	150
202062	M/C Drawing & Comp. Graph.	-	2	-	25	50	-	75
211063	Workshop Practice	-	2	-	25	-	-	25
<b>Total of First Term</b>		<b>20</b>	<b>10</b>	<b>500</b>	<b>125</b>	<b>125</b>		<b>750</b>

**SECOND TERM**

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME				
		Lect.	Pract/Dwg	Paper	TW	Or	Pr	Total
202064	Theory of Machine and Machine Design – I **	4	2	100	25	25	-	150
202065	Thermal Engineering -II	4	2	100	25	50	-	175
202066	Geometric Modelling Practices	-	2	-	-	-	50	50
202067	Manufacturing Engineering	4	-	100	-	-	-	100
202068	Computer applications	4	2	100	50	-	-	150
203050	Electrical Technology *	4	2	100	25	-	-	125
<b>Total of First Term</b>		<b>20</b>	<b>10</b>	<b>500</b>	<b>125</b>	<b>75</b>	<b>50</b>	<b>750</b>

\* Common to SE Mechanical Course

\*\* Theory Paper of 4 Hours Duration

## 202042 METALLURGY

### **Teaching scheme:**

**Lectures:** 4Hrs/week

**Practical:** 2 Hrs/week

### **Examination Scheme:**

**Theory:** 100 marks

**Term work:** 25 marks

### **Unit 1 - Structure Property Relation**

Introduction to engineering materials, Elastic and plastic deformation, deformation in a single crystal and polycrystalline metal, Critical resolved shear stress, Imperfections in a crystal, plastic deformation mechanisms-slip and twin, effect of defects on deformation mechanism, work hardening, fracture mechanics, changes in properties due to deformation, Re-crystallisation, cold working and hard working.

### **Unit 2 - Testing of metals**

Concept of stress, working stress strain, strength, elasticity, plasticity, stiffness, resilience, Toughness, Malleability, Ductility, Brittleness, Tension Test- Engineering and True stress-strain curves, their conversion relationships, evaluation of properties. Numerical based on tension test, engineering stress-strain diagram for ductile and brittle metal, compression test. Hardness test- Brinell. Poldi, Vickers, Rockwell, Rockwell superficial. Micro hardness test. Impact tests- Charpy and izod, concept of fracture toughness testing, Fatigue and creep test, Erichsen cupping test

Non Destructive Testing: Visual Inspection, Magna flux, dye penetration test, sonic and ultra sonic test, radiography and eddy current test.

Examples of selection of NDT and mechanical testing methods for selected components like crankshafts, gears, razor blades, welded joints, steel and C.I. casting, rolled products.

### **Unit 3 - Ferrous metals and Designation**

Wrought and cast components, Allotropy of Iron, Iron-iron carbide diagram, plain carbon steels, limitations of plain carbon steel, and advantages of alloy steels. Effect of alloying elements on mechanical properties of steel, Alloy steels, Tool steels, stainless steels, cast irons. Designation of steels and cast iron. UNS, BIS, ASTM, AISI, EN series, SAE designation of steel

### **Unit 4 - Heat Treatment**

Effect of non equilibrium cooling on microstructure and properties of steel, TTT diagram for 0.8% carbon steel only, Isothermal treatments, Continuous cooling Transformation curves, CCR, Heat treatment of steels Annealing, Normalizing, Hardening and tempering. Hardenability of steels, Jominey end quench test, surface hardening treatments-carburizing. Nitriding, Carbonitriding, tufftride, sursulf, Induction hardening and flame hardening.

### **Unit 5 – Powder Metallurgy and Non Ferrous Metals and alloys.**

Steps in the making of Powder metallurgical component, Advantages and limitations of powder metallurgy. Production of sintered structural components, self lubricated bearing, cemented carbides, cermets, refractory metals, electrical contact material, friction material, and diamond impregnated tools.

Non ferrous alloys- Copper and its alloys, Aluminium and its alloys, babbits.

### **Unit6 - Introduction to Advanced Material**

Property, types, and application of Composite, smart materials, Biocompatible materials, Engineering ceramics, nanomaterials. (Exclude Method of manufacturing)

### **Term Work**

The students should maintain a journal keeping record of any 8 experiments from the following-

1. Tension test
2. Compression test.
3. Brinell and Poldi hardness test

4. Vickers hardness test
5. Rockwell hardness test
6. Charpy or Izod Impact test
7. Any two Non Destructive tests
8. Jominey End quench test
9. Demonstration of Annealing or Normalising or Hardening and measurement of hardness.
10. Observe and record following microstructures - Any four plain carbon steels
11. Observe and record following microstructures - Any two cast irons  
Any two non ferrous
12. Observe and record following microstructures - Heat affected zone of welded joint.
13. A report on industrial visit or component study

**Books recommended**

1. Engineering Metallurgy By R.A. Higgins, Viva Books Pvt Ltd
2. Properties of Engineering Materials by R.A.Higgins, Viva Books Pvt Ltd
3. Material science and metallurgy for Engineers by Dr V.D.Kodgire
4. The Science and Engineering of materials by Donald R Askeland et al, Thomson Brooks/cole

## 202043 FLUID MECHANICS

### Teaching Scheme:

Lectures: 4 Hrs/week

Practical: 2 Hrs/week

### Examination Scheme:

Theory: 100 Marks

TW : 25 Marks

Oral : 50 Marks

### Section-I

#### UNIT 1

#### Fluid Properties

8 Hrs

Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Kinematics Viscosity, Stoke's Theorem, Surface Tension Capillarity, Compressibility, Vapour pressure.

#### Fluid Kinematics

Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational. Stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates.

#### UNIT 2

#### Fluid Statics

8 Hrs

Hydrostatic law, Pascal's law, Pressure at a point, Total Pressure, Centre of pressure, Pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimede's Principle , Buoyancy and stability of floating and submerged bodies, Metacentric height.

#### UNIT 3

#### Fluid Dynamics

8 Hrs

Introduction to Navier-Stoke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to Pitot tube, Venturi meter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch .(Without considering Velocity of Approach)

### Section-II

#### UNIT 4

#### Laminar Flow

8 Hrs

Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates.

#### Dimensional Analysis

Dimensions of physical quantities, dimensional homogeneity, Buckingham pi Theorem, important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).

#### UNIT 5

#### Flow Through Pipes

8 Hrs

TEL, HGL , Energy losses through pipe, Darcy-Weisbach equation, Moody diagram, Minor losses in pipes, pipes in series and parallel, Siphons, Transmission of power, Turbulent Flow, Velocity Distribution.

## UNIT 6

8 Hrs

### Boundary Layer Theory

Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar sub layer, Separation of Boundary Layer and Methods of Controlling.

### Flow around Immersed Bodies

Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil. Introduction to CFD Methodology (Elementary Treatment).

### TERM WORK

Term work includes study of relevant theory of the topic, study of apparatus / set-up, conducting experiment/trial on the apparatus / set-up, calculations of results and conclusions.

Term work shall consist of any 8 experiments of the followings:  
Out of eight experiments performed, two must be with 'C' programming.

### EXPERIMENTS

- 1) Study of Pressure Measuring devices.
- 2) Determination of viscosity of liquids and its variation with temperature.
- 3) Stability of floating bodies and optimum loading capacity
- 4) Drawing Flow Net by using Electrical Analogy method.
- 5) Verification of modified Bernoulli's equation.
- 6) Calibration of Venturimeter / Orifice meter.
- 7) Determination of hydraulic coefficients of orifice.
- 8) Calibration of notch (Triangular / Rectangular).
- 9) Laminar and Turbulent flows by Reynolds's apparatus.
- 10) Flow around immersed bodies, point of stagnation, formation of wake etc by Haleshaw apparatus.
- 11) Determination of "Friction Factor" for Laminar and Turbulent flow through pipes of different materials.
- 12) Determination of minor losses due to pipe fittings (expansion, contraction, bend, elbow, gate valve, globe valve etc.).

### Text Books:

- 1) Dr. R.K. Bansal, Fluid Mechanics, Laxmi Publication (P) Ltd. New Delhi
- 2) Kumar K. L., Engineering Fluid Mechanics, S.Chand & Company Ltd, Eurasia Publishing House
- 3) R.K. Rajput Fluid Mechanics & Hydraulic Machines, S.Chand & Company Ltd.
- 4) Modi P. N. and Seth S. M., Hydraulics and Fluid Mechanics, Standard Book House.

### Reference Books:

1. James E. A., John and Haberm W. A., Introduction to Fluid Mechanics, Prentice Hall of India
2. Jain A. K., Fluid Mechanics, Khanna Publishers
3. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication (India) Pvt.Ltd.
4. Dr.D.S.Kumar, Fluid Mechanics and Fluid Power Engineering, S.K.Kataria & Sons.
5. Frank M.White, Fluid Mechanics, McGraw Hill Publication
6. James A. Fay., Introduction to Fluid Mechanics

7. Cengel & Cimbala Fluid Mechanics, TATA McGraw-Hill
- 8 Anderson- Fundamentals of CFD McGraw-Hill, International Edition, Mechanical Engineering Series
9. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.

## 207002 ENGINEERING MATHEMATICS – III (2008 Course)

Teaching Scheme:  
Lectures: 4 hrs./week

Examination Scheme:  
Paper: 100 marks  
Duration: 3 hrs.

### *Section I*

**Unit I:** Linear Differential Equations (**LDE**) of second and higher order (09 Hours)  
LDE with constant coefficients, Homogeneous Equations, Cauchy's and Legendre's DE. Simultaneous & Symmetric Simultaneous DE, Mass spring mechanical systems, Damped and Undamped systems.

**Unit II:** Transforms (09 Hours)  
a) Laplace Transform (**LT**): LT of standard functions, properties and theorems, Inverse LT, Application of LT to solve LDE.  
b) Fourier Transform (**FT**): Fourier Integral theorem, Fourier transform Fourier Sine & Cosine transform, Inverse Fourier Transform.

**Unit III:** Partial Differential Equations (**PDE**) (09Hours)  
Basic concepts, modeling: Vibrating String, Wave equation. Method of separation of variables, Use of Fourier series, Heat equation: one and two dimensional heat flow equations, Solution by Fourier Transforms, modeling Membrane two dimensional wave equation.

### *Section II*

**Unit IV:** Statistics and Probability (09 Hours)  
Measure of central tendency, dispersion, Correlation and Regression, Probability, Probability distributions, Binomial, Poisson and Normal distributions, Population and Sample, Sampling Distributions, t-distribution Chi Square distribution.

**Unit V:** Vector Differential Calculus (09 Hours)  
Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

**Unit VI:** Vector Integral Calculus (09Hours)  
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem.

### **Text Books:**

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

### **Reference Books:**

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

## 202051 STRENGTH OF MACHINE ELEMENTS (SE Mech& Mech .- S/W)

**Teaching Scheme;**  
**Lectures; 4hrs/week**

**Examination scheme:**  
**Paper: 100 Marks**

### **Unit - 1**

#### **Simple stresses & strains**

Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials. Various strengths of material- Yield strength, Ultimate tensile strength etc,

Concept of 3D stress state. Interrelation between elastic constants, Proof stress & True stress & strain. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self weight.

Temperature stresses in simple & composite members.

Strain energy due to axial load (gradual, sudden & impact), strain energy due to self weight.

### **Unit - 2**

#### **Shear Force & Bending Moment Diagrams.**

Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending moment & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading diagram & SFD from BMD.

**Slope & deflection of beams** - relation between BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases

### **Unit- 3**

#### **Principal stresses & strains**

Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow)

**Theories of elastic failure:** Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum strain theory – their applications & limitations.

## **Unit - 4**

### **Stresses in Machine Elements.**

#### **Bending stresses :**

Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections( rectangular, I,T,C ) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations.

#### **Shear stresses :**

Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web.

## **Unit - 5**

### **Torsion**

Stresses, strain & deformations in determinate shafts of solid & hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts.

### **Buckling of columns:**

Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions. Limitations of Euler's formula, Rankine's formula, safe load on columns.

## **Unit- 6**

### **Design Process:**

Machine Design, Traditional design methods, Basic procedure of Machine Design, Forming Design specifications, Design for:- 1) functional requirement, 2) customer orientation 3) Safety requirement & 4) Analysis for use. Requisites of design engineer, Design of machine elements, Sources of Design data , Use of Design data book, Use of standards in design, Selection of preferred sizes, Design Synthesis, Creativity in design. Use of internet for gathering information & Consideration of energy requirement, product life cycle & design for environment.

### **Design of Simple Machine parts:**

Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams (for circular cross-section only).

## Reference books

- 1) Gere and Timoshenko - Mechanics of material, CBS Publisher, 1984.
- 2) E.P. Popov - Introduction to Mechanics of Solids, Prentice Hall Publication.
- 3) Singer and Pytel - Strength of materials, Harper and row Publication.
- 4) Timoshenko and Young - Strength of materials, CBS Publication.
- 5) Beer and Johnston - Strength of materials, CBS Publication.
- 6) Shigley J.E. and Mischke C.R. – “Mechanical Engineering Design” – McGraw Hill Publication Co. Ltd.
- 7) Spotts M.F. and Shoup T.E. – “Design of Machine Elements” – Prentice Hall International.
- 8) Bhandari V.B. – “Design of Machine Elements” – Tata McGraw Hill Publication Co. Ltd.
- 9) Black P.H. and O. Eugene Adams – “Machine Design” – McGraw Hill Book Co. Inc.
- 10) PSG Design Data Book
- 11) S.S. Rattan Strength of material – Tata McGraw Hill Publication Co. Ltd.
- 12) Dr. R. K. Bansal Strength of material, Laxmi publication Pvt. Ltd., New Delhi
- 13) Ramamurtham, Strength of material, Dhanpatrai Publication.

## **202061 THERMAL ENGINEERING-I**

**Teaching Scheme;**  
**Lectures; 4hrs/week**  
**Practical; 2hrs/week**

**Examination scheme:**  
**Paper: 100 Marks**  
**Oral: 25 Marks**  
**Term Work: 25 marks**

### **UNIT 1**

**Ideal Gas Properties and Processes:** Ideal Gas definition, Gas Law, Equation of State, Specific Gas constant and Universal Gas constant, Specific heat, Constant Pressure, Constant Volume, Isothermal, Adiabatic, Polytropic and Throttling Processes on P-V and T-S diagrams. First law applied to non flow and steady flow systems.

**Second Law of Thermodynamics & Entropy:** Limitations of first law, statements of second law, heat engine and heat pump, reversible and irreversible processes, Clausius theorem and Clausius inequality, principal of increase of entropy, isolated system and entropy changes. Introduction to availability; Definition, available and unavailable energy, availability of non-flow or closed system, availability of steady flow system,

### **UNIT 2 STEAM GENERATORS**

Historical development. Classification. Constructional details of process & power boilers. Boiler mountings & accessories, equivalent evaporation, boiler efficiency, energy balance. Boiler draught- natural & artificial draught. Draught losses. Introduction to IBR. Principal & working of high-pressure boilers.

### **UNIT 3**

**Steam processes:** Nonflow & steady flow vapour processes, change of properties. Work transfer & heat transfer. Use of P-v, T-s, h-s diagram for steam. Determination of dryness fraction. Study of different calorimeters.

**Vapour power cycles:** Cannot cycle using steam, Ideal Rankine cycle. Calculation of thermal efficiency, specific steam consumption, work ratio. Comparison of Carnot & Rankine cycle. Effect of different parameters on performance of Rankine cycle.

### **UNIT 4**

#### **Fuels and combustion:**

Mass fraction, mole fraction. Combustion equations. Theoretical air, excess and deficient air. Stoichiometric & actual air to fuel ratio. Analysis of products of combustion. Gravimetric & volumetric analysis and their conversion. Methods to determine flue gas analysis.

#### **Fuels for I.C. Engine**

Types of fuels, Important properties of S.I. & C.I. engine fuels such as volatility, ignition quality, antiknock quality, specific gravity, viscosity, flash point, pour point, fire point, carbon residue. Alternative fuels for I.C. engine.

### **UNIT 5 AIR STANDARD CYCLES**

Concept of air standard cycles, assumptions, Otto, Diesel and Dual cycle, efficiency of air standard cycle, mean effective pressure, comparison of Otto, Diesel and dual cycle, deviation from theoretical cycle, relative efficiency, and concept of fuel air cycle. Comparison of p-v

diagram of air standard and fuel-air cycle, actual cycles, losses in actual engine operation, comparison of actual and fuel air cycles in diesel engines.

## **UNIT6**

**Reciprocating Air Compressor:** Uses of compressed air, classification of compressors, constructional details of single and multistage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, need of multi staging, intercooling and after cooling. Capacity controls of compressors.

## **TERM WORK**

Term work shall consist of record of any eight experiments of the following

1. Determination of calorific value using Bomb calorimeter
2. Demonstration to determine exhaust gas analysis by using orsat apparatus
3. Study of boiler mounting and accessories
4. Study of high-pressure boilers
5. Determination of dryness fraction of steam by using separating calorimeter or throttling calorimeter.
6. Determination of flash point, fire point and carbon residue of fuel or lubricating oil
- 7 Trial on reciprocating compressor to find volumetric efficiency & isothermal efficiency.
8. trial on boiler plant to determine equivalent evaporation, boiler efficiency and heat balance.
9. Visit to any plant using boiler for processing or power generation.

## **Reference Books:**

1. Ganesan V.: Internal combustion engines. Tata McGraw Hill.
2. Mathur and Sharma: Internal combustion engines, Dhanpatrai and Company.
3. P L Ballaney: Thermal engineering, Khanna Publishers.
4. Kumar Vasandani: Thermal engineering,
5. Domkundwar; Thermodynamics, Dhanpatrai and Company.
6. Nag : Engineering Thermodynamics.
7. Cengel & Boles : Thermodynamics an engineering approach..
8. Joel : Basic engineering Thermodynamics.

\*\*\*\*\*

**202062 Machine Drawing & Computer Graphics (MECH S/W)**

**Teaching Scheme:**

**Lecture:**

**Practical: 2 Hrs/week**

**Examination Scheme:**

**Term Work: 25 Marks**

**Practical: 50 Marks**

(No unitization is adopted in detailing of this syllabus as there is no theory examination in this subject.)

**Part –I: Machine Drawing**

1. **I S Conventions** :- Need and Types, I S conventions of Threads, Nuts, Bolts, Gears, Bearings, Springs, Washers, Knurling, array of holes, Ratchet & Pawl, Piping Symbols, Heating Ventilation and Air Conditioning Symbols(HVAC).
2. **Dimensioning** :- Methods of dimensions, Functional and Non-functional dimensions, Dimensioning common features like: Circular Arcs, Diameters, Holes, Angles, Chamfers, Tapers, Undercut, Repetitive features, Countersunk, Square, Sphere, Across flat, Threads.
3. **Limits, Fits & Dimensional Tolerances**:- Terminology, Necessity of Limit system, Unilateral and Bilateral Tolerances, Relation between Tolerances and Manufacturing Processes, Methods of indicating tolerances on drawings, IT grades, Systems of fits, Types fits, Selection of fits, Selection of tolerances based on fits.
4. **Geometrical Tolerances**:- Need of Geometrical Tolerances, Terminology, Tolerances for Single Features such as Straightness, Flatness, Circularity, Cylindricity. Tolerances for Related Features such as Parallelism, Perpendicularity, Angularity, Concentricity, Tolerance Symbol and Value, Indicating Geometrical Tolerances on drawings.
5. **Surface Finish**:- Surface Texture, Surface Roughness Number, Roughness Symbols, Range of Roughness obtainable with different manufacturing processes.

**Part-II: Computer Graphics**

1. **Data types**:- User input & output: real, integer, string, list, getreal, getint, getpoint, getstring, initget, getkeyword, prompt, princ, print, sset, entsel, entget.
2. **Math operators and functions**:- add, subtract, multiply, divide, log, exponential, Trigonometric functions, logical operator, logical operators.
3. **List of Filtering Function**:- car, cdr, list, nth, reverse, osmode, osnap, appende, assoc.
4. **Decision making and looping**: Comparative and Logical operators (if and while only)
5. **Introduction to file handling**: Writing and reading file.

**TERM WORK (to be completed using suitable drafting package)**

**Part A( to be completed using suitable drafting package )**

- **One A2 size sheet** based on various IS conventions mentioned in the above syllabus [06]
- **Two A2 size sheets**: one on Assembly & other on Details of simple mechanical system such as vice, tool post, tailstock and valve. (Actual dismantling, measurement of dimensions of various components is necessary) Sheet on Details must include dimensional as well as geometrical tolerances and surface finish requirements

**Part B**

- One Program on parametric drawing [02]
- Osnap & Osmode [01]
- One Programs on decision making [04]
- One Programs on looping [04]
- Math. Function

**Text Books:**

1. Siddheshwar,  
Machine Drawing,  
Tata-McGraw Hill.
2. N. D. Bhat,  
Machine Drawing,  
Charotar Publishing Company
3. Ajeet Singh
3. ABCs of Auto LISP,  
George Omura,  
BPB Publications.

**Reference Books:**

1. James H. Earle  
Engineering Design Graphics  
Addison-Wesley Publishing Co.
2. K. L. Narayana and P. Kannaiah  
Machine Drawing  
New Age International Ltd
3. David I. Cook and Robert N. McDongal  
Engineering Graphics and Design with Computer Applications  
Holt-Sounders International Editors
4. IS Code SP 46
5. PSG Design Data

**211063 MECH S/W**  
**Workshop Practice**

Teaching Scheme: Practical 2hr/week

Term Work: - 25 Marks

.....  
Each candidate shall be required to complete and submit the following term work:

1. Jobs
  - a. Plane turning, taper turning, and thread cutting – one job
  - b. Forging and grinding of lathe tool with one knife and other end vee – one job
  - c. Making a simple solid pattern involving wood turning – one job
  - d. Welding gas or arc – one job
2. Journal and demonstration:  
A journal containing record of following assignments based on the following topics  
(with sketches and relevant description)
  1. Block diagrams (Any two)
    - a. Lathe
    - b. Universal milling machine
    - c. Radial drilling machine
    - d. Cylindrical grinder
  2. Mechanisms (Any two)
    - a. All geared head stock of a center lathe
    - b. Spindle arbor (assembly) drive of a milling machine.
    - c. Crank and slotted lever quick return drive of shaping machine
    - d. Spindle assembly of a drilling machine
  3. Casting and super finishing processes (Any two)
    - a. Types of pattern
    - b. Different casting methods
    - c. Honing
    - d. Buffing
  4. Welding (Any two)
    - a. Classification of welding processes
    - b. Different types of welding symbols and joints
    - c. Testing of welded joints
    - d. Welding defects

Note: -

Industrial visit / audio visual films may be arranged for covering above topics

Text Books:-

- 1) Hajara Choudhary, Bose S K, Elements of Workshop Technology Vol I and II, Asia Publishing House.
- 2) Rao P N, Manufacturing Technology and Foundry, Forming and Welding, Tata McGrawHill publishing Company
- 3) Parmar R S, Welding Process and Technology, Khanna Publisher.

Reference Book: Jain R K, Production Technology, Khanna Publisher

## 202064 THEORY OF MACHINES & MACHINE DESIGN –I

### Teaching scheme

Lectures: 4 Hrs/ Week

Drawing: 2 Hrs/ Week

### Examination scheme

Paper : 100 Marks(4 Hrs.)

T/W: 25 Marks

Oral : 25 Marks

### Unit-1

(7 Hrs.)

**Introduction:** Definition & types of kinematic link, kinematic pair classification, kinematic constraints, kinematic chain, mechanism, machine, structure. Inversions of single and double slider crank chain & four bar chain.

**Degrees of freedom / Mobility:** Kutzbach criterion & Grubler criterion for planar mechanisms.

**Lower pair mechanisms:** study and analysis of various mechanisms such as Pantograph, Steering gear mechanisms- types, condition for correct steering, Hooke's joint- relation between input & output shaft angular displacements, speed fluctuation & angular acceleration of output shaft.

### Unit -2

(10 Hrs.)

#### **Kinematic Analysis of Planar Mechanisms :**

Graphical Method of Velocity and Acceleration Analysis- relative velocity and relative acceleration method. Coriolis component of acceleration.

Introduction to Instantaneous center method. Kennedy's theorem of three centers in line.

Loop closure equation, Solution of loop closure equation by complex algebra method. Application to slider crank, four bar mechanism.

### Unit -3

(7 Hrs.)

#### **Static and dynamic force analysis:**

Kinematic analysis of centered slider crank mechanism by analytical method.

#### **Inertia of rigid bodies :**

Methods of finding Mass M.I.of rigid bodies – compound pendulum, bifilar and trifilar suspension method.

Two point mass dynamically equivalent system, correction couple.

Static force analysis of slider crank mechanism,

Inertia force analysis of IC engine mechanism by analytical method- Gas force, piston effort.

## Unit – 4

(9 Hrs.)

**Design of shafts, keys and couplings:** Transmission shaft- shaft design on strength basis, torsional rigidity basis & lateral, rigidity basis, spindles and axles, A.S.M.E. code for shaft design,

**Types of Keys**-classification and fitment in key ways. Design considerations in parallel and Kennedy keys, splines.

**Couplings**-Design of flange couplings & bush pin type flexible couplings.

**Design of Welded joints:** Advantages, Types and applications of welded joints, stresses in butt and fillet welds, Strength of welded joints, welded joints subjected to direct and eccentric loads.

## Unit – 5

(7 Hrs.)

**Design of power screws:** Power screw thread forms and their applications. Torque analysis with square and trapezoidal threads, collar friction, stresses in power screws, Differential and compound screws, recalculating ball screws.

**Mechanical Springs:** Types, Applications and materials of springs, Stress and deflection equations for helical, Springs, Style of ends, Design of helical compression and tension springs, Springs in series and Parallel, Concentric helical springs. Helical torsion Spring, Multi-leaf spring (theoretical treatment only), Shot peening,

## Unit – 6

(8 Hrs.)

**Belt Drives:** Limiting tension ratio, power transmitted, centrifugal effect, maximum power transmitted by belt, slip, creep & initial tension.

Materials and construction of flat and “V” belts, Power rating of belts, Design considerations in flat and V pulley drives. Selection of belts from manufacturer’s catalogue.

**Flywheel:** T- $\theta$  diagrams, speed and energy fluctuation, determination of flywheel size for different types of engines and machines, torque analysis, stresses in rim and spokes, design of solid rimmed flywheel.

## TERM WORK

The Term work shall consist of following exercises:

### A. A Journal consisting of:

#### a) Experimentation of the following:

- i) Determination of moment of inertia of connecting rod by Compound pendulum method.
- ii) Determination of moment of inertia of a rigid body by bifilar suspension or trifilar suspension method.
- iii) Developing a computer program for velocity and acceleration analysis of slider crank mechanism.

**B. Four sheets (Half imperial size):**

I) Velocity analysis by Instantaneous center method

II) Graphical Method of Velocity and Acceleration Analysis- relative velocity and relative acceleration method. Sheet consist of two problems, one problem with Coriolis component of acceleration.

III) Design project- It shall consist of two half imperial size sheets –one involving assembly drawing with a part list and overall dimensions and other sheet involving drawings of individual components. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of components and assembly should be submitted in a file.

Design projects should be in the form of 'Design of Mechanical System' comprising of machine elements studied and topics covered in the syllabus. Design data book shall be used wherever necessary to achieve selection of standardized components.

**Reference Books**

1. Mechanical engineering design by J.E. Shigley and C.R. Mischke, 5<sup>th</sup> Edition, McGraw Hill Publication.
2. Design of machine elements by M.F. Spotts – Prentice Hall Publication.
3. Fundamentals of machine design by Phelen- McGraw Hill Publication.
4. Fundamentals of machine component design by Robert C Juvinall John Wiley and Sons.
5. Design of machine elements by V.B. Bhandri –Tata Mc Graw Hill Publication.
6. Design Data compiled by faculty of Mech. Engg., PSG College of Tech. Coimbatore.
7. Thomas Bevan, 'The Theory of Machines' , CBS Publication
8. J.E.Shigley and J.J.Uicker, Jr. 'Theory of Machines and Mechanisms', McGraw Hill.
9. S.S. Rattan, 'Theory of Machines', Tata McGraw Hill.
10. P.L.Ballaney, 'Theory of Machines', Khanna Publishers.
11. Dr.Jagdish Lal, 'Theory of Mechanisms and Machines', Metropolitan Book Co.
12. Johan Hannah and R.C.Stephens, 'Mechanics of Machines Advanced
13. Pandya Shah,"Machine Design" Charotar Publications

## 202065 THERMAL ENGINEERING-II

**Teaching Scheme:**  
**Lecturers: 4Hrs/Week**  
**Practical: 2 hours per week**

**Examination Scheme:**  
**Theory: 100 Marks**  
**Practical: 50 Marks**  
**Term Work: 25 Marks**

### UNIT 1

**Refrigeration:** Definition, refrigeration load, unit of refrigeration, reverse carnot cycle, systems of refrigeration, Bell-Coleman cycle, vapour compression cycle (VCC), effect of operating parameters on VCC, use of P-h charts, refrigerants, properties of refrigerants, alternative refrigerants, simple vapour absorption system, comparison of vapour compression and vapour absorption cycle.

### UNIT 2

**Air-Conditioning:** Psychrometry, properties, relations, use of chart, processes, air conditioning equipments, air-conditioning systems; comfort and industrial air conditioning, factors affecting human comfort, effective temperature and comfort chart, central and unitary air conditioning systems, applications of air conditioning.

### UNIT 3

**Components of Refrigeration and Air Conditioning System:** Compressors, condensers, evaporators, expansion devices such as capillary tubes, automatic expansion valves, thermostatic expansion valves and controls such as thermostats, humidistat, solenoid. Installation, charging, testing, and maintenance , and trouble shooting of system.

**Ducts:-**Introduction, classification of ducts, distribution systems, duct material, pressure in ducts, flow through duct, pressure losses in duct, friction losses, dynamic losses, air flow through simple duct system, equivalent diameter, methods for determination of duct size, equal friction, velocity reduction, static regain method.(Theoretical treatment only)

### UNIT 4

**I.C. Engine :-**Classification, I.C. Engine systems such as fuel feeding systems for S.I. Value timing diagram slow speed & high speed engines and C.I. engines, starting systems, ignition, cooling, lubrication, governing, power take off and exhaust systems.

**I.C. Engine Testing And Performance:** Determination of IP, BP, FP and mean effective pressure, fuel consumption, air consumption, energy balance calculations, Morse test, determination of mechanical, thermal and relative efficiency, performance characteristics

## UNIT 5

**Combustion in S.I. engines:** Stages of combustion, flame propagation, factors influencing, flame speed, abnormal combustion- preignition and detonation, rating of S.I. engine fuels, octane number and dopes, evolution of combustion and types of combustion chambers in S.I. engines.

**Combustion in C.I. engines:** Stages of combustion, ignition delay and factors affecting delay period, diesel knock, rating of C.I. engine fuels, cetane number, comparison of diesel knock and detonation, evolution of combustion chamber and types of combustion chambers for C.I. engines.

## UNIT 6

**Supercharging:** Need for supercharging, supercharging and turbocharging, types of superchargers and turbochargers. Limitations of supercharging in S.I. and C.I. engines. Simple numericals on supercharging and turbocharging.

**Emission and pollution control:** Emissions from S.I. and C.I. engines and their harmful effects. Catalytic converters – construction and working (elementary treatment). Contemporary and latest proposed emission norms, Exhaust Gas Recirculation (EGR) system.

### Term Work:

The term shall consist of record of minimum eight experiments from the followings.

1. Trial on refrigeration test rig.
2. Trial on air conditioning test rig.
3. Study of combustion chambers in SI and CI engines.
4. Study of supercharging and turbocharging.
5. Study and demonstration of exhaust gas analyzer and smoke meter.
6. Visit to any refrigeration or air conditioning plant.
7. Test on multi cylinder petrol engine to determine BP, IP, brake thermal efficiency and bsfc
8. Test on diesel engine to determine BP, bsfc, thermal efficiency, and relative efficiency for one load
9. Trial on Ice plant test rig
10. Study of condensers and evaporators used in refrigeration systems
11. Study of I.C.Engine systems:- ignition and lubrication system

### Reference Books:

- a. Ganesan V.: Internal combustion engines. Tata McGraw Hill.
- b. Mathur and Sharma: Internal combustion engines, Dhanpatrai and Company.
- c. P L Ballaney: Thermal engineering, Khanna Publishers.
- d. Kumar Vasandani: Thermal engineering,

- e. Domkundwar and Domkundwar: Internal combustion engines, Dhanpatrai and Company.
- f. Arrora and Domkundwar: Refrigeration and air-conditioning, Dhanpatrai and Company.
- g. C P Arrora: Refrigeration and Air-conditioning, Tata McGraw Hill.

## 202066 Geometric Modeling Practices (Mech S/W.)

### Teaching Scheme

**Lectures:**

**Practical:** 2 Hours/Week

### Examination Scheme

**Practical** – 50 Marks

#### Unit 1: Introduction

Strengths and weaknesses of conventional 2D drawing. Types of geometric modeling, wire frame modeling, surface modeling, solid modeling (CSG & B-rep) advantages, disadvantages and application. File Format Data exchange

#### Unit 2: Sketching

Sketching, line, circle, arc, spline. Filletting, trimming. Dimensioning linear, angular, diameter, radius, modifying dimension. Constraints parallel, perpendicular, co-incident, vertical, horizontal, tangent, symmetric.

#### Unit 3: Surface modeling techniques

tabulated surface, revolved surface, swept surface, lofted surface, edge defined surface. Multi-section sweep & Variable section sweep

**Unit 4: Part Modeling** Sketch based features extrude, revolve, sweep, variable section sweep, loft. Add, subtract, intersection. Use of part library threads, tapped holes, ribs, nuts, bolts etc. Datum planes, points, curves etc. parent child relationship. Modifying commands fillet, chamfer, array, copy, and mirror etc., Design Tables. (Creating dimensional relationship)

#### Unit 5: Assembly & Mechanism

Assembly top down and bottom up approach, constraints, mate, align, Joints

#### Unit 6: Drafting & Detailing

Detailing generating views, sectional views, Orthographic views, isometric Dimensioning views, adding dimensional and geometric tolerances, surface finish. Creating BOM.

#### Term work:

1. One assignments on sketching. (4 Hrs.)
2. One surface modeling (4 Hrs.)
3. One assignment on Part modeling. (6 Hrs.)
4. One assemblies of machine component like knuckle joint, coupling, gate valve, stop valve Bench vice, tool post . (10 Hrs.)

Detailing of any one assembly and parts made in assignment 4. (4 Hrs.)

## 202067 MANUFACTURING ENGINEERING

**Teaching Scheme:**  
**Lectures: 4 Hrs/week**

**Examination Scheme:**  
**Theory: 100 Marks**

### **SECTION – I**

#### **UNIT I:                   Casting Processes**

Sand Casting, Pattern types, materials, pattern making allowances, moulding sand types, properties and testing. Hand and machine moulding processes and equipments.

Core - types and manufacturing. Gating Systems. Cleaning and finishing. Defects in casting. Shell moulding, investment casting, die casting, centrifugal casting. Continuous casting.  
**(07 Hrs)**

#### **UNIT II:                   Metal Forming Processes**

Introduction to hot working and cold working.

Forming processes

Rolling- Types of rolling mills, Roll forming, Roll forging

Forging- Drop, press and upset, defects

Extrusion- Direct and indirect

Drawing- Wire drawing, tube drawing

Swaging, shot peening.

**(07 Hrs)**

#### **UNIT III:                   Joining Processes**

Surface preparation and various joints.

Arc Welding- Theory, SMAW, GTAW, FCAW, Submerged arc welding, Stud Welding.

Resistance welding- Theory, Spot, Seam and Projection weld process.

Gas Welding.

Soldering, brazing and braze welding.

Use of adhesives for joining - Classification of adhesives, types of adhesives, applications.

**( 07 Hrs)**

### **SECTION -II**

#### **UNIT IV:                   Centre Lathe Machine**

Introduction to centre lathe, types of lathes. (Capstan and turret)

Construction and working of lathe, attachments and accessories, lathe mechanisms.

Thread cutting and taper turning methods.

Simple numerical on calculation of machining time.

**(07Hrs.)**

#### **UNIT V:                   Milling, Drilling, Planning and Boring Machines**

Milling machine: Types of milling, Construction, Working and Mechanism of Column and Knee types milling machine. Cutter- types and geometry and their application, Speed, feed and depth of cut. Simple numerical to calculate machining time. Universal Dividing head, methods of indexing- Simple, Compound, Differential. Only simple numerical on indexing.

Drilling Machine: Twist drill geometry, tool holder, Types of drilling machine, Types of drills and operations, speed, feed of drill, Simple numerical to calculate machining time.

Introduction to planer and boring machines.

**(07 Hrs.)**

**UNIT VI: Grinding Machines**

Abrasive machining process machines – Types, construction and operation.

Grinding wheel –Designation, mounting and dressing of grinding wheels.

Superfinishing processes - honing, lapping, buffing and burnishing.

**(07 Hrs.)**

**Text Books:**

1. Hajara Choudhari, Bose S. K.

Elements of Workshop Technology Vol I, II

Asia Publishing House

2. P. N. Rao

Manufacturing Technology Vol I & II

Tata McGraw Hill Publishing Co

**Reference Books:**

1. R. K. Jain

Production Technology

Khanna Publishers

2. P. C. Sharma

Production Technology

Khanna Publishers

3. Chapman W. A. J.

Workshop Technology Vol I, II, III

ELBS Publishers

4. HMT

Production Technology

Tata McGraw Hill Publishing Co

5. Degarmo, Black and Koshert

Materials and Processes in manufacturing 8<sup>th</sup> Edition

Prentice Hall of India

## 202068 COMPUTER APPLICATIONS

**Teaching Scheme;**  
**Lectures; 4hrs/Week**  
**Practical; 2hrs/Week/Batch**

**Examination scheme:**  
**Paper: 100 Marks**  
**Term Work: 50 marks**

### Section 1

#### Unit 1

##### **Roots of Equations and Numerical Integration [8]**

False position method, Newton Raphson method, Modified Newton Raphson method, and Successive approximation method.

Trapezoidal rule, Simpson's Rules ( $1/3^{\text{rd}}$  ,  $3/8^{\text{th}}$  ), Gauss Quadrature Method- 2 point, 3 point, Double integration – Trapezoidal rule, Simpson's  $1/3^{\text{th}}$  rule.

##### **Unit 2 Interpolation and Differentiation [8]**

Lagrange's Interpolation, Newton's interpolation – Forward, Backward, divided difference, inverse interpolation, Numerical Differentiation. Forward, Backward difference

##### **Unit 3 Simultaneous Equations [10]**

Gauss Elimination Method, partial pivoting, , Gauss-seidal method, Gauss-Jordan method, LU decomposition, Cholesky method.

### Section II

##### **Unit 4 Curve Fitting and errors [8]**

Least square technique- straight line, quadratic equation, power equation, exponential equation. Errors and approximations

##### **Unit 5 Numerical Solutions of ODE [8]**

Taylor series method, Euler Method, Modified Euler Method, Runge Kutta Methods- second order and fourth order, Predictor-corrector – milne's method, simultaneous equations

## Unit 6 Finite difference methods

[10]

Introduction to finite difference method, Boundary value problems of exact differential equations limited to second order only, PDEs- Parabolic – elliptical & hyperbolic equations.

### Term work

- Any Eight Programs from following list
- Programming should be completed in C Language / Matlab

1. Program on **Roots of Equations**
2. Program on **Numerical Integration**
3. Program on **Interpolation**
4. Program on **Numerical differentiation**
5. Program on **Simultaneous Equations**
6. Program on **Curve Fitting**
7. Program on **ODE**
8. Program on **Finite difference methods**
9. Program on **Partial differential equation**

### Reference Books

1. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 4/e, Tata McGraw Hill Editions, 2002, ISBN 0-07-047437-0
2. Dr. B. S. Garewal, Numerical Methods in Engineering and Science, 7/e, Khanna Publishers, ISBN 81-74009-205-6 (Unit No 2)
3. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, 2/e, Tata Mc-GrawHill Publishing Co-Ltd, 2008, ISBN 0-07-064853-0,
4. M. K. Jain, S R K Iyengar, R K Jain, Numerical Methods for Scientific and Engineering Computations, 5/e New Age International Publishers ISBN 13 978-81-224-2001-2008 (Unit No 4)
5. Gerold/ Wheatley, Applied Numerical Analysis, 6/e, Pearson Education Asia, 2002 ISBN 81-7808-567-4
6. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd, New Delhi, ISBN 10: 0-07-0643419-X (Unit No1)

## 203050 ELECTRICAL TECHNOLOGY

### Teaching Scheme:

Lectures: 4 Hrs/week

Practical: 2 Hrs/week

### Examination Scheme:

Theory: 100 Marks

Term work: 25 Marks

---

### UNIT 1

**a) Electrical Power Measurement:** - Measurement of active and power power in three phase balanced loads by using one wattmeter & two wattmeter, effect of power factor on wattmeter reading.

**b) Electrical Energy Measurement:-** Single Phase three phase energy meter (construction and Working), Use of CT & PT for measurement of Power / Energy in single phase and three phase system (Theoretical Treatment only), standard specifications of single and three phase energy meter.

**c) Tariff-**introduction, objectives & Details of H.T. and L.T tariff, TOD tariff, advantages and improvement of power factor (Theoretical Treatment only)

**d) Illumination:-** Various terms related to illumination, types & requirement good lighting scheme, special purpose lighting  
**(08 Hours)**

### UNIT 2

**a) Single phase transformer:-** Types, KVA rating, approximate equivalent circuit, voltage regulation and efficiency of transformer, condition for maximum efficiency.

**b) Three phase transformers:** Types of transformer connection (star/star, star/delta, delta/star, and delta/delta) and applications based on connections. (Theoretical Treatment only) Introduction of power transformer, distribution transformer, study of typical distribution transformer substation, specifications of transformer (KVA rating, voltage ratio, current rating)

**c) Three phase Induction Motor:-** Constructional feature, working principle of three phase induction motors, types; torque equation, torque slip characteristics; power stages; efficiency; types of starters; methods of speed control Industrial applications.  
**(08 Hours)**

### UNIT 3

**a) Single phase induction motors:** Types, construction, working principle of split phase and shaded pole type induction motors, applications. Specifications of induction motors (KW rating, rated voltage, current rating, frequency, speed, class of insulation)

**b) Synchronous Generator:** Constructional features (Salient and non- salient),working principle,  $e m f$  equation, synchronous speed of an alternator, concept of synchronous reactance and impedance, phasor diagram of loaded alternator, voltage regulation of alternator by direct loading method and synchronous impedance method. Specifications of synchronous generator  
**(06 Hours)**

## UNIT 4

### D.C. Machines

Construction, working principle of D.C. generator, emf equation of D C generator. (Theoretical concept only).

Working principle of D.C. motor. Types of D. C. motor, back emf , torque equation for D.C. motor, characteristics of D. C. motor (series, shunt and compound), starters of D.C. shunt and series motor, methods for speed control of D.C shunt and series motors, Industrial applications.

**Special purpose motors:** Construction, working principle, characteristic and applications of stepper motors, A.C. and D.C servomotors, universal motors, Industrial applications.

**(06 Hours)**

## UNIT 5 POWER SEMICONDUCTOR DEVICES SUCH AS

**SCR:-** Construction detail, V-I Characteristics, Methods to turn ON, switching action during ON & OFF, specification, Concept of commutation of SCR. applications

**DIAC:-** Construction, V-I Characteristics

**TRIAC:-** Construction, V-I Characteristics, turning ON process.

**MOSFET:-** Construction, transfer Characteristics, output characteristics, Methods to turn ON & OFF, applications

**IGBT:-** Construction detail, transfer Characteristics, output characteristics, Methods to turn ON & OFF, applications

**(08 Hours)**

GTO Construction ,working and characteristic

## UNIT 6

**Drives:-**Advantages of Electrical Drives, Individual & Group drives, selection of drives depending on load characteristics.

**Speed Control:-** Single phase full converter fed D.C. Drives, Three phase converter fed D.C. Drives, Chopper Drives, two quadrant & four quadrant chopper drives, stator voltage control of three phase induction motor, frequency control of three phase induction motor, V/F control of three phase induction motor.

**(08 Hours)**

## **Term Work**

A term work shall consist of a record of eight practical of the following:

(Experiment no. 9 & 10 are compulsory, 6 experiments out of expt. No 1 to 8).

1. Speed control of a D. C. shunt motor by armature voltage and flux control methods.
2. Load test on a D. C. shunt motor.
3. Load test on a D. C. series motor.
4. Measurement of active power in a three phase balanced inductive load using two wattmeter method.
5. Regulation of an alternator by synchronous impedance method.
6. Regulation of an alternator by direct loading method.
7. Load test on a three phase induction motor.
8. Study of a) D.C. motor starters, b) three phase induction motor starter.
9. Study of V-I characteristics of SCR & TRAIC
10. Study of a distribution transformer substation and HT/LT energy bill.

## **Books to be referred**

1. Electrical Technology  
B. L. Theraja, S Chand Publication Co Ltd.
2. Ashfaq Husain,  
Fundamentals of Electrical Engineering'  
Dhanpat Rai & Co.
3. Electrical machines  
D P Kothari and I J Nagrath  
Tata McGraw Hill ,Third Edition
4. Electrical Machinery  
S.K. Bhattacharya  
TTTI Chandigad
5. Electrical Technology  
Edward Hughes  
Pearson Education
6. Art and Science of Utilization of Electrical Energy  
H Pratap  
Dhanpat Rai and Co ,Third Edition
7. Power Electronics  
Dr. P.S. Bhimbra  
Khanna Publication