PART – I

(ME 202) MACHINE DRAWING

Theory : 4 Hours/Week — Theory : 100 Marks
Practical : 2 Hours/Week — Term Work : 25 — Practical: 50

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1. SECTIONAL VIEWS:
   Conversion of pictorial view into sectional orthographic projections, sectional views with different types of sections such as revolved, broken aligned section missing views. (5)
2. ADVANCE ISOMETRIC VIEWS:
   Isometric view of complex objects and Machine Parts "Sectional Isometric. Views" Introduction to Oblique views and perspective projection and exploded views of an assembly (No question will be ask on oblique and exploded views) (4)
3. INTERSECTION OF SURFACE:
   Interpenetration of solids, prism and prism, cylinder and cylinder, cylinder and prism, cone and cylinder, cone and prism (4)
4. LATEST ISI CONVENTIONS:
   Conventions covering the standard practice in machine drawing. Conventions for various components like bearing, gears, springs, key and key ways, threads, tap holes and materials. Symbolic Representations: Working drawing for welded joints, Use of specifications for limits, fits and tolerances, Conventions used for surface roughness i.e. machining symbols M/c allowance symbols. Constructional details and working of various machine elements such as, Rivets and Riveted joints, Keys, Cotters and cotter joints, knuckle joints and couplings. Bearing and bearing mountings, Engine and machine tool components. (7)
5. DETAILED AND ASSEMBLY DRAWING:
   Preparation of detailed and assembly drawing of simple machine assemblies, like pedestal bearing, Plummer block, simple eccentric, stuffing box, cross head, connecting rod, tail stock, tool post, c-clamp, screw jack, boiler safety valve Gear Trains etc. (The Assembly drawing must be drawn by showing Tolerances, IS Conventions of Standard parts) (10)
6. INTRODUCTION TO CAD DRAWING 2 D AND 3 D (10)

TERM WORK

PART –A

Full Imperial Sheets and Problems in sketchbook on following Topics (Select Practical Problems)

a) Sectional views of objects
b) Development of surfaces
c) Intersection of solids

PART- B

Drawing of following Machine Elements using AUTOCAD/SOLIDWORKS (at least four)

a) Cotter Joint
b) Knuckle Joint
c) Flange Coupling
d) Wall Bracket
e) Plummer Block
f) Stuffing Box
g) Tool Post

(Practical Examination should be based on part B)

BOOKS RECOMMENDED

TEXT BOOKS:

a) Machine Drawing N.D. Bhatt Charotar Pulisher, 2003, 38th edition
b) Machine Drawing N. Sidheshwar, Shastry, Kanhaiah. Tata Mcgraw Hill 2005
c) Machine Drawing Narayanan K.L., Reddy K.V., New Age International Publisher 2004, 2nd Edition
d) Machine Drawing R.K. Dhawan S. Chand and Co, 2005
e) Computer Graphics and Design P. Radhakrishnan – Dhanpatrai and Sons.
f) Using AUTOCAD James E Fuller – Denmark Publishing Co.
g) Machine Drawing, P.J. Shah, Shah Publishers, 1997, 3rd edition.

(ME 203) ENGINEERING THERMODYNAMICS

Theory : 4 Hours/Week — Theory : 100 Marks
Practical : 2 Hours/Week — Term Work : 25
Practical: 25

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1. FIRST LAW OR THERMODYNAMICS APPLIED TO FLOW PROCESS
   Concept of Flow work, control volume and steady flow process, assumptions, Steady flow energy equation on time and mass basis, difference between steady flow and non flow process, study and applications of SFEE to some steady flow devices viz nozzles, diffusers, throtting valve, turbine, compressors, I.C. Engine, Heat Exchangers etc. Limitations of First law of Thermodynamics, Concept of PMM-I (5 Hrs.)
2. SECOND LAW OF THERMODYNAMICS
   Various statements, Heat engine, Refrigerator and Heat pump. COP of Heat pump and Refrigerator, Reversed heat engine, Equivalence of Kelvin-Planck and Clausius statements, PMM-II, Carnot theorem, Thermodynamic temperature scale. (7 Hrs.)

3. ENTROPY

Concept of Entropy, Clauius Theorem, Clausius inequality, temperature-entropy diagrams, Entropy changes for an ideal gas during reversible processes, entropy of isolated system in real processes, Principle of increase of Entropy, total entropy changes, Applications of Entropy principle, Available and unavailable energy. (5 Hrs.)

4. AIR STANDARD CYCLE

Concept of air standard cycle, assumptions, carnot, otto diesel and dual air standard cycles with representation on P-V & T-S planes, mathematical analysis for efficiency, mean effective pressure and power out put, comparison. (7 Hrs.)

5. FUELS AND COMBUSTION:

Definition of Fuel, calorific values, Definition of combustion, mass fraction, mol fraction, combustion equation, stoichiometric air, excess air, and deficient air, analysis of product of combustion, gravimetric and volumetric analysis and their conversion, determination of actual and excess air quantity from combustion analysis and stoichiometric and actual air to fuel ratios. Orsat apparatus, method to determine flue gas analysis – CO, CO_2, CO_2. (7 Hrs.)

6. PROPERTIES OF STEAM

Change of phase of water at constant pressure, Critical state and critical point parameters, significance of critical point, Wet, dry, saturated, superheated steam. Enthalpy, internal energy and entropy of steam. First law of thermodynamics applied to steam processes. Vizconstant volume, constant pressure, hyperbolic, isentropic and polytropic processes. Temperature entropy and enthalpy entropy diagrams of steam. Methods of determining the dryness fraction. (7 Hrs.)

7. NON CONVENTIONAL ENERGY PRINCIPLES

Principles of Nuclear and solar energy Conversions, Solar collectors and Devices and applications of Nuclear and solar energy. (2 Hrs.)

TERM WORK

The term work shall consist of Performing/Studying following experiments. The candidate shall submit the report of each experiment and the assignments.

THE LIST OF EXPERIMENTS

a) Study of determination of Calorific Value of Fuels by using different calorimeters.
b) Determination of exhaust gas analysis by using Orsat Apparatus.
c) Determination of Dryness fraction by using different Calorimeters.
d) Study of solar energy devices
e) Assignment on Topic No 03
f) Assignment on Topic No 04

LIST OF RECOMMENDED BOOKS

a) Engineering Thermodynamics by P.K. Nag
b) Thermal Engineering by R.K. Rajput
c) Thermal Engineering by Arora and Domkundwar
d) Thermal Engineering by P.L. Ballaney
e) Engineering Thermodynamics by J.B. Jones and R.E. Dugar PHI Publications
f) Thermal Engineering by B.K. Sarkar, Tata Mc Graw Hill Pub.

(ME 204) MANUFACTURING PROCESSES

Theory : 4 Hours/Week Theory : 100 Marks

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1. PATTERN MAKING & MOULD DESIGN:

Production to basic manufacturing processes, Pattern materials, allowances, Types of patterns. Basic principle and Terminology of sand casting, gating system, types of gate, Risers design, Rise ring aids, Directional and Progressive solidification. Analytical approach to riser design. General properties of moulding sands, testing of moulding sand, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making. (6)

2. TECHNOLOGY OF MELTING & SPECIAL CASTING METHODS:

Melting furnaces pit, open hearth, gas fired cupola and electric hearth furnaces, cupola operation development in cupola melting, Electric furnaces – Direct Arc, Indirect Arc and Electric induction furnace. Modernization and Mechanization of Foundries, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipments and processes for Gravity, pressure and vacuum casting methods. (6)

3. DEFECTS, INSPECTION & TESTING OF CASTING:

Origin and classification of defects, shaping faults, Inclusions and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Radiography ultrasonic, Eddy current testing fluorescent penetrate test. (5)

4. MECHANICAL WORKING OF METALS:

Principle of Hot and Cold working processes, Different types of hot and cold working processes, e.g. Rolling, types of rolling forging operations, extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Spinning, embossing and coining, squeezing and bending operations, rotary swaging (5)

5. PROCESSING OF PLASTICS:

Compression, Transfer, Injection, Extrusion. Below moulding, Rotational moulding and calendaring. (3)

6. JOINING PROCESSES:

Introduction to riveting, soldering, brazing and welding. Gas welding working principle and its application, Arc welding: arc initiation, arc maintenance, and arc control, transfer of metal across the gap, Electrode efficiency, Types and purpose of Electrodes, TIG welding: working principle and its application, MIG-welding: working principle and its application. SAW-welding: working principle and its application, Resistance welding: - Working principle and its applications. (8)

7. OTHER WELDING PROCESSES:
Working principle and applications of Friction Welding, Forge Welding, Plasma Arc, and Thermit Welding. Ultrasonic, Electro slag, Electron Beam, Laser welding, Welding defects, Testing and Inspection of welds: Various welding defects, weld testing methods. Weld ability. (6)

8. SURFACE TREATMENT:
Electroplating, electroforming, and iodizing, metal spraying, shot penning, polishing, mechanical cleaning. (3)

BOOKS RECOMMENDED:

TEXT BOOKS:

a) Workshop Technology 1 B S Raghuwanshi, Dhanpat Rai and Sons 2001
b) Workshop Technology Hajra Chaudhary, Dhanpat Rai and Sons 2001
c) Manufacturing Process II H.S. Bawa, Tata Mc Graw hill Publishing Co. Ltd. 2004
d) Production Technology, Jain R.K., Khanna Publications 2000

REFERENCES BOOKS:

a) Processes and Materials of Manufacture By R.A. LindBerg PH Pub 2001
b) Workshop Technology, O.P. Khanna Dhanpat Rai and Sons 2001

(ME 205) STRENGTH OF MATERIALS

Theory : 4 Hours/Week — Theory : 100 Marks
Practical : 2 Hours/Week — Term Work : 25 Marks

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1. MECHANICAL PROPERTIES OF MATERIALS:
Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and tri-axial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor or safety (06)

2. UNI-AXIAL STRESSES & STRAINS:
Stresses and strains in compound bars in uni-axial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only. (6)

3. AXIAL FORCE, SHEAR FORCE & BENDING MOMENT DIAGRAMS:
Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear force, bending moment and loading intensity. (6)

4. SIMPLE OR PURE BENDING THEORY:
Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. (4)

5. TORSION:
Theory of torsion and assumptions, derivation of torsion equation, polar modulus, stresses in solid and hollow circular shaft, power transmitted by shaft. Shear stress distribution on beam cross sections. Thin and thick cylinders and thin spherical shells subjected to internal pressures. Strain energy under uni-axial tension and compression impact loads and instantaneous stresses. (8)

6. COMBINED DIRECT & BENDING STRESSES:
Combined direct and bending stresses applications to short columns with eccentric loads. (3)

7. PRINCIPAL STRESSES:
Biaxial stress system, principal stresses, principal planes and Mohr's circle of stresses, principal strains. (3)

8. DEFLECTION OF BEAMS:
Deflection in statically determinate (simply supported, cantilever and beams with overhang) beams subjected to point loads, uniformly distributed loads, moments by double integration, McCauley's method. (4)

PRACTICAL: (Any six Experiments)

List of the Experiments

a) Tension test on metals.
b) Compression test on materials.
c) Shear test on metals.
d) Impact test on metals.
e) Hardness test on metals.
f) Torsion test on metals.
g) Deflection of beams
h) Modulus of rupture test
i) Bucking of columns
j) Deflection of springs

BOOKS RECOMMENDED:

TEXT BOOKS

1. Strength of Materials, Stephen Timoshenko, CBS Publishers, Delhi, First Edition 1986.
2. Strength of Materials, F.L. Singer, Harper and Row, New York, Fourth Edition Reprint 1998.
3. Strength of Materials, Ramamruthm, Dhanpat Rai and Sons, New Delhi, Thirteenth Edition 2000.

REFERENCE BOOKS

1. Mechanics of Materials, E.P. Popov, Prentice Hall of India, New Delhi
2. Introduction to Solid Mechanics, ***** Shames, Prentice Hall of India, New Delhi.

3. Mechanics of Materials, Beer & Johston McGraw Hill, New Delhi, Metric Edn.1992
4. Mechanics of Materials, B.C. Punmia, A.K. Jain, Arunkumar Jain, Laxmi Publications, New Delhi 2000
5. Strength of Materials, A Practical Approach, Vol-1, D.S. Prakash Rao, First Edition University Press, Hydrabad.

(ME 206) WORKSHOP PRACTICE – III

TEACHING SCHEME
PRACTICAL: 2 hrs / week

EXAMINATION SCHEME
PRACTICAL : 50 marks (Duration: 8 Hours)

1. TURNING SHOP:
   Study of different operations to be carried on the lathe machine taper turning methods (calculations), single point cutting tool operations, external threading, facing, finishing cuts JOB: Preparing a job on lathe machine performing the above operations
2. FORGING & BLACK SMITHY SHOP:
   Study of different forging operations, hand forging, power forging, heating devices, forging temperatures, different forging tools JOB: Preparing a useful job involving upsetting, elongation, bending, tapering, changing cross section, job to be done by hand forging performing the above operations
3. FOUNDRY SHOP:
   Sand moulding, types of sands, preparing sand for moulding, equipments, sand moulds (cope, drag, check etc.) JOB: Preparing sand moulds for single, multi-piece patterns in at least two or multi-piece moulding boxes and details like runners, risers, gates etc mould cavity finishing, demonstration of casting using ferrous or non-ferrous metal
4. WELDING SHOP:
   Different welding machines and equipments, types of welding and welded joints, used in fabrication, preparation for weld joints, joint finishing, safety precautions, different tools, types of electrodes, angle cutters, portable grinder, drills etc. JOB: Preparing a job individually or in a group of students of any useful item of daily use using various welding operations.

TERM WORK:

The term work will consist of submitting a file for all the shops with neatly written records of the study and diagrams. A workshop diary should be maintained by the students to record the progress of the jobs done The term work will be assessed by the Internal and External Examiners

PRACTICAL EXAMINATION

The Practical Examination will comprise of two jobs. One Job in Turning Shop is compulsory and another in any remaining shops. The jobs should involve all the operations studied during the semester. Duration will be Four hours for each job. Question paper will be set by University. The jobs will be assessed by two examiners, one will be the Internal and other will be External examiner appointed by University.

ENGINEERING MATHEMATICS - III

(Common for all braches)

Exam Scheme
Theory: 100 Marks for three hours

Teaching Scheme
4 Hours / Week

1. VECTOR CALCULUS:
   Differentiation of vectors, Radial, Transverse, Normal and Tangential components of velocity and acceleration. Scalar and vector point functions, Gradient of a scalar point function, Divergence and curl of a vector point function, Solenoidal and irrotational fields. Line integral, Surface integral, Gauss's divergence theorem, Stoke's theorem, Green's theorem. Cylindrical, Spherical polar and Curvilinear coordinates. (14 Hours)
2. FOURIER TRANSFORM:
   Fourier integral, Fourier sine and cosine integral, Complex form of Fourier integral. Fourier transform. Fourier sine and cosine transform and inverse transform. (6 Hours)
3. LINEAR DIFFERENTIAL EQUATION:
   Solution of linear differential equation of n^{th} order with constant coefficients. General method, Shortcut methods to find particular integral. Method of variation of parameters, Equations reducible to linear form i.e. Cauchy's and Legendre's form, Solution of simultaneous linear differential equations. Application to civil, Mechanical, Electrical and Electronics Engineering. (10 Hours)
4. LAPLACE TRANSFORM
   Introduction to Laplace transform, Properties and theorems of Laplace transform, Laplace transform of special functions, Bessel's, Periodic, Error function, Heaviside Unit Step Function, Displaced Heaviside Unit Step Function, Dirac-Delta function (impulse function), Inverse Laplace Transform. Methods to find inverse Laplace transform by (i) use of Laplace transform table (ii) use of theorems (iii) use of partial fraction (iv) Convolution theorem. Solution of linear differential equation of n^{th} order with constant coefficients and simultaneous linear differential equations by Laplace Transform. (10 Hours)

NOTE: -

Section A : Chapter 1 and Chapter 2
Section B : Chapter 3 and Chapter 4

More stress should be given on Engineering Applications.

BOOKS RECOMMENDED:

1) A Text Book of Applied Mathematics (Volume II and III)

P.N. Wartikar and J.N. Wartikar
Pune Vidyarthi Griha Prakashan
1786, Sadashiv Peth, Pune.

2) Advanced Engineering Mathematics
H.K. Dass
S. Chand and Company Ltd.
Ram Nagar, New Delhi 110055

3) Engineering Mathematics III
G.V. Kumbhojkar
C. Jamnadas and Co.
146-C Shamaldas Gandhi Marg,
Mumbai-400002

4) Higher Engineering Mathematics
Dr. B.S. Grewal
Khanna Publishers
2-3 Nath Market, Nai Sarak,
New Delhi- 110006.

COMMUNICATION SKILL

Teaching Scheme	Exam Scheme
Practical : - 2 Hours / Week	Term Work : - 50 Marks

COURSE CURRICULUM

BASIC COMMUNICATION SKILLS.

- Communicating with Peers.
- Communicating Formally
- Communicating Casually
- Communicating for Daily Requirements.

PERSONALITY DEVELOPMENT

- Formal Dressing
- Dressing up to the occasion
- Interview Dressing
- Body Language
- Eye Contact
- Persona Management

EFFECTIVE GROP DISCUSSION

- What is Group Discussion
- Why are Group discussions Held
- What is judged in a Group Discussion
- What are the keys to a successful Group Discussion
- Different topics for a Group Discussion
- Different ways or Modules of Group Discussion

EFFECTIVE PUBLIC SPEAKING

- How to deliver an Effective
- How to involve the public at large
- Stage Courage
- Effective crowed alertness and zinc

ART OF EFFECTIVE ENGLISH COMMUNICATION

- Why is it so important
- What difference does it make
- Motivation Therapy
- New Avenues for improved communication
- New therapies for inculcating English

PRESENTATION FOR APTITUDE TEST

- What is an Aptitude Test
- Why are Aptitude Tests Held
- What is judged in an Aptitude Test
- What are the keys to a successful Aptitude Test
- Different areas for an Aptitude Test
- Different ways or Modules of Aptitude Test

ENGLISH GRAMMAR

- Why is Grammar important?
- What are the different parts of English Grammar?
- How do we practice it?

INTERVIEW TECHNIQUES

- Types of Interviews
- Why is the Interview Held?

- What is judged in an Interview?
- Types and rounds of Interviews
- Operations Round for an Interview
- HR Round for an Interview
- Technical Round for an Interview
- How to express freely and ethically in an Interview?
- How to make a resume or a bio-data
- Things meant to be said in an Interview and vice-versa
- How to crack and get an offer from an Interviewer?
- Psychological aspects of question.
- Reading the Interviewers mind

TELEPHONIC ETIQUETTES

- How to give telephonic Interviews?
- How to introduce yourself and speak on a call?
- How to speak to anyone on the phone?
- What are telephonic Interviews held for?
- How to crack a Telephonic interview?

MOCK CALL HANDLING

- What is the benefit of Mock Calls?
- How does one benefit from the Mock Call sessions?

PART – II

(ME 208) ENGINEERING MATHEMATICS - IV

THEORY EXAM: 100 Marks
THEORY: 4 hours / week THEORY EXAM TIME: 3 hours

1. FUNCTIONS OF COMPLEX VARIABLES:
   Introduction, Analytic function, Cauchy Riemann equations in Cartesian and polar form, Harmonic functions, Integration: Line integral, counter integral, Cauchy integral theorem, extension and Cauchy integral formula (with proof). Taylor's and Laurent's series (without proof). Singularities, Residues, Cauchy residue theorem (without proof). Integration along unit circle and along the upper half semicircle, conformal transformation and bilinear transformation. (14 hours)
2. STATISTICS & PROBABILITY
   Measures of dispersion, moments, skewness and kurtosis. Binornial, Poisson's and normal distribution (6 hours)
3. NUMERICAL METHODS
   Solution of algebraic and Transcendental equations by Newton-Raphson method solution of linear simultaneous equations by Gauss Elimination and Gauss-Seidal method, Lagrange's interpolation formula, Numerical differentiation, solution of ordinary differential equations by Picard's method, Taylor's series method, Euler's modified method and Runge-Kutta fourth order method. (10 hours)
4. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
   Solution of partial differential equations by method of separation of variables, Application to vibration of string (wave equation) one dimensional heat flow equation, two dimensional heat flow equation. (6 hours)
5. Z-TRANSFORMS
   Z-transforms of elementary functions, properties of z-transform (without proof), Inverse z-transform, Solution of difference equation by z-transform. (4 hours)

NOTE: -

In all Numerical methods derivations are not expected.
SECTION A: Chapter 1 and 2
SECTION B: Chapter 3, 4 and 5.

REFERENCE BOOKS

a) A Text Book of Applied Mathematics Vol – I, II & III - - J.N. Wartikar & P.N. Wartikar
b) Higher Engineering Mathematics - - Dr. B.S. Grewal
c) Engineering Mathematics - - H.K. Dass
d) Numerical Methods for Scientists and Engineers - - Dr. B.S. Grewal
e) Numerical Methods - - S.S. Shatry.

BOOKS RECOMMENDED:
TEXT BOOKS:

a) Electrical Technology (AC and DC drives) by B.L. Thereja, vol – II and vol – III
b) Electric machines (second edition) by I.J. Nagrath and D.P. Kothari, Tata McGraw Hill Publishing Co.Ltd., New Delhi.
c) Utilization of Electrical Power, R.K. Rajput, Laxmi publications.

REFERENCE BOOKS:

a) Electric Motor Drives-modeling, analysis and control by R. Krishnan, Low price Edition, Pearson Edu.
b) Utilization of Electrical Energy, H. Pratab.

(ME 209) ELECTRICAL MACHINES & APPLIED ELECTRONICS

THEORY : 4 hrs / week THEORY : 100 Marks

PRACTICAL: 2 hrs / week TERM WORK : 25 Marks

1. CONCEPT OF GENERAL ELECTRIC DRIVES:
Classification and comparison of electric drive system, cooling and heating of electric motors, Theory and working principle of power transistors, power MOSFET, SCR. (4)
2. BASIC CHARACTERISTICS OF DC MOTORS:
Torque equation, modified speed-torque characteristics, starting and braking of electric DC motors, comparison of mechanical and electric braking methods, conventional speed control methods. (4)
3. CLASSIFICATION OF AC MOTORS:
Construction, types, characteristics of 3-phase IM, torque equation, applications, staring and braking of 3-phase IM, conventional speed control methods. Thyristorised stator voltage control of 3-phase IM, (V/F) control, slip-power recovery scheme, thyristorised armature voltage control of DC motors using phase control and thyristorised chopper. Introduction, principle, construction and working of DC servomotors, stepper motors, brushless DC motors, classification of 1 –Phase IM, construction, principle, working and applications, principle and working of Universal motor, linear IM (10)
4. INDUSTRIAL APPLICATIONS:
Classes of duty, Selection of an Electric Drive for particular applications such as steel mill, paper mill, cement, textile mill, electric traction, coal mining, etc. (4)
5. SENSORS & ACTUATOR:
Application of sensors like Thermocouple, Air flow sensors, Gas sensors, LDR, Gas switches, Proximity switch sensors, Piezo sensors, Shaft encoder / decoder, Load cell etc. Actuators like as Optocouplers solenoid valves, Relay (AC/DC) Buzzer, Beepers, Alarms, 7 Segments display & LCD Display. (Sensors speciation, Market code and Specific Use must be emphasize) (10)
6. INDUSTRIAL ELECTRONICS:
Concept of Industrial Electronics, Devices Used in Industrial Electronic Circuits, Protection of Devices and size of heat sinks, Light Dimmer circuit, RTC based temperature controller, ON/OFF and Sequential Timer (8)

LIST OF THE EXPERIMENTS

a) To perform speed control of d.c. shunt motor.
b) Speed control of 3-phase induction motor by changing rotor resistance.
c) To perform load test on D.C. series motor.
d) Rheostatic speed braking of D.C. shunt motor.
e) To study single phase induction motor.
f) To identify different parts and understand working of starters used for 3-phase I.M.
g) Study of D.C. motor starters
h) To study different types of heating.
i) To study power mosfet.

(ME 210) APPLIED THERMODYNAMICS

TEACHING SCHEME EXAMINATION SCHEME
THEORY : 4 hrs / week THEORY : 100 Marks
PRACTICAL: 2 hrs / week TERM WORK : 25 Marks
PRACTICAL: 50 Marks

1. AIR COMPRESSORS:
a) Classifications and working principles, reciprocating compressors. Terminologies used effect of clearance volume, actual indicated diagram, multistage compression, (Numerical problems on reciprocating compressors) Rotary compressors, working principles, Roots blower, Vane type blower, Centrifugal compressor, and axial flow compressor. Comparison between reciprocating and rotary compressors. Vacuum pumps, air motor. (Descriptive treatment only) (6)
2. STEAM GENERATORS:
Classification, constructional details of process and power boilers, equivalent evaporation, boiler efficiency, energy balance, steam generation controls, boiler draught, natural and artificial draught, draught losses, regulation of chimney height, introduction to IBR laws, principle and working of high pressure boilers. (Numerical Treatment). (7)
3. STEAM CONDENSERS:
Classifications, comparison between Jet and Surface condensers, vacuum, vacuum efficiency, Daltons law of partial pressure, vacuum measurement, mass of circulating water required in a condenser, air removal, capacity of air extraction pumps, introduction to cooling towers. (Numerical Treatment) (6)
4. STEAM NOZZLES:
Types of nozzles, equation of continuity of nozzle, isentropic flow through nozzle, use of mollier chart, velocity of steam leaving a nozzle, effect of friction, mass of steam discharged, nozzle efficiency, cirtical pressure ratio and maximum discharge, supersaturated flow through the nozzle, effect of back pressure on nozzle characteristics. (Numerical Treatment) (6)
5. VAPOUR POWER CYCLES:
Carnot cycle /, ideal Rankine cycle, modified Rankine cycle, Reheat and Regenerative cycles with bleeding of steam, thermal efficiency, specific steam consumption, work ratio, power output, effect of superheat, inlet pressure and back pressure on performance of Rankine cycle. (Numerical Treatment) (8)
6. I.C. ENGINES:

Classifications, components, working of 2-Stroke, 4-Stroke Spark Ignition and Compression Ignition engines. Valve timing diagrams, Carburettor, different circuits of carburetors such as idling, throttling, compensating, starting etc.
Ignition systems, fuel pump, fuel injectors, fuel filters, lubrication system, Governing of I.C. engines, cooling system of I.C. engines, and their types. (Descriptive Treatment only) (7)

TERM WORK

The term work shall consist of Performing / Studying following experiments. The candidate shall submit the report of each experiment and the assignments.

THE LIST OF EXPERIMENTS

a) Study of any two boilers
b) Study of boiler mounting and accessories
c) Study of condensers and cooling towers
d) Study of contemporary carburetor
e) Study of fuel pump and fuel injector of I.C. Engine
f) Study of conventional ignition systems of I.C. Engine
g) Study of lubricating system of I.C. Engine
h) Trial on reciprocating air compressor
i) Assignment on topic no.1
j) Assignment on topic no. 5

LSIT OF RECOMMENDED BOOKS

a) Engineering Thermodynamics by P.K. Nag
b) Thermal Engineering by R.K. Rajput.
c) Thermal Engineering by Arora and Domkundwar
d) Thermal Engineering by P.L. Ballaney
e) Engineering Thermodynamics by J.B. Jones and R.E. Dugar PH I Publications.
f) Thermal Engineering by B.K. Sarkar, Tata Mc Graw Hill Pub.

(ME 211) MECHANISM OF MACHINE

TEACHING SCHEME	EVALUATION
THEORY : 4 hrs / week	THEORY : 100 Marks
PRACTICAL: 2 hrs / week	TERM WORK : 25 Marks
	PRACTICAL: 50 Marks

1. BASIC CONCEPTS
Introduction, Mechanisms and Machines, Kinematic pairs, Kinematic chains and their classification, Classification of mechanisms, Grashofs law, Class-I and Class-II mechanisms. Different four bar mechanisms, Inversions of single slider, double slider, Kinematics hain, Grublers criberion Kutrbach's theory. (4)

2. KINEMATICS ANALYSIS OF MECHANISMS:
Displacement analysis, Transmission angle, coupler curve and their properties, radius of curvature of coupler curves, body and space centriods. Velocity analysis (Graphical): Relative Velocity method, instantaneous center of rotation method, Acceleration analysis (Graphical) Relative acceleration method, Corriolis component of acceleration, analytical method for slider crank mechanism, Klein's construction for slider crank mechanism and Ritterhaus construction, four bar mechanism (10)

3. SYNTHESIS OF MECHANISM:
Introduction to type, Number and dimensional synthesis, graphical method of two positions, three position and four position, synthesis for Input output co-ordination. Overlay's method, Frendentein's equation (4)

4. SPECIAL PURPOSE MECHANISMS:
Straight-line motion mechanism, steering Gear mechanism, quick return and toggle mechanism. (2)

5. CAMS:
Introduction, Classification of cam and follower, Radial cam Nomenclature, different motions of followers, graphical layout of cam profiles, pressure angle. (6)

6. DYNAMIC FORCE & MOTION ANALYSIS
Motion of rigid body subjected to a system of forces, Principals of virtual work, D' Alemberts Principal and Dynamic Equilibrium, Dynamic force analysis Graphical method and analytical method. (5)

7. BALANCING
Importance of balancing, Balancing of revolving masses in one plane and different planes. Balancing of reciprocating parts in engine mechanism, primary and secondary forces, Balancing of locomotives: Uncoupled and coupled locomotives, Variation in tractive efforts, Swaying couple and hammer below. Balancing of symmetrical and asymmetrical inline engines, Determination of primary, secondary or higher order forces and couples for two stroke and four strokes engines. Principle of direct and reverse cranks, balancing of radial and V Engines, Balancing of V8 and W12 Engines. Principle construction and working of dynamic balancing machine. (9)

LIST OF EXPERIMENTS:

a) To draw inversions of four bar kinematics chain locating end points and explain working of mechanisms
b) To draw inversions of single slider crank chain, locating points and explain working of mechanisms.
c) To draw inversions of double slider cranks Kinematic chain locating end points and explains working of mechanisms.
d) To determine relative velocity of given links in mechanisms by relative velocity method or as center of rotation.
e) To determine relative acceleration of links in mechanisms by relative acceleration method.

f) To layout profile of cam graphically for given follower with its specified motion.
g) Mini Project on working toys with operative mechanism or Clutch or Brake system It is required to select these contrivances from working system. With suitable sketch explain working of system.
h) Gear trains – case study
i) Balancing of revolving masses in different planes.
j) Balancing of reciprocating masses for inline cylinder Engine.

BOOKS RECOMMENDED:
TEXT BOOKS:
a) Theory of Machines and Mechanisms, P.L. Ballaney, Khanna Publishers Delhi, 3rd Edition 2000.
b) Theory of Machines, S.S Rattan, Tata Mc-Graw Hill Company, New Delhi, 2nd Edition, 2005.

REFERENCE BOOKS:
a) The Theory of Machines, Thomas Beven, CBS Publishers and Distributors, 3rd Edition 2000
b) Theory of Machines and Mechanisms, Joseph Edward Shigley and Johan Joseph Uicker Jr. McGraw-Hill, Inc- 2nd Edition 1995.

(ME 212) MACHINE TOOLS

TEACHING SCHEME	EXAMINATION SCHEME
THEORY : 4 hrs / week	THEORY : 100 Marks
PRACTICAL: 2 hrs / week	TERM WORK : 25 Marks

1. METAL CUTTING & CUTTING TOOLS
Introduction, types of cutting tools, orthogonal and oblique cutting, types of chips, chip breakers, cutting tool nomenclature, cutting action of hand tools, cutting feed and speed, friction and heat sources in cutting, tools life and wear, machinability, cutting tool materials, cutting fluids, economics of machining
2. GEAR CUTTING
Gear cutting methods, formed cutter methods, gear cutting by formed disc cutter, indexing and dividing heads, indexing methods, gear cutting by formed end mill, gear cutting by formed single point tool, gear cutting by shear speed process, broaching gear teeth, template gear cutting, generating methods, rack cutter generating method, pinion cutter generating method, gear hobbing, bevel gear generating process.
3. DRILLING, BORING & BROACHING MACHINES
Drilling – Introduction, types of drill, twist drill nomenclature, types of drilling machines, work holding devices, tool holding devices, drilling machine operation, speed, feed and machine time, Boring – Introduction, classification of boring machines, boring bars, boring heads, boring defects, Broaching- Introduction, principle parts of broarch, broaching machines, application of broach, advantages of broaches, limitations of broaches and broaching tools.
4. GRINDING MACHINES
Introduction, grinding wheels, manufacturing of artificial abrasives, bonds and bonding processes, grit, grade and structure of grinding wheels, types of wheels, method of specifying grinding wheel, selection of grinding wheels, dressing and truing of grinding wheels, types of grinding machines.
5. NON TRADITIONAL MACHINING
Introduction, classification of machining processes, abrasive jet machining (AJM), ultra sonic machining (USM), Chemical machining (CHM), electrochemical machining (ECM),
Electrochemical grinding (ECG), electro discharge machining (EDM), electron beam machining (EBM), laser beam machining (LBM), plasma arc machining (PAM), ion beam machining.

PRACTICAL ON (Any Two Machines)
a) TURNING:
Study of different operations to be carried on the lathe machine using tail stock, taper turning methods (calculations), internal cutting tool operations, internal threading, facing, finishing cuts, performing jobs related to above operations.
b) MILLING
Study of different operations to be carried on the Milling machine, Face milling, Side face milling, etc, Machining time calculations. Performing jobs related to above operations.
c) GRINDING
Study of different operations to be carried on the Grinding Machine and performing jobs related to above operations
d) DRILLING
Study of different operations to be carried on the Drilling Machine and performing jobs related to above operations.

REFERENCE
a) Gerling, “All about Machine Tools”
b) Krar S.F., “Technology of Machine Tools”
c) Boothroyd, “Fundamentals of Metal Machining and Machine Tools”
d) Raghuvanshi B.S., “Workshop Technology”, Vol I
e) Hazra Choudhary, “Elements of Workshop Technology”, Vol I
f) Jain R.K. “Production Technology”
g) Bawa H.S. “Workshop Technology” Vol I

(ME 213) WORKSHOP PRACTICE – IV

TEACHING SCHEME	EXAMINATION SCHEME
PRACTICAL: 2 hrs / week	PRACTICAL : 50 marks
	(Duration: 6 Hours)

1. TURNING SHOP:
   Study of different operations to be carried on the lathe machine using tail stock taper turning methods (calculations), internal cutting tool operations, internal threading, facing, finishing cuts JOB: Preparing a job on lathe machine performing the above operations
2. MILLING:
   JOB : Preparing a job individually or in a group of students i.e. Gear blank by turning, External milling of gear teeth involving calculations for indexing.
3. DRILLING OR BORING:
   JOB: Preparing a job individually or in a group of students based on drilling, boring, internal splines cuts on slotting machines and surface grinding for surface finishing files

TERM WORK

The term work will consist of submitting a file for all the shops with neatly written records of the study and diagrams. A workshop diary should be maintained by the students to record the progress of the jobs done.

The term work will be assessed by the Internal and external Examiners.

PRACTICAL EXAMINATION

The Practical Examination will comprise of one job. The jobs should involve all the operations studied during the semester. Duration will be Six hours for each job. Question paper will be set by University. The jobs will be assessed by two examiners, one will be the Internal and other will be External examiner appointed by University.