



B
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SHIVAJI UNIVERSITY, KOLHAPUR.

Proposed Programme Structure

of

(B.E. Mechanical and Automation Engineering)

Semester –III to VIII

To be introduced from the academic year 2014-15
(i.e. from June 2014)

(Subject to the modifications by B.O.S. from time to time)



SHIVAJI UNIVERSITY, KOLHAPUR

**STRUCTURE OF S.E. (MECHANICAL AND AUTOMATION ENGINEERING)
SEMESTER III and IV**

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2014-15

SEMESTER III

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Engineering Mathematics III	3	-	-	3	100	-	-	-	100
2	Thermal Science	3	--	2	5	100	25	--	25	150
3	Electric Drives and Controls	3	--	2*	4	100	25	--	--	125
4	Fluid Mechanics	3	--	2	5	100	25	--	25	150
5	Manufacturing Technology	3	--	-	3	100	--	---	--	100
6	Mechanical Engineering Drawing	3	--	2	5	100#	25	--	--	125
7	Computer Programming	--	--	2*	1	--	25	--	--	25
8	Workshop Practice III (Foundry and Processing)	--	--	2	2	---	25	--	---	25
		18	---	12	28	600	150	---	50	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, TW: Term Work POE/OE: Practical/ Oral Exam

***Practicals to be conducted alternate weeks. (For Electric Drives and Control/Computer Programming)**

Theory paper of 04 hours duration.

UNLESS SPECIFIED THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

[Note: - Examination scheme and term work marks strictly as per above structure]



SHIVAJI UNIVERSITY, KOLHAPUR

**STRUCTURE OF S.E. (MECHANICAL AND AUTOMATION ENGINEERING)
SEMESTER III and IV**

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2014-15

SEMESTER IV

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Strength of Materials	3	-	2*	4	100	25	-	-	125
2	Numerical Analysis	3	--	--	3	100	--	--	--	100
3	Metrology and Quality Control	3	--	2	5	100	25	--	--	125
4	Machine Tool Systems	3	--	2	5	100	25	--	--	125
5	Theory of Machines	3	--	2*	4	100 @	25	---	25	150
6	Fluid and Turbo Machinery	3	--	2	5	100	25	--	--	125
7	Computer Aided Machine Drawing	--	--	2	2	--	25	--	--	25
8	Workshop Practice IV (Machine Shop)	--	--	2	2	---	25	--	---	25
		18	---	12	30	600	175	---	25	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, TW: Term Work POE/OE: Practical/ Oral Exam

* Practicals to be conducted alternate weeks.

@ Theory paper of 04 hours duration.

UNLESS SPECIFIED THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

[Note: - Examination scheme and term work marks strictly as per above structure]



SHIVAJI UNIVERSITY, KOLHAPUR

**STRUCTURE OF T.E. (MECHANICAL AND AUTOMATION ENGINEERING)
SEMESTER V and VI**

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2015-16

SEMESTER V

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Environmental Science and Engineering	3	-	-	3	100	--	-	-	100
2	Microprocessors and Applications	3	--	2	5	100	25	25	--	150
3	Machine Design I	3	--	2	5	100	25	--	--	125
4	Database Management Systems	3	--	2	5	100	25	--	--	125
5	Material Science and Metallurgy	3	--	2	5	100	25	---	--	125
6	Instrumentation and Control	3	--	2	5	100	25	--	25	150
7	Programming and Simulation Lab I	--	--	2	2	--	25	--	--	25
		18	---	12	30	600	150	25	25	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, TW:Term Work POE/OE: Practical/ Oral Exam

UNLESS SPECIFIED THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

[Note: - Examination scheme and term work marks strictly as per above structure]



SHIVAJI UNIVERSITY, KOLHAPUR

**STRUCTURE OF T.E. (MECHANICAL AND AUTOMATION ENGINEERING)
SEMISTER V and VI**

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2015-16

SEMESTER VI

MyUniversityBuzz

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Principles of Management	3	-	-	3	100	--	-	-	100
2	Heat and Mass Transfer	3	--	2	5	100	25	--	25	150
3	Machine Design II	3	--	2	5	100	25	25	--	150
4	Manufacturing Automation	3	--	2	5	100	25	--	--	125
5	Applied Hydraulics and Pneumatics	3	--	2	5	100	25	---	--	125
6	Finite Element Analysis	3	--	2	5	100	25	--	--	125
7	Programming and Simulation Lab II	--	--	2	2	--	25	--	--	25
		18	---	12	30	600	150	25	25	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, T/W:Term Work POE/OE: Practical/ Oral Exam

@ Industrial training of minimum two (2) weeks should be done after T.E. (II) in summer vacation and it's assessment will be done in B.E. (I) based on report submitted.

UNLESS SPECIFIED, THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

[Note: - Examination scheme and term work marks strictly as per above structure]



SHIVAJI UNIVERSITY, KOLHAPUR

Structure of B. E. (MECHANICAL AND AUTOMATION ENGINEERING) Semesters VII & VIII

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2016-17

SEMESTER VII

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Industrial Automation and Robotics	3	-	2	5	100	25	25	-	150
2	P.L.C. & SCADA Programming	3	--	2	5	100	25	--	25	150
3	Metal Cutting and Tool Design	3	--	2	5	100	25	--	--	125
4	Elective-I	3	--	2	5	100	25	--	--	125
5	Elective-II	3	--	2	5	100	25	---	--	125
6	Seminar	-	--	2	2	--	25	--	---	25
7	Project	--	--	3	3	--	50	--	--	50
8	Industrial Training @	--	--	--	--	---	50	--	---	50
		15	---	15	30	500	250	25	25	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, T/W:Term Work POE/OE: Practical/ Oral Exam

@ Industrial training of minimum two (2) weeks should be done after T.E. (II) in summer vacation and it's assessment will be done in B.E. (I) based on report submitted. Work load of the assessment can be assigned to the project seminar guide.

UNLESS SPECIFIED THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

Sr. No.	Elective I	Elective II
1	Computational Fluid Dynamics	Nano Technology
2	Design of Jigs, Fixture and Press Tools	Industrial Product Design
3	Refrigeration and Air Conditioning	Total Quality Management
4	Computer Aided Design and Computer Aided Manufacturing	Mechatronics



SHIVAJI UNIVERSITY, KOLHAPUR

B. E. (MECHANICAL AND AUTOMATION ENGINEERING)

Semesters VII & VIII

WITH EFFECTIVE FROM THE ACADEMIC YEAR 2016-17

SEMESTER VIII

Sr. No.	Subject	L	TUT	P	Total	TP	TW	OE	POE	Total
1	Industrial Engineering	3	-	2	5	100	25	--	--	125
2	Mechanical System Design	3	--	2	5	100	25	25	--	150
3	Advanced Control Systems	3	--	2	5	100	25	--	--	125
4	Elective-III	3	--	2	5	100	25	--	--	125
5	Elective-IV	3	--	2	5	100	25	---	--	125
7	Project	--	--	5	5	--	100	--	50	150
		15	---	15	30	500	225	25	50	800

L: Lecture, TUT: Tutorial P: Practical, TP: Theory Paper, T/W:Term Work POE/OE: Practical/ Oral Exam

UNLESS SPECIFIED THE THEORY EXAMINATION DURATION WILL BE OF 03 HOURS.

Sr. No.	Elective III	Elective IV
1	Reliability Engineering	Entrepreneurship Development
2	Management of Manufacturing Systems	Production Planning and Control
3	Nonconventional Machining Processes	Noise and Vibration
4	Engineering Optimization	Micro-Electro Mechanical Systems (MEMS)

[Note: - Examination scheme and term work marks strictly as per above structure]

S.E. (MECH & AUTOMATION) – Part I

1. ENGINEERING MATHEMATICS – III

Teaching Scheme:

Lectures: 3 hours/week

Examination Scheme:

Theory: 100 Marks (3Hrs Duration)

MyUniversityBuzz

SECTION – I

1 Linear Differential Equations: Linear Differential Equations with constant coefficients, Homogeneous Linear differential equations, [5 hours]

2 Applications of Linear Differential Equations: Applications of Linear Differential Equations with constant coefficients to Whirling of Shafts and Oscillations of a spring (Free oscillations, Damped Oscillations, Forced oscillations without damping). [5 hours]

3 Partial differential equations: Four standard forms of partial differential equations of first order. [5 hours]

4 Application of Partial differential equations: Wave Equation. One dimensional heat flow equation, Two dimensional heat flow Laplace equation (Steady State). [4 hours]

SECTION – II

5 Laplace Transform: Definition, Transforms of elementary functions, Properties of Laplace transforms, transforms of derivatives, transforms of integral, transforms of periodic function. [5 hours]

6 Inverse Laplace transforms: Inverse Laplace transforms by using partial fractions, Convolution theorem, Applications to linear differential equations with constant coefficients (Initial value problems). [5 hours]

7 Vector Calculus: Differentiation of vectors, Velocity and acceleration, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function, Irrotational and Solenoidal vector fields. [5 hours]

8 Fourier series: Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansion of odd and even periodic functions, Half range series [5 hours]

Reference Books:

1. A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P. N. Wartikar , Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. A textbook of Engineering Mathematics by N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar- Laxmi Publication, Delhi.
5. Advanced Engineering Mathematics 2e ,M.D.Greenberg, Pearson Education.

S.E. (MECH AND AUTOMATION) – Part I

2. THERMAL SCIENCE

Teaching Scheme:

Lectures : 3 hours/week

Practical: 2 hours/week

Examination Scheme:

Theory : 100 marks (3Hrs Duration)

Termwork: 25 marks

POE: 25 marks

SECTION – I

1. Review of Laws of Thermodynamics: (3)

Zeroth law, first law & Second law of thermodynamics, Equivalence & Corrolories of Second Law, Numerical treatment on second law.

2. A) Entropy: (6)

Clausius inequality, entropy as a property of system, entropy of pure substance. T-S and h-s planes, entropy change in a reversible and irreversible processes, increase of entropy principle, calculation of entropy changes of gases and vapours, Statement of third law of thermodynamics.

B) Availability:

Available and unavailable energy: availability of a closed and open system, availability of work and heat reservoirs, and simple numericals.

3. Properties of Pure Substances and Vapour Power Cycles (7)

Properties of steam, use of steam table and Mollier chart, Deviation of real gases from ideal gases, Equations of state- Vander Waal, Beattie-Bridgemen, Virial & Diterici's equations, P-V-T surfaces & triple point of water.(Descriptive treatment). Carnot cycle using steam, limitations of Carnot cycle Rankine cycle, representation on T-s and h-s planes, thermal efficiency, specific steam consumption. Work ratio, effect of steam supply pressure and temperature, condenser pressure on the performance. (Numerical Treatment)

4. Steam Condensers: (4)

Functions, elements of condensing plant, types of steam condensers, surface and jet condensers, comparison, vacuum efficiency, condenser efficiency, loss of vacuum, sources of air leakages, methods of leak detection, air extraction methods, estimation of cooling water required, capacity of air extraction pump, air ejectors.

SECTION II

5. Steam Nozzles: (5)

Functions, shapes, critical pressure ratio, maximum discharge condition, effect of friction, design of throat and exit areas, nozzle efficiency, velocity coefficient, coefficient of discharge, supersaturated flow, degree of under-cooling and degree of super saturation, effects of super saturation.

6. Steam Turbines: (15)

6.1 Principles of operation, classification, impulse and reaction steam turbine, compounding of steam turbines.

6.2 Flow through impulse turbine blades, velocity diagrams, work done, efficiencies, end thrust, blade friction, influence of ratio of blade speed to steam speed on efficiency of single and multistage turbines and its condition curve and reheat factors.

6.3. Flow through impulse reaction blades, velocity diagram, and degree of reaction, parson's reaction turbine, and backpressure and pass out turbine.

6.4 Reheat regenerative steam power cycles.

6.5. Governing of steam turbines. losses in steam turbines, performance of steam turbines.

6.6. Function of diaphragm, glands, turbine troubles like erosion, corrosion, vibration, fouling etc.

TERM WORK

Any ten experiments from the list given below:

1. Significance and relevance of lubrication properties and systems.
2. Test on grease penetrometer and dropping point apparatus.
3. Test on carbon residue, cloud and pour point apparatus.
4. Test on Redwood Viscometer.
5. Test on Aniline point apparatus.
6. Determination of flash and fire point of a lubricating oil.
7. Demonstration of water tube and fire tube boilers
8. Demonstration of boiler mountings and accessories
9. Trial / Demonstration of on steam calorimeters
10. Trial / Demonstration of condenser and study of cooling towers
- 11 Trial / Demonstration of on steam calorimeters
- 12 Trial on steam power plant
13. Report on industrial visit to a steam power plant

Instructions for practical examination

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.
3. Oral will be based on the practical performed in the examination and the experiments included in the journal.

REFERENCE BOOKS

1. Kumar and Vasandani, Thermal Engineering, Metropolitan Book Co., Delhi,
2. Mathur and Mehta, Thermal Engineering, Jain Bros. Publishers, Delhi.
3. Ballaney P.L., Thermal Engineering, Khanna Publishers, New Delhi.
4. P.K. Nag., Engineering Thermodynamics, Tata Mc Graw Hill ,New Delhi
5. Holman, Thermodynamics, Mc Graw Hill, London

6. Engineering Thermodynamics, Gupta & Prakash, Nemichand & Sons
8. Cengel & Boles Thermodynamics: an engineering approach, 3/e, Tata McGraw-Hill, New Delhi
9. R. K. Rajput, Thermal Engineering , Laxmi Publications
10. Wylen Van, G. J. & Sonntag R. E. , Fundamentals of Classical Thermodynamics. John Wiley & Sons
11. R. Yadav, Steam & Gas Turbines CPH Allahabad.
- 12 Fundamentals of Engineering Thermodynamics- 4e MORAN Wiel

S.E. (MECHANICAL AND AUTOMATION) – Part I

3. ELECTRIC DRIVES AND CONTROLS

Teaching Scheme:

Lectures : 3 hours/week

Practical: 2 hours/alternate week

Examination Scheme:

Theory : 100 marks (3Hrs Duration)

Termwork: 25 marks

SECTION I

1. INTRODUCTION (5)

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

2. DRIVE MOTOR CHARACTERISTICS (6)

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

3. STARTING METHODS (8)

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

SECTION II

4. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES (10)

Speed control of DC series and shunt motors – Armature and field control, Ward- Leonard control system
- Using controlled rectifiers and DC choppers –applications.

5. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES (10)

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TERMWORK:

Any SIX experiments from the following;

- 1) Case study of any one industrial application.
- 2) Speed control of D. C. Shunt motor by flux control method.
- 3) Speed control of D. C. Shunt motor by rheostatic control method
- 4) Load test on D. C. Shunt motor,
- 5) Efficiency calculation of resistance ovens.
- 6) Calibration of single-phase energy meter
- 7) Power factor correction of three phase load using static capacitors.
- 8) Starting of Three phase squirrel cage and slip ring induction motors.

REFERENCE BOOKS:

1. Vedam Subrahmaniam, “Electric Drives (concepts and applications)”, Tata McGraw- Hill, 2001
2. Nagrath .I.J. & Kothari .D.P, “Electrical Machines”, Tata McGraw-Hill, 1998 REFERENCES
3. Pillai.S.K “A first course on Electric drives”, Wiley Eastern Limited, 1998
4. M.D.Singh, K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998
5. H.Partab, “Art and Science and Utilisation of electrical energy”, Dhanpat Rai and Sons, 1994.

S.E. (MECHANICAL AND AUTOMATION) – Part I

4. FLUID MECHANICS

Teaching Scheme:

Lectures: 3 hours/week

Practical: 2 hours/ week

Examination Scheme:

Theory : 100 marks(3Hrs Duration)

Termwork: 25 marks

Practical Oral: 25 marks

SECTION-I

1. Introduction:

(3)

Definition of fluid, properties of fluid, fluid as a continuum, Pascal's law, hydrostatic law of pressure, Viscosity, types of fluid, compressibility, surface tension, capillarity and vapor pressure.

2. Kinematics & Dynamics of Fluid Flow

(10)

Kinematics: Flow visualization, types of flow, streamline, path line, streak line, stream tube, continuity equation in Cartesian coordinates in three dimensional form. Velocity and Acceleration of fluid particles, stream function and velocity potential function .

Dynamics: Equation of motion. Integration of Euler's equation as energy equation. Energy correction factor Steady and unsteady flow through orifice. Orifice meter, time required to empty the tank, Venturimeter, flow over triangular and rectangular notches.

3. (A) Momentum Equation

(7)

Derivation of momentum equation, momentum correction factor. Applications of momentum equation.

(B) Dimensional Analysis and Similitude

Dimensionally homogeneous equations, Buckingham's TT theorem, calculation of dimensionless parameters. Similitude, complete similarity, model scales.

SECTION – II

5. Laminar & Pipe Flow

(9)

Laminar: Laminar flow through circular pipes. Laminar flow through parallel plates, Navier Stoke's equation and its applications, introduction to CFD.

Pipe Flow: Energy losses in transition, expansion and contraction (Darcy's and Chezy's equation), Parallel pipe, siphon pipes, branching pipes and equivalent pipes.

6. Boundary Layer Theory

(3)

Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, separation, boundary layer control (descriptive treatment)

7 Forces on immersed bodies

(3)

Types of drags on a flat plate. Drag on aerofoil. Development of lift. (Magnus effect) stalling condition of aerofoil.

8. Compressible flow

(5)

Propagation of elastic waves, Mach number cone. Energy equation of compressible flows. Stagnation pressure and temperature, Adiabatic flow through pipes of varying cross section, Isentropic flow, Condition of maximum discharge.

TERM WORK

The term work shall consist of the report on any ten experiments from the following:

1. Flow visualization by plotting of streamline (Heleshaw apparatus).
2. Reynolds experiment.
3. Verification of Bernoulli's equation.
4. Calibration of venturimeter .
5. Calibration of orifice-meter.
6. Calibration of notches.
7. Orifice under steady and unsteady flow condition
8. Determination of velocity profile through circular pipes for laminar flow.
9. Determination of minor losses in pips-fittings
10. Determination of loss head and discharge in parallel pipe.
11. Determination of loss of friction in series pipes.
12. Demonstration or trial on wind tunnel for measurement of lift and drag on any model.
13. Pressure and velocity distribution over aerofoil.

Instructions for practical examination

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.
3. Oral will be based on the practical performed in the examination and the experiments included in the journal.

REFERENCE BOOKS

1. V. L. Streeter and E. B. Wylie, Fluid Mechanics, Wiley Eastel Limited, New Delhi
2. K. L. Kumar, Fluid Mechanics, S. Chand Publication. New Delhi
3. K. Subramanya, Theory and Applications of machines, Tata McGraw Hill Publication.
4. Fox and McDonald, Fluid Mechanics, John Wiky and Sons, New York.
5. Bansal. Fluid Mechanics , Laxmi publications. New Delhi.
6. Fraizini, Fluid Mechanics. 4/e. Tata McGraw-Hill, New Delhi.
7. White, Fluid Mechanics, 4/e, Tata McGraw-Hill, New Delhi.
9. Modi and Seth, 'Fluid mechanics and Hydraulic machines',
10. R. K Rajput, 'Fluid mechanics and Hydraulic machinenary', Laxmi publishers
11. Fluid Mechanics By J.F.Douglas, J.M.Gasiorek J.A.Swaffied 4e pearson education
- 12 Fluid Mechanics –Fundamentals & Application Y.A.Cengel,J.M.Cimbala Adopted by S.C. Bhattacharya TMI
- 13 Fundamentals Of Fluid Mechanics, B.R. Munson,D.F. Young, T.H.Okiishi 5e Wiley India Pvt.Ltd.

S.E. (MECHANICAL AND AUTOMATION) PART-I

5. MANUFACTURING TECHNOLOGY

Teaching Scheme:
Lectures: 3 hrs/week

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)

SECTION I

1. Patterns and Pattern making (3)

Introduction to Foundry - Steps involved in casting, advantages, limitations and applications of casting process. Pattern types, allowances for pattern, pattern materials, color coding and storing of patterns.

2. Moulding & Casting Processes (11)

Moulding: methods & processes- equipment, Moulding sand ingredients, essential requirements, sand preparation and control, testing, core making. Moulding machines and core making machines. Design considerations in casting, gating and Riser - directional solidification in castings, solidification control devices: chills, ceramics bricks, directional solidification.

Casting:Sand castings, sand properties and their testing, pressure die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, CO2 Moulding, continuous casting-squeeze casting, electro slag casting.

3. (A)Melting and pouring (6)

Types of fuel fired melting furnaces -Cupola furnace, crucible furnaces, Electric furnaces, - Metallurgical control in furnaces- Advanced Metal pouring equipments – Molten metal transfer and automatic pouring machines.

(B) Casting defects: NDT tests, Machines and instruments used for identification of defects.

Foundry layouts and mechanization – Use of automatic machines and robots for various casting processes.

SECTION II

4. Forming Processes (10)

a. Forging - Forging principle, classification, equipments, tooling-processes, parameters and calculation of forces and power requirements during forging.

b. Rolling - Principles of rolling processes, classification, types of rolling mills, rolling mill control, , effects of friction. Form rolling, rolling defects, causes and remedies

c. Extrusion and Drawing Processes - Classification of extrusion processes-tools, equipments, and principle of these processes, rod/wire drawing-tool, equipment and principle of processes defects-Tube drawing and sinking processes

5. Basic Joining Processes (6)

Types of welding-gas welding, -arc welding,-shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types)-atomic hydrogen arc welding-thermit welding, Flame cutting - Use of Oxyacetylene, modern cutting processes, arc cutting

6. Shaping of plastics (3)

• Introduction to blow molding, injection molding, extrusion, calendaring and thermo forming

Note: The Workshop practice III should cover the practical based on this syllabus, the load of which shall be allotted to teaching staff.

REFERENCES:

1 Serope Kalpakjian, Steven R. Schmid “Manufacturing Engineering and Technology” (4th Edition) Prentice Hall.

2 P.N.Rao “Manufacturing Technology”, TMH Ltd 1998(Revised edition)

3 Dieter “Mechanical Metallurgy”, Revised edition 1992, Mcgraw

4 E. Paul DeGarmo, J. T. Black, Ronald A. Kohser, "Materials and Processes in Manufacturing", Wiley.

5 Lindberg, "Processes and Materials of Manufacture ", Prentice Hall of India (p) Ltd

S.E. (MECHANICAL AND AUTOMATION) PART-I

6. MECHANICAL ENGINEERING DRAWING

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/week

Examination Scheme:

Theory Paper: 100 marks (4 hrs. duration)

Term work: 25 marks

SECTION-I

1. Study of B.I.S. (Bureau of Indian Standards) Conventions. (5)

Significance and importance of BIS Conventions, Drawings sheet sizes and layout recommended by BIS. Conventional representation of engineering Materials, spur helical and bevel gears, worm and worm wheel, rack and pinion, gear assemblies, type of helical, disc and leaf springs. Internal and external threads, square head, spline shaft, diamond knurling BIS conventions for sectioning, type of sections, exceptional cases. BIS methods of linear- and angular dimensioning. Symbolic representation of welds as per BIS for representation of above conventions.

2. Interpenetration of Solids (6)

Introduction, interpenetration of prism with prism, prism with cylinder, prism with cone, prism with pyramids. (Prisms and Pyramids limited up to rectangular), cylinder with cylinder, Cone with cylinder.

3. Sketching of machine component (8)

Importance of sketching and entering proportionate dimensions on sketches. Sketches of nut, bolts (square and hexagonal flanged nuts, lock nuts, dome nut, capstan nut, wing nut, castle nut, split pin, square headed bolt, cup headed bolt, T-headed bolt, Rag foundation bolt, stud, washer. Various types of rivets and riveted joints, Various types of keys, Socket and spigot (Cotter joint), Knuckle (pin) joint, Muff coupling, Protected and unprotected Flanged, coupling, universal coupling, solid and bush bearing. Plummer block (pedestal bearing), foot step bearing. Flat and V-belt pulleys, Fast and loose pulleys, speed cone pulleys, Pipe joint for C.I. Flanged, socket and spigot type pipe joint. Union pipe joint and standard pipe-fitting. Students should know the applications of above machine components.

SECTION II

4. Auxiliary Projection

(5)

Projection on auxiliary vertical and horizontal plane, Auxiliary projection of simple machine components.

5. Limits, fits and tolerances

(6)

Significance of system of limits and fits. Definitions, Types, Recommendations and selections, Tolerances of form and position, surface finish symbols as per BIS, Selection and entering of all these symbols with reference to details and assembly drawings, Tolerancing an individual dimensions of details drawing.

6. Details and assembly drawing

(9)

To prepare detail drawings from given assembly drawing. To prepare assembly drawing from given drawing of details. The no. of parts is limited to ten to twelve. Preparation of detailed drawing from the given details such as: Screw jack, Tools post of center lathe, Tail stock. Cross head Assembly, Jigs and fixtures, connecting rod and piston of I.C. Engines, Gland and stuffing box, Crossed head assembly, Valve assembly, etc. Assembly selected should include different types of sections.

TERM WORK

Sheet no. 1. Based on BIS conventions mentioned in section 1.1

Sheet no. 2: Based on sketching (Free hand drawing) of various machine components mentioned in section 1.

Sheet no. 3: To draw details drawing from given assembly.

Sheet no. 4 .To draw details and assembly drawing by taking actual measurements and entering limits, fits, tolerances, surface finish symbols, geometrical requirements etc.

Sheet no. 5: Sheet based on auxiliary view.

Sheet no. 6: Sheet based on interpenetration of solids.

Note: Use first angle of projection method only.

BOOKS

1. IS: SP46- Engineering drawing practice for schools and colleges, B.I.S. Publications.

2. IS: 696- Code of practice for general engineering drawings B.I.S. Publications.
3. IS : 2709-Guide for selection of fits, B.I.S. Publications.
4. IS:919- Recommendation for limits and fits for Engineering, B.I.S. Publications
5. IS: 8000- Part I, II. III. IV, geometrical tolerancing of technical drawings -- B.I.S. Publications.
6. P.S. Gill, Machine Drawing., S.K. Kataria and Sons , Delhi.
7. N. D. Bhatt., Machine Drawing. Charotar Publication House, Bombay.
8. N. Sidheshwar . P. Kannaiah and V.V. S. Sastry. Machine Drawing, Tata McGraw Hill, New Delhi.
9. R.K. Dhavan, Machine Drawing, S. Chand and Company.
10. Narayana, Kannaiah and Venkatareddy, Production Drawing, New Age International
- 11 N.D.Junnarkar Machine Drawing 1 st print Pearson Education

S.E (MECHANICAL & AUTOMATION) PART I

7. COMPUTER PROGRAMMING

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Practical: 2 Hrs /Alternate Week

Term Work: 25 Marks,

TERM WORK:

- 1) Minimum 1 program on Input/output & arithmetic expressions, hierarchy of operators, branching and loop control statements
- 2) Minimum 1 program on pointers with Arrays and Function.
- 3) Minimum 1 program on structures.
- 4) Minimum 2 programs on Class & Objects
- 5) Minimum 2 programs on Inheritance
- 6) Minimum 2 programs on Overloading
- 7) Minimum 2 programs on Polymorphism

REFERENCE BOOKS:

- 1) Object Oriented Programming - E. Balguruswami (Tata McGraw hill Publication)
- 2) Let us C++ , Yashwant Kanitkar (BPB Publication).
- 3)C++ Programming, 7th ed Alstevans wiely, India
- 4)C++/CLI , Sivkumar wiely India
- 5)Professional c++ , Solter wiely India

S.E (MECHANICAL & AUTOMATION) PART I**8. WORKSHOP PRACTICE III**

Practical: 2 Hrs

Term Work: 25 Marks,

Term Work:

The load of workshop practice III will be allotted to the teaching staff and will be assisted by workshop staff for completing the jobs.

1. Preparation of pattern from component drawing, Pattern manufacturing after preparing pattern drawing.
2. Study of different types of forging processes and one job based on smithy/ forging.
3. Study of different types of welding processes and one job based on any one welding method.

[Jobs carry 15 marks and journal carries remaining 10 marks.]

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S.E. (MECHANICAL AND AUTOMATION) PART-II

1. STRENGTH OF MATERIALS

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/Alternate week

Examination Scheme:

Theory Paper: 100 marks

Term work: 25 marks

SECTION-I

1. Stresses and Strain.

(7)

Concept of stress and strain, (Linear, lateral, shear and volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of rigidity', stress-strain diagram for ductile and brittle material factor of safety, working stress. Normal and shear stresses, Thermal Stresses. Complementary shear stress, Bulk Modulus, Inter-relationship between elastic constants.

2. A) Torsion

(7)

Basic assumptions. Torsion formula. Hollow and solid circular shafts, Angular deflection

B) Shear Force and Bending Moment Diagram.

Concept and definition of shear force and bending moment in determinate beams due to concentrated, UDL and uniformly varying load

3. Stresses in Beams

(7)

A) Bending stresses -

Symmetric pure bending of beams, flexure formula, moment of resistance of crosssections, simple built-up section, design of rectangular and circular (solid and hollow) sections; L, I and T sections

B) Shear stresses -

Distribution of shear stresses in beams of various commonly used sections such as circular, I, T, and angles

SECTION II

4. Principal Stresses and Strains

(8)

Normal and shear stresses on any oblique planes, concept of Principal planes, derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr's circle of stresses, Combined effect of shear and bending in Beam, Theories of elastic failure (Without derivation).

5. Deflection of Beams

(4)

Strain curvature and moment curvature relation, solution of beam deflection problem by Double integration method, Area moment method. (Simply Supported Beam & Cantilever.)

6. A) Columns

(7)

Euler's formula for different end connections, concept of equivalent length, eccentric loading, Rankine formula.

B) Energy Methods

Strain energy for uniaxial stress, Pure bending (Simply Supported Beam & Cantilever.), Shear stresses (Direct Shear & Pure Torsional), Use of energy theorem to determine deflections and twists of shafts.

TERM WORK

A term work shall consist of report on the assignments given below.

1. Shear force and bending moment diagram.
2. Bending and shear stresses in beams.
3. Principal stresses and theories of failures.
4. Torsion.
5. Deflection of beams.
6. Columns.

TEXTBOOKS

1. Ferdinand P Beer and E.R. Johnston JR. John Dewolf, Mechanics of Materials 3/e, McGraw Hill Book Company
2. Timoshenko and Young. Elements of Strength of Materials, East-West Press. Pvt. Limited, New Delhi.
3. Ramamurthum, Strength of Materials, Dhanpat Rai and Sons, New Delhi.

4. Rajput, Strength of Materials, Laxmi Publication
5. S.B Junnerkar. Mechanics of structure Vol I, Publication House
6. Bansal, Charotor Strength of Materials, Laxmi Publication
7. Khurmi Gupta, Strength of Materials, S. Chand Publication.
8. E.P.Popov “Mechanics of Materials” Prentice Hall Inc.
9. Andrew P. & Singer F.L., “Strength Of Materials”, Harper & Row Publishers
10. G.H. Rider. “Strength of Materials “, Mac Millan India Ltd.
- 11 Mechanics of Materials Hibbler 2e Pearson Education Publication
12. Den Hartong, Strength of Materials, McGraw Hill, New York.
13. H. BURR and John Cheatam, Mechanical Analysis and Design, PHI, New Delhi.
14. Robert Norton, Machine Design, Prentice Hall

MyUniversityBuzz S.E. (MECHANICAL AND AUTOMATION) PART-II

2. NUMERICAL ANALYSIS

Teaching Scheme:

Lectures: 3 hrs/week

Examination Scheme:

Theory Paper: 100 marks

SECTION - I

1) Roots of equation: (5)

- a) Bracketing Methods - Bisection Methods, False Position Method
- b) Open Methods - Newton Rapson, Multiple Roots, System of non-linear Equations, Secant Method
- c) Roots of polynomials -Muller's Method

2) Linear Algebraic equation: (5)

- a) Gauss Elimination Method - Naive Gauss Elimination, Pitfalls of Elimination Methods, Techniques of improving solutions, Gauss-Jordan Method
- b) Matrix Inversion - LU Decomposition, Matrix Inverse, Gauss Seidel, Jacobi Iteration Method

3) Curve Fitting: (5)

- a) Least Square Regression - Linear Regression, Polynomial Regression.
- b) Interpolation - Newton's divided difference, Interpolating Polynomial Lagrange's interpolating polynomial,

- 4) **Statistics:** (5)
Mean and standard deviation. Addition and multiplication laws of probabilities. Binomial, Poisson and normal distribution

SECTION - II

- 5) **Numerical Differential & Integration:** (4)

- a) Newton's Cote's Integration of Equation - Trapezoidal rule, Simpson's rules, Integration Unequal Segments.
b) Integration of equations - Romberg's Integration & Gauss quadrature.
c) Numerical Differentiation. - Differentiation formulae, Richardson Extrapolation, Derivation of unequally spaced data. Forward difference, Central difference, Backward difference

- 6) **Ordinary Differential Equation:** (5)

- a) Taylor's Series method, Picard method, Runge-Kutta methods, Euler's method, Improved Polygon Method, System of Equations. ,
b) Boundary Value & Eigen Value Problem, shooting Method, Finite Difference Method, Eigen Value Problem based on Polynomial Method, Power Method.

- 7) **Partial Differential Equation:** (6)

- a) Finite difference - Elliptical Equations, Laplace's equation Liebmen Method, Secondary Variables, Boundary condition
b) Finite difference - Parabolic Equations, Explicit Method Implicit Method, Crank Nicolson Method

- 8) **Introduction to Finite Element Method:** - Solutions to boundry value problems, (5)
integral formulations for numerical solutions, One dimensional linear element, Applications of FEM in 1D and 2D conduction and convection heat transfer problems.

REFERENCE BOOKS:

- 1) Numerical method for Engineers - S.C. Chapra, Canale (Tata McGraw Hill Publications)
- 2) Numerical Methods – Dr. B.S. Grewal (Khanna Publications)
- 3) Numerical methods – E Balguruswamy (Tata McGraw Hill Publications)
- 4) Numerical Heat transfer and Fluid flow - S.U. Patankar (McGraw Hill Publications)
- 5) Applied Finite Element Analysis – Larry J. Segerlind (John Wiley & Sons)
- 6) Introductory Methods of Numerical Analysis- S. S. Sastry (Prentice Hall Publication)

S.E. (MECHANICAL AND AUTOMATION) PART-II

3. METROLOGY AND QUALITY CONTROL

Teaching Scheme:

Lectures: 3 hrs/week
Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks
Term work: 25 marks

SECTION – I

1. Measurements:

International standards of length-Line and end measurement, Need of measurement, possible errors in measurement, slip gauges, precision & accuracy, Sources of errors in measurement. **04**

2. Tolerances and Gauging:

Unilateral and bilateral tolerances, Limits, Fits, Types of Fits, IS specifications of limits. Importance of limits, System in mass production, limit gauges used for plain and taper works. **04**

3. Magnification :

Venires, Micrometers, Dial gauges, Mechanical, Optical, electrical, Pneumatic method of magnification, Mechanical and pneumatic types of comparators, Use of comparators in inspection. **03**

4. Measurement of Angles, Tapers and Radius:

Bevel Protractor, Spirit level, Clinometers, angle Decker, standard balls and rollers for angle measurement, angle slip gauges, radius measurement of circular portion, measurement of concave and convex surface radius. **03**

5. Flat Surface Measurement :

Flatness Measurement, straight edges, surface plates, optical flat and auto collimator. **02**

6. Surface Roughness Measurement:

Differences between surface roughness and surface waviness – Numerical assessment of surface finish – CLA, RMS Values, Ra & Rz value, Methods of measurement of surface finish – profilograph. Talysurf, ISI symbols for indication of surface finish. **04**

SECTION – II

7. Optical Measuring Instruments:

Tool maker's microscope and its uses – collimators, optical projector, interferometer, Coordinate Measuring Machine - Types and applications. **03**

8. Measurement of External Threads:

Different errors in screw threads, measurement of forms of thread with profile projector, pitch measurement, measurement of thread diameter with standard wire. **03**

9. Measurement of Spur Gears:

Run out, Pitch, profile, backlash & tooth thickness measurement, alignment, errors in gears, checking of composite errors. **03**

10. Quality Control:

A) Concept of quality and quality control, elements of quality and its growth, purpose, policy and objectives, quality controlling factors, quality of design and conformance, value & cost of quality. **03**

B) Quality management, TQM, Total Quality Control, Process quality, QS9000 / TS, CAQC, Zero defect, KAIZEN, quality circles. **03**

11. Statistical Quality Control:

Importance of statistical methods in quality control, measurement of statistical control variables and attributes, measurement/inspection, different types of control charts (X Bar, R & P charts) and their constructions and their applications. **03**

12. Acceptance Sampling:

Sampling inspection and percentage inspection, basic concept of sampling inspection, operating characteristic curves, conflicting interests of consumer and producer, producer and consumers risks, AWQL, LTPD, ADGL, single and double sampling plans. 02

TERM WORK:

1. Demonstration and use (care & maintenance) of various measuring instruments
2. Measurement of automobile components – piston, connecting rod, cylinder liner.
3. Demonstration on Pneumatic comparator
4. Screw thread measurement using floating carriage diameter measuring machine
5. Gear measurement using gear tooth caliper.
6. Measurement of template using tool makers microscope
7. Angle measurement using sine bar
8. Measurement of angle of V – Groove and determines its width using standard balls and rollers
9. Thread measurement by Tool Makers microscope
10. Use of X Bar and R chart
11. Use of P chart
12. O.C. curves

REFERENCE BOOKS:

1. Text Book of Engg. Metrology- I.C. GUPTA, Dhanpat Rai & Sons, New Delhi
2. Practical Engg. Metrology, Sharp K.W.B. Pitman, London
3. Statistical Quality Control- E.L. Grant, Tata McGraw Hill Book Co Ltd., New Delhi
4. Engg. Metrology, R.K.Jain, Khanna Publishers, Delhi
5. Statistical Quality Control –R.C. Gupta, Khanna Publishers, Delhi, Third Edition
6. I.S. 919/1963
7. I.S. 2709/1964
8. Engg. Metrology-Hume K.J.,MC Donald,Techincal & Scientific ,London
9. Total Quality Management-Dalela
10. Statistical Quality Control-Mahajan A.K., Dhanpat Rai & Co., New Delhi
11. Statistical Quality Control, Eugene I. grant and Richard S. Levanworth, Tata McGraw
12. Total Quality management, K Shridhara Bhat, Himalaya Publication House
13. Juran’s Quality Planning and Analysis, frank M. Gryna, Richard C.H. Chua, Joseph a. Defeo

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S.E. (MECHANICAL AND AUTOMATION) PART-II

4. MACHINE TOOL SYSTEMS

Teaching Scheme:

Lectures: 3 hrs/week
Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks
Term work: 25 marks

SECTION-I

1. Introduction to metal cutting and machine tools (3)

Metal cutting principle, orthogonal and oblique cutting, machine tool - definition and purpose, characteristics, classification, elements, cutting motions (primary and feed).

2. Lathe (6)

Working principles, types specifications, principal parts, accessories and attachments, various lathe operations, introduction to automats.

3. Capstan and Turret Lathes (3)

Principle parts, working, comparison with centre lathe, turret indexing mechanism, bar feeding mechanism, turret tool holders.

4. Drilling, Boring, Shaping Machine

(6)

Classification of drilling machines, construction and working of radial drilling machine, various accessories, various operations.

Horizontal and vertical boring machine, construction and operation, boring tools and bars.

Introduction to Jig boring-machine.

Types-crank shaper, hydraulic shaper, Crank and slotted link quick return mechanism. Table feed mechanism, various operations.

SECTION-II

5. Milling Machine

(6)

Classification of milling machines, construction and working of column and knee type milling machines, milling operations, study of standard accessories- dividing head, rotary table, gear cutting on milling machine, vertical milling attachment for horizontal milling machine.

6. Grinding & Broaching Machine

(9)

Classification - cylindrical (external/internal), centerless, surface grinder, tool and cutter grinder, gear grinding, Grinding wheels- Abrasives, bonds and bonding processes, grit, grade and structure of wheel, wheel shapes, wheel specifications. Selection, mounting, glazing, loading, truing, wheel balancing (Introduction only).

Classification of broaching machines, various operations, advantages and limitations.

7. Gear Manufacturing Processes

(5)

Study of various processes like gear shaping, gear hobbing. Gear finishing processes -gear shaving, gear burnishing and gear rolling.

Note: The Workshop practice IV should cover the practical based on this syllabus, the load of which shall be allotted to teaching staff.

REFERENCE BOOKS

- 1) W. A. J. Chapman,. Workshop Technology vol. I, II, III, CBS Distributor New Delhi.
- 2) Raghuvansrii, Workshop Technology vol. II, Dhanpat Rai and Sons.
- 3) Gupta/Kaushik, Workshop Technology vol.. New Heights, Delhi.
- 4) Hajra Choudhary, Workshop Technology vol. II, Media promoters and Publications
- 5) P. C. Sharma, Production Technology, S. Chard publication.
- 6) Dalela, Manufacturing Science and Technology vol. II
- 7) R. K. Jain, Production technology, Khanna Publications.
- 8) Kundra, Rao, Tiwari, Computer Aided Manufacturing,
- 9) Manufacturing Processes and System 9E P. Ostwald, J. Munoz, John Wiley & Sons (asia) Pvt.Ltd.

S.E. (MECHANICAL AND AUTOMATION) PART-II
5. THEORY OF MACHINES

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/ Alternate week

Examination Scheme:

Theory Paper: 100 marks (4 Hrs)

Term work: 25 marks

POE: 25 marks

SECTION-I

1. Basic Concept of Mechanisms: (3)

Links, kinematic pair (lower and higher), kinematic chain, mechanism, inversion, types of constraints, Grubler's criterion, slider crank chain and its inversions, double slider crank chain and its inversions, four bar chain and its inversions.

2. Velocity and Acceleration in Mechanisms: (7)

Velocity and acceleration diagram for different mechanisms using relative velocity and acceleration method, Coriolis' component of acceleration, Klein's construction for slider crank mechanism, velocity analysis by Instantaneous center method for four bar chain and slider crank chain.

3. (A) Mechanisms with Lower Pairs: (10)

Pantograph, exact straight-line mechanisms- Paucellier and Hart Mechanism, Approximate straight line mechanism Tchebicheff and Grass-Hopper Mechanism, steering gear mechanisms, Hooke's joint.

(B) Kinetic analysis of Mechanisms:

Velocity and acceleration of slider crank mechanism by analytical method, Inertia force and torque, D'Alembert's principle, Dynamically equivalent system.

SECTION-II

4. Synthesis of Mechanism: (3)

Chebyshev method to find precision points for four bar mechanism and slider crank mechanism, Freudenstein's Equation.

5. (A) Cams: (12)

Types of cams and followers, profiles of cams for specified motion of different followers, spring load on the follower, jumping of follower.

(B) Governors:

Types of governors. Porter and Hartnell governor, controlling force and stability of governor, hunting, sensitivity, isochronism, governor effort and power, Insensitiveness of governors.

6. Belts and Ropes: (4)

Types of belt and rope drives, calculation of length and power transmitted, belt tension ratio, actual tension in a running belt, centrifugal and initial tension in belt, slip and creep of belt.

TERM WORK

A term work shall consist of report on any six of the following.

- 1) One A3 size sheet of Velocity and acceleration problems by relative velocity and acceleration method.
- 2) One A3 size sheet of problems on Instantaneous center method and Klein's construction.
- 3) Verification of ratio of angular velocities of shafts connected by Hooks joint.
- 4) Determination of M.I. by Bifilar suspension, Trifilar suspension, compound pendulum.
- 5) Synthesis of mechanism –Two position for slider crank and Three position for four bar Mechanism
- 6) One A3 size sheet of Problems on cam profile. (Minimum four problems)
- 7) Governor characteristics for Porter or Hartnell governor.

TEXT BOOKS

- 1) Ratan S.S, Theory of Machines, Tata McGraw Hill New Delhi.
- 2) P.L.Ballany, Theory of Machines, Khanna Publication, New Delhi.
- 3) V.P. Singh, Theory of Machines, Dhanpat Rai and Sons.

- 4) Phakatkar, Theory of Machines I and II, Nirali Publication. Pune
- 5) Dr. R.K.Bansal, Theory of machines, Laxmi Publication.

REFERENCE BOOKS

- 1) Thomas Bevan, Theory of Machines, CBS Publishers, New Delhi.
- 2) Shigley, Theory of Machines and Mechanism, McGraw Hill, New York
- 3) G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int. Publications Ltd. New Delhi.
- 4) Shah and Jadhawani, Theory of Machines, Dhanpat Rai & Sons
- 5) Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.

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S.E. (MECHANICAL AND AUTOMATION) PART-II

6. FLUID AND TURBO MACHINERY

Teaching Scheme:

Lectures: 3 hrs/week
Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks
Term work: 25 marks

SECTION I

1 Impulse Water Turbines:

(07)

Impact of Jet, Euler's equation for work done in Rotodynamic Machines, classification of water turbines, Pelton wheel, its construction and working, velocity triangles. Types, Pelton wheel design bucket dimensions, number of buckets, jet diameter, wheel diameter, jet ratio, speed ratio, number of jets, calculation of efficiency, power, discharge etc.

Governing of Pelton wheel, Model Testing, Unit quantities, Specific speed of turbine & performance characteristics of turbine.

2 Reaction Water Turbines:

(07)

Principle of operation, construction and working of Francis and Kaplan Turbine, effect of modification of velocity triangles on runner shape, draft tube, cavitation calculation of various efficiencies, power, discharge, blade angles, runner dimensions etc. Governing of Francis and Kaplan turbine. Draft tube-types

and analysis. Model Testing, Specific speed of turbine & performance characteristics of turbine.

3 Centrifugal Pumps: (06)

Working principles, Construction, types, various heads, multistage pumps, velocity triangles, minimum starting speed, cavitation, Maximum permissible suction head (MPSH) and Net positive suction head (NPSH). Methods of priming, calculations of efficiencies, discharge, blade angles, head, power required, impeller dimensions etc. Specific speed & performance characteristics of pumps.

SECTION II

4 Air compressors: (08)

Application of compressed air, classification of compressor, reciprocating compressors, construction, work input, necessity of cooling, isothermal efficiency, heat rejected, effect of clearance volume, volumetric efficiency, necessity of multistaging, construction, optimum intermediate pressure for minimum work required, after cooler, free air delivered, air flow measurement, capacity control. Roots blower and vane blower (descriptive treatment)

5 Rotodynamic Air Compressors: (07)

Centrifugal compressor, velocity diagram. Theory of operation, losses, Adiabatic efficiency, effect of compressibility, diffuser, pre-whirl, pressure coefficient, slip factor, performance. Axial flow compressors, velocity diagram, degree of reaction, polytropic efficiency, surging, choking, stalling, performance, comparison with centrifugal compressor.

6 Gas turbines: (05)

Working principles, applications, open, closed cycle and their comparison. Cycle modified to regeneration, reheat, intercooling performance. Calculation of gas turbine work ratio, efficiency etc. Types of fuels for gas Turbine.

TERM WORK

Any seven experiments from 1 to 9.

1. Study and trial on Pelton wheel.
2. Study and trial on Francis Turbine
3. Study and trial on Kaplan turbine
4. Trial on Centrifugal pump
5. Study and demonstration of reciprocating pump and hydraulic ram
6. Study and trial on reciprocating compressor
7. Study and trial on centrifugal blower
8. Study of hydraulic devices- Intensifier, Accumulator, Hydraulic jacks, press, Crane.
9. Study of other types of pumps- Gear pump, Jet pump, submersible pump, air lift pump.
10. Industrial visit to pump/turbine manufacturing industry or hydro power plant.

REFERENCES:

1. Hydraulic Machines by V.P. Vasantdani
2. Fluid flow machines by N.S. Govindrao

3. Turbo machines by S.M. Yahya
4. Fans, compressor & turbine by S. M. Yahya
5. Steam & gas Turbines by R. Yadav
6. Gas Turbines by V. Ganeshan
7. Thermal Engg. By Kumar vasantdani
8. Thermal Engg. By P.L. Balleny
9. Gas turbines & Compressor by Cohen & Rogers
10. Thermodynamics & Heat Engines – Vol-II by R. Yadav
11. Fluid mechanics and hydraulic machines by Modi and Seth
12. Thermal Engineering by R K Rajput
13. Fluid Mechanics & Hydraulic Machines S.C. Gupta 1e Pearson Education
14. Fluid Mechanics & hydraulic machines by R. K. Rajput
15. Fluid Mechanics & hydraulic machines by R. K. Bansal
16. Turbo Machines by Pai, Willey India

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S.E. (MECHANICAL AND AUTOMATION) PART-II

7. COMPUTER AIDED MACHINE DRAWING

Teaching Scheme:

Practical: 2 hrs/week

Examination Scheme:

Term work: 25 marks

1. Basic command to draw 2- D objects like line, point, circle, arc, ellipse, polygon, polyline, spline etc.
2. Editing: Erase, extension, breaking, fillet, chamfer, trimming, scaling etc.
3. Viewing and other: Zoom pan, mirroring, rotating, moving objects, arrange blocks, offset etc.
4. Hatching of sections.
5. Use of layers in drawing
6. Plotting of drawing.
7. Introduction to 3-D drawing. Elevation, thickness, viewpoint, UCS, paper space etc.

TERM WORK

1. Computer aided drafting of four simple components like engine piston, crankshaft, connecting rod, screw jack, crane hook, tail stock, tool post etc. and print out of the same.

2. Drawing of details and assembly containing 6 – 8 component with tolerance, machining symbol etc. and plotting the same on paper of size not less than A-3
3. 3-D drawing of one simple component and printing its 2-D views along with 3 D object drawing.

Note: Latest computer aided drafting software like Auto CAD and any 3D modeling software are to be used.

BOOKS

1. George Omura, Mastering Auto CAD, BPB Publication.
2. George Omura, ABC's of Auto CAD, BPB Publication.
3. Bethune, Engineering graphic with Auto CAD 2002, Pearson Publication
4. Machine drawing with Auto CAD Goutam Purohit & Goutam Ghosh, Pearson Edition.

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S.E. (MECHANICAL AND AUTOMATION) PART-II

8. WORKSHOP PRACTICE -IV

Teaching Scheme:

Practical: 2 hrs/ week

Examination Scheme:

Term work: 25 marks

The load of workshop practice IV will be allotted to the teaching staff and will be assisted by workshop staff for completing the jobs.

- 1) One job of plain turning, taper turning, external threading and knurling operation with its process sheet.
- 2) Description on thread manufacturing processes and gear train calculations.
- 3) Assignments Consist of Following:
 - a. Process sheet and tool layout on Capstan /Turret lathe.
 - b. Setting of milling machine for gear cutting.

- c. Study and demonstration of grinding machine (Surface, cylindrical and center less).
- d. Study and demonstration of shaper/planer (mechanisms and stroke).

Assessment of journal based on above term work is to be done by the teaching staff member assisted by workshop staff.

[Jobs carry 15 marks and journal carries remaining 10 marks.]

S.E. (MECH & AUTOMATION) – Part I

1. ENGINEERING MATHEMATICS – III

Teaching Scheme:

Lectures: 3 hours/week

Examination Scheme:

Theory: 100 Marks (3Hrs Duration)

SECTION – I

1 Linear Differential Equations: Linear Differential Equations with constant coefficients, Homogeneous Linear differential equations, [5 hours]

2 Applications of Linear Differential Equations: Applications of Linear Differential Equations with constant coefficients to Whirling of Shafts and Oscillations of a spring (Free oscillations, Damped Oscillations, Forced oscillations without damping). [5 hours]

3 Partial differential equations: Four standard forms of partial differential equations of first order. [5 hours]

4 Application of Partial differential equations: Wave Equation. One dimensional heat flow equation, Two dimensional heat flow Laplace equation (Steady State). [4 hours]

SECTION – II

5 Laplace Transform: Definition, Transforms of elementary functions, Properties of Laplace transforms, transforms of derivatives, transforms of integral, transforms of periodic function. [5 hours]

6 Inverse Laplace transforms: Inverse Laplace transforms by using partial fractions, Convolution theorem, Applications to linear differential equations with constant coefficients (Initial value problems). [5 hours]

7 Vector Calculus: Differentiation of vectors, Velocity and acceleration, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function, Irrotational and Solenoidal vector fields. [5 hours]

8 Fourier series: Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansion of odd and even periodic functions, Half range series [5 hours]

Reference Books:

1. A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P. N. Wartikar , Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. A textbook of Engineering Mathematics by N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar- Laxmi Publication, Delhi.
5. Advanced Engineering Mathematics 2e ,M.D.Greenberg, Pearson Education.

S.E. (MECH AND AUTOMATION) – Part I

2. THERMAL SCIENCE

Teaching Scheme:

Lectures : 3 hours/week
Practical: 2 hours/week

Examination Scheme:

Theory : 100 marks (3Hrs Duration)
Termwork: 25 marks
POE: 25 marks

SECTION – I

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1. Review of Laws of Thermodynamics: (3)

Zeroth law, first law & Second law of thermodynamics, Equivalence & Corrolories of Second Law, Numerical treatment on second law.

2. A) Entropy: (6)

Clausius inequality, entropy as a property of system, entropy of pure substance. T-S and h-s planes, entropy change in a reversible and irreversible processes, increase of entropy principle, calculation of entropy changes of gases and vapours, Statement of third law of thermodynamics.

B) Availability:

Available and unavailable energy: availability of a closed and open system, availability of work and heat reservoirs, and simple numericals.

3. Properties of Pure Substances and Vapour Power Cycles (7)

Properties of steam, use of steam table and Mollier chart, Deviation of real gases from ideal gases, Equations of state- Vander Waal, Beattie-Bridgemen, Virial & Diterici's equations, P-V-T surfaces & triple point of water.(Descriptive treatment). Carnot cycle using steam, limitations of Carnot cycle Rankine cycle, representation on T-s and h-s planes, thermal efficiency, specific steam consumption.

Work ratio, effect of steam supply pressure and temperature, condenser pressure on the performance.
(Numerical Treatment)

4. Steam Condensers: (4)

Functions, elements of condensing plant, types of steam condensers, surface and jet condensers, comparison, vacuum efficiency, condenser efficiency, loss of vacuum, sources of air leakages, methods of leak detection, air extraction methods, estimation of cooling water required, capacity of air extraction pump, air ejectors.

SECTION II

5. Steam Nozzles: (5)

Functions, shapes, critical pressure ratio, maximum discharge condition, effect of friction, design of throat and exit areas, nozzle efficiency, velocity coefficient, coefficient of discharge, supersaturated flow, degree of under-cooling and degree of super saturation, effects of super saturation.

6. Steam Turbines: (15)

6.1 Principles of operation, classification, impulse and reaction steam turbine, compounding of steam turbines.

6.2 Flow through impulse turbine blades, velocity diagrams, work done, efficiencies, end thrust, blade friction, influence of ratio of blade speed to steam speed on efficiency of single and multistage turbines and its condition curve and reheat factors.

6.3. Flow through impulse reaction blades, velocity diagram, and degree of reaction, parson's reaction turbine, and backpressure and pass out turbine.

6.4 Reheat regenerative steam power cycles.

6.5. Governing of steam turbines. losses in steam turbines, performance of steam turbines.

6.6. Function of diaphragm, glands, turbine troubles like erosion, corrosion, vibration, fouling etc.

TERM WORK

Any ten experiments from the list given below:

1. Significance and relevance of lubrication properties and systems.

2. Test on grease penetrometer and dropping point apparatus.
3. Test on carbon residue, cloud and pour point apparatus.
4. Test on Redwood Viscometer.
5. Test on Aniline point apparatus.
6. Determination of flash and fire point of a lubricating oil.
7. Demonstration of water tube and fire tube boilers
8. Demonstration of boiler mountings and accessories
9. Trial / Demonstration of on steam calorimeters
10. Trial / Demonstration of condenser and study of cooling towers
- 11 Trial / Demonstration of on steam calorimeters
- 12 Trial on steam power plant
13. Report on industrial visit to a steam power plant

Instructions for practical examination

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.
3. Oral will be based on the practical performed in the examination and the experiments included in the journal.

REFERENCE BOOKS

1. Kumar and Vasandani, Thermal Engineering, Metropolitan Book Co., Delhi,
2. Mathur and Mehta, Thermal Engineering, Jain Bros. Publishers, Delhi.
3. Ballaney P.L., Thermal Engineering, Khanna Publishers, New Delhi.
4. P.K. Nag., Engineering Thermodynamics, Tata Mc Graw Hill ,New Delhi
5. Holman, Thermodynamics, Mc Graw Hill, London
6. Engineering Thermodynamics, Gupta & Prakash, Nemichand & Sons
8. Cengel & Boles Thermodynamics: an engineering approach, 3/e, Tata McGraw-Hill, New Delhi

9. R. K. Rajput, Thermal Engineering , Laxmi Publications
10. Wylen Van, G. J. & Sonntag R. E. , Fundamentals of Classical Thermodynamics. John Wiley & Sons
11. R. Yadav, Steam & Gas Turbines CPH Allahabad.
- 12 Fundamentals of Engineering Thermodynamics- 4e MORAN Wiel

S.E. (MECHANICAL AND AUTOMATION) – Part I

3. ELECTRIC DRIVES AND CONTROLS

Teaching Scheme:

Lectures : 3 hours/week

Practical: 2 hours/alternate week

Examination Scheme:

Theory : 100 marks (3Hrs Duration)

Termwork: 25 marks

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SECTION I

1. INTRODUCTION (5)

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

2. DRIVE MOTOR CHARACTERISTICS (6)

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

3. STARTING METHODS (8)

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

SECTION II

4. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES (10)

Speed control of DC series and shunt motors – Armature and field control, Ward- Leonard control system
- Using controlled rectifiers and DC choppers –applications.

5. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES (10)

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TERMWORK:

Any SIX experiments from the following;

- 1) Case study of any one industrial application.
- 2) Speed control of D. C. Shunt motor by flux control method.
- 3) Speed control of D. C. Shunt motor by rheostatic control method
- 4) Load test on D. C. Shunt motor,
- 5) Efficiency calculation of resistance ovens.
- 6) Calibration of single-phase energy meter
- 7) Power factor correction of thee phase load using static capacitors.
- 8) Starting of Three phase squirrel cage and slip ring induction motors.

REFERENCE BOOKS:

1. Vedam Subrahmaniam, “Electric Drives (concepts and applications)”, Tata McGraw- Hill, 2001
2. Nagrath .I.J. & Kothari .D.P, “Electrical Machines”, Tata McGraw-Hill, 1998
3. Pillai.S.K “A first course on Electric drives”, Wiley Eastern Limited, 1998
4. M.D.Singh, K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998
5. H.Partab, “Art and Science and Utilisation of electrical energy”, Dhanpat Rai and Sons, 1994.

S.E. (MECHANICAL AND AUTOMATION) – Part I

4. FLUID MECHANICS

Teaching Scheme:

Lectures: 3 hours/week

Practical: 2 hours/ week

Examination Scheme:

Theory : 100 marks(3Hrs Duration)

Termwork: 25 marks

Practical Oral: 25 marks

MyUniversityBuzz

SECTION-I

1. Introduction: (3)

Definition of fluid, properties of fluid, fluid as a continuum, Pascal's law, hydrostatic law of pressure, Viscosity, types of fluid, compressibility, surface tension, capillarity and vapor pressure.

2. Kinematics & Dynamics of Fluid Flow (10)

Kinematics: Flow visualization, types of flow, streamline, path line, streak line, stream tube, continuity equation in Cartesian coordinates in three dimensional form. Velocity and Acceleration of fluid particles, stream function and velocity potential function .

Dynamics: Equation of motion. Integration of Euler's equation as energy equation. Energy correction factor Steady and unsteady flow through orifice. Orifice meter, time required to empty the tank, Venturimeter, flow over triangular and rectangular notches.

3. (A) Momentum Equation (7)

Derivation of momentum equation, momentum correction factor. Applications of momentum equation.

(B) Dimensional Analysis and Similitude

Dimensionally homogeneous equations, Buckingham's TT theorem, calculation of dimensionless parameters. Similitude, complete similarity, model scales.

SECTION – II

5. Laminar & Pipe Flow

(9)

Laminar: Laminar flow through circular pipes. Laminar flow through parallel plates, Navier Stoke's equation and its applications, introduction to CFD.

Pipe Flow: Energy losses in transition, expansion and contraction (Darcy's and Chezy's equation), Parallel pipe, siphon pipes, branching pipes and equivalent pipes.

6. Boundary Layer Theory

(3)

Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, separation, boundary layer control (descriptive treatment)

7 Forces on immersed bodies

(3)

Types of drags on a flat plate. Drag on aerofoil. Development of lift. (Magnus effect) stalling condition of aerofoil.

8. Compressible flow

(5)

Propagation of elastic waves, Mach number cone. Energy equation of compressible flows. Stagnation pressure and temperature, Adiabatic flow through pipes of varying cross section, Isentropic flow, Condition of maximum discharge.

TERM WORK

The term work shall consist of the report on any ten experiments from the following:

1. Flow visualization by plotting of streamline (Heleshaw apparatus).
2. Reynolds experiment.
3. Verification of Bernoulli's equation.
4. Calibration of venturimeter .
5. Calibration of orifice-meter.
6. Calibration of notches.
7. Orifice under steady and unsteady flow condition
8. Determination of velocity profile through circular pipes for laminar flow.
9. Determination of minor losses in pips-fittings
10. Determination of loss head and discharge in parallel pipe.
11. Determination of loss of friction in series pipes.
12. Demonstration or trial on wind tunnel for measurement of lift and drag on any model.
13. Pressure and velocity distribution over aerofoil.

Instructions for practical examination

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.
3. Oral will be based on the practical performed in the examination and the experiments included in the journal.

REFERENCE BOOKS

1. V. L. Streeter and E. B. Wylie, Fluid Mechanics, Wiley Eastel Limited, New Delhi
2. K. L. Kumar, Fluid Mechanics, S. Chand Publication. New Delhi

3. K. Subramanya, Theory and Applications of machines, Tata McGraw Hill Publication.
4. Fox and McDonald, Fluid Mechanics, John Wiley and Sons, New York.
5. Bansal. Fluid Mechanics , Laxmi publications. New Delhi.
6. Fraizini, Fluid Mechanics. 4/e. Tata McGraw-Hill, New Delhi.
7. White, Fluid Mechanics, 4/e, Tata McGraw-Hill, New Delhi.
9. Modi and Seth, 'Fluid mechanics and Hydraulic machines',
10. R. K Rajput, 'Fluid mechanics and Hydraulic machinery', Laxmi publishers
11. Fluid Mechanics By J.F.Douglas, J.M.Gasiorek J.A.Swaffield 4e pearson education
- 12 Fluid Mechanics –Fundamentals & Application Y.A.Cengel,J.M.Cimbala Adopted by S.C. Bhattacharya TMI
- 13 Fundamentals Of Fluid Mechanics, B.R. Munson,D.F. Young, T.H.Okiishi 5e Wiley India Pvt.Ltd.

S.E. (MECHANICAL AND AUTOMATION) PART-I

5. MANUFACTURING TECHNOLOGY

Teaching Scheme:

Lectures: 3 hrs/week

Examination Scheme:

Theory Paper: 100 marks (3 hrs. duration)

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SECTION I

1. Patterns and Pattern making

(3)

Introduction to Foundry - Steps involved in casting, advantages, limitations and applications of casting process. Pattern types, allowances for pattern, pattern materials, color coding and storing of patterns.

2. Moulding & Casting Processes

(11)

Moulding: methods & processes- equipment, Moulding sand ingredients, essential requirements, sand preparation and control, testing, core making. Moulding machines and core making machines. Design considerations in casting, gating and Riser - directional solidification in castings, solidification control devices: chills, ceramics bricks, directional solidification.

Casting: Sand castings, sand properties and their testing, pressure die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, CO₂ Moulding, continuous casting-squeeze casting, electro slag casting.

3. (A) Melting and pouring

(6)

Types of fuel fired melting furnaces -Cupola furnace, crucible furnaces, Electric furnaces, - Metallurgical control in furnaces- Advanced Metal pouring equipments – Molten metal transfer and automatic pouring machines.

(B) Casting defects: NDT tests, Machines and instruments used for identification of defects.

Foundry layouts and mechanization – Use of automatic machines and robots for various casting processes.

SECTION II

4. Forming Processes (10)

- a. Forging - Forging principle, classification, equipments, tooling-processes, parameters and calculation of forces and power requirements during forging.
- b. Rolling - Principles of rolling processes, classification, types of rolling mills, rolling mill control, , effects of friction. Form rolling, rolling defects, causes and remedies
- c. Extrusion and Drawing Processes - Classification of extrusion processes-tools, equipments, and principle of these processes, rod/wire drawing-tool, equipment and principle of processes defects-Tube drawing and sinking processes

5. Basic Joining Processes (6)

Types of welding-gas welding, -arc welding,-shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types)-atomic hydrogen arc welding-thermit welding, Flame cutting - Use of Oxyacetylene, modern cutting processes, arc cutting

6. Shaping of plastics (3)

- Introduction to blow molding, injection molding, extrusion, calendaring and thermo forming

Note: The Workshop practice III should cover the practical based on this syllabus, the load of which shall be allotted to teaching staff.

REFERENCES:

- 1 Serope Kalpakjian, Steven R. Schmid “Manufacturing Engineering and Technology” (4th Edition) Prentice Hall.
- 2 P.N.Rao “Manufacturing Technology”, TMH Ltd 1998(Revised edition)
- 3 Dieter “Mechanical Metallurgy”, Revised edition 1992, Mcgraw
- 4 E. Paul DeGarmo, J. T. Black, Ronald A. Kohser, “Materials and Processes in Manufacturing”, Wiley.
- 5 Lindberg, “Processes and Materials of Manufacture ", Prentice Hall of India (p) Ltd

S.E. (MECHANICAL AND AUTOMATION) PART-I

6. MECHANICAL ENGINEERING DRAWING

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/week

Examination Scheme:

Theory Paper: 100 marks (4 hrs. duration)

Term work: 25 marks

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SECTION-I

1. Study of B.I.S. (Bureau of Indian Standards) Conventions. (5)

Significance and importance of BIS Conventions, Drawings sheet sizes and layout recommended by BIS. Conventional representation of engineering Materials, spur helical and bevel gears, worm and worm wheel, rack and pinion, gear assemblies, type of helical, disc and leaf springs. Internal and external threads, square head, spline shaft, diamond knurling BIS conventions for sectioning, type of sections, exceptional cases. BIS methods of linear- and angular dimensioning. Symbolic representation of welds as per BIS for representation of above conventions.

2. Interpenetration of Solids (6)

Introduction, interpenetration of prism with prism, prism with cylinder, prism with cone, prism with pyramids. (Prisms and Pyramids limited up to rectangular), cylinder with cylinder, Cone with cylinder.

3. Sketching of machine component (8)

Importance of sketching and entering proportionate dimensions on sketches. Sketches of nut, bolts (square and hexagonal flanged nuts, lock nuts, dome nut, capstan nut, wing nut, castle nut, split pin, square headed bolt, cup headed bolt, T-headed bolt, Rag foundation bolt, stud, washer. Various types of rivets and riveted joints, Various types of keys, Socket and spigot (Cotter joint), Knuckle (pin) joint, Muff coupling, Protected and unprotected Flanged, coupling, universal coupling, solid and bush bearing. Plummer block (pedestal bearing), foot step bearing. Flat and V-belt pulleys, Fast and loose pulleys, speed cone pulleys, Pipe joint for C.I. Flanged, socket and

spigot type pipe joint. Union pipe joint and standard pipe-fitting. Students should know the applications of above machine components.

SECTION II

4. Auxiliary Projection

(5)

Projection on auxiliary vertical and horizontal plane, Auxiliary projection of simple machine components.

5. Limits, fits and tolerances

(6)

Significance of system of limits and fits. Definitions, Types, Recommendations and selections, Tolerances of form and position, surface finish symbols as per BIS, Selection and entering of all these symbols with reference to details and assembly drawings, Tolerancing an individual dimensions of details drawing.

6. Details and assembly drawing

(9)

To prepare detail drawings from given assembly drawing. To prepare assembly drawing from given drawing of details. The no. of parts is limited to ten to twelve. Preparation of detailed drawing from the given details such as: Screw jack, Tools post of center lathe, Tail stock. Cross head Assembly, Jigs and fixtures, connecting rod and piston of I.C. Engines, Gland and stuffing box, Crossed head assembly, Valve assembly, etc. Assembly selected should include different types of sections.

TERM WORK

Sheet no. 1. Based on BIS conventions mentioned in section 1.1

Sheet no. 2: Based on sketching (Free hand drawing) of various machine components mentioned in section 1.

Sheet no. 3: To draw details drawing from given assembly.

Sheet no. 4 .To draw details and assembly drawing by taking actual measurements and entering limits, fits, tolerances, surface finish symbols, geometrical requirements etc.

Sheet no. 5: Sheet based on auxiliary view.

Sheet no. 6: Sheet based on interpenetration of solids.

Note: Use first angle of projection method only.

BOOKS

1. IS: SP46- Engineering drawing practice for schools and colleges, B.I.S. Publications.
2. IS: 696- Code of practice for general engineering drawings B.I.S. Publications.
3. IS : 2709-Guide for selection of fits, B.I.S. Publications.
4. IS:919- Recommendation for limits and fits for Engineering, B.I.S. Publications
5. IS: 8000- Part I, II. III. TV, geometrical tolerancing of technical drawings -- B.I.S. Publications.
6. P.S. Gill, Machine Drawing., S.K. Kataria and Sons , Delhi.
7. N. D. Bhatt., Machine Drawing. Charotar Publication House, Bombay.

8. N. Sidheshwari . P. Kannaiah and V.V. S. Sastry. Machine Drawing, Tata McGraw Hill, New Delhi.
9. R.K. Dhavan, Machine Drawing, S. Chand and Company.
10. Narayana, Kannaiah and Venkata reddy, Production Drawing, New Age International
- 11 N.D.Junnarkar Machine Drawing 1 st print Pearson Education

S.E (MECHANICAL & AUTOMATION) PART I

7. COMPUTER PROGRAMMING

Practical: 2 Hrs /Alternate Week

Term Work: 25 Marks,

TERM WORK:

- 1) Minimum 1 program on Input/output & arithmetic expressions, hierarchy of operators, branching and loop control statements
- 2) Minimum 1 program on pointers with Arrays and Function.
- 3) Minimum 1 program on structures.
- 4) Minimum 2 programs on Class & Objects
- 5) Minimum 2 programs on Inheritance
- 6) Minimum 2 programs on Overloading
- 7) Minimum 2 programs on Polymorphism

REFERENCE BOOKS:

- 1) Object Oriented Programming - E. Balguruswami (Tata McGraw hill Publication)
- 2) Let us C++ , Yashwant Kanitkar (BPB Publication).

3)C++ Programming, 7th ed Alstevans wiely, India

4)C++/CLI , Sivkumar wiely India

5)Professional c++ , Solter wiely India

S.E (MECHANICAL & AUTOMATION) PART I

8. WORKSHOP PRACTICE III

Practical: 2 Hrs

Term Work: 25 Marks,

Term Work:

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The load of workshop practice III will be allotted to the teaching staff and will be assisted by workshop staff for completing the jobs.

1. Preparation of pattern from component drawing, Pattern manufacturing after preparing pattern drawing.
2. Study of different types of forging processes and one job based on smithy/ forging.
3. Study of different types of welding processes and one job based on any one welding method.

[Jobs carry 15 marks and journal carries remaining 10 marks.]

S.E. (MECHANICAL AND AUTOMATION) PART-II

3. STRENGTH OF MATERIALS

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/Alternate week

Examination Scheme:

Theory Paper: 100 marks

Term work: 25 marks

SECTION-I

1. Stresses and Strain.

(7)

Concept of stress and strain, (Linear, lateral, shear and volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of rigidity', stress-strain diagram for ductile and brittle material factor of safety, working stress. Normal and shear stresses, Thermal Stresses. Complementary shear stress, Bulk Modulus, Inter-relationship between elastic constants.

2. A) Torsion

(7)

Basic assumptions. Torsion formula. Hollow and solid circular shafts, Angular deflection

B) Shear Force and Bending Moment Diagram.

Concept and definition of shear force and bending moment in determinate beams due to concentrated, UDL and uniformly varying load

3. Stresses in Beams

(7)

A) Bending stresses -

Symmetric pure bending of beams, flexure formula, moment of resistance of crosssections, simple built-up section, design of rectangular and circular (solid and hollow) sections; L, I and T sections

B) Shear stresses -

Distribution of shear stresses in beams of various commonly used sections such as circular, I, T, and angles

SECTION II

4. Principal Stresses and Strains

(8)

Normal and shear stresses on any oblique planes, concept of Principal planes, derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr's circle of stresses, Combined effect of shear and bending in Beam, Theories of elastic failure (Without derivation).

5. Deflection of Beams

(4)

Strain curvature and moment curvature relation, solution of beam deflection problem by Double integration method, Area moment method. (Simply Supported Beam & Cantilever.)

6. A) Columns

(7)

Euler's formula for different end connections, concept of equivalent length, eccentric loading, Rankine formula.

B) Energy Methods

Strain energy for uniaxial stress, Pure bending (Simply Supported Beam & Cantilever.), Shear stresses (Direct Shear & Pure Torsional), Use of energy theorem to determine deflections and twists of shafts.

TERM WORK

A term work shall consist of report on the assignments given below.

1. Shear force and bending moment diagram.
2. Bending and shear stresses in beams.
3. Principal stresses and theories of failures.
4. Torsion.
5. Deflection of beams.
6. Columns.

TEXTBOOKS

1. Ferdinand P Beer and E.R. Johnston JR. John Dewolf, Mechanics of Materials 3/e, McGraw Hill Book Company
2. Timoshenko and Young. Elements of Strength of Materials, East-West Press. Pvt. Limited, New Delhi.
3. Ramamurthum, Strength of Materials, Dhanpat Rai and Sons, New Delhi.
4. Rajput, Strength of Materials, Laxmi Publication
5. S.B Junnerkar. Mechanics of structure Vol I, Publication House
6. Bansal, Charotor Strength of Materials, Laxmi Publication
7. Khurmi Gupta, Strength of Materials, S. Chand Publication.
8. E.P.Popov "Mechanics of Materials" Prentice Hall Inc.
9. Andrew P. & Singer F.L., "Strength Of Materials", Harper & Row Publishers
10. G.H. Rider. "Strength of Materials ", Mac Millan India Ltd.

- 11 Mechanics of Materials Hibbler 2e Pearson Education Publication
- 12. Den Hartong, Strength of Materials, McGraw Hill, New York.
- 13. H. BURR and John Cheatham, Mechanical Analysis and Design, PHI, New Delhi.
- 14. Robert Norton, Machine Design, Prentice Hall

S.E. (MECHANICAL AND AUTOMATION) PART-II

4. NUMERICAL ANALYSIS

Teaching Scheme:

Lectures: 3 hrs/week

Examination Scheme:

Theory Paper: 100 marks

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SECTION - I

1) Roots of equation: (5)

- a) Bracketing Methods - Bisection Methods, False Position Method
- b) Open Methods - Newton Rapson, Multiple Roots, System of non-linear Equations, Secant Method
- c) Roots of polynomials -Muller's Method

2) Linear Algebraic equation: (5)

- a) Gauss Elimination Method - Naive Gauss Elimination, Pitfalls of Elimination Methods, Techniques of improving solutions, Gauss-Jordan Method
- b) Matrix Inversion - LU Decomposition, Matrix Inverse, Gauss Seidel, Jacobi Iteration Method

3) Curve Fitting: (5)

- a) Least Square Regression - Linear Regression, Polynomial Regression.
- b) Interpolation - Newton's divided difference, Interpolating Polynomial Lagrange's interpolating polynomial,

4) Statistics: (5)

Mean and standard deviation. Addition and multiplication laws of probabilities. Binomial, Poisson and normal distribution

SECTION - II

5) Numerical Differential & Integration: (4)

- a) Newton's Cote's Integration of Equation - Trapezoidal rule, Simpson's rules, Integration Unequal Segments.
- b) Integration of equations - Romberg's Integration & Gauss quadrature.
- c) Numerical Differentiation. - Differentiation formulae, Richardson Extrapolation, Derivation of unequally spaced data. Forward difference, Central difference, Backward difference

6) Ordinary Differential Equation: (5)

- a) Taylor's Series method, Picard method, Runge-Kutta methods, Euler's method, Improved Polygon Method, System of Equations. ,
- b) Boundary Value & Eigen Value Problem, shooting Method, Finite Difference Method, Eigen Value Problem based on Polynomial Method, Power Method.

7) Partial Differential Equation: (6)

- a) Finite difference - Elliptical Equations, Laplace's equation Liebmen Method, Secondary Variables, Boundary condition
- b) Finite difference - Parabolic Equations, Explicit Method Implicit Method, Crank Nicolson Method

8) Introduction to Finite Element Method: - Solutions to boundry value problems, (5)
integral formulations for numerical solutions, One dimensional linear element, Applications of FEM in 1D and 2D conduction and convection heat transfer problems.

REFERENCE BOOKS:

- 1) Numerical method for Engineers - S.C. Chapra, Canale (Tata McGraw Hill Publications)
- 2) Numerical Methods – Dr. B.S. Grewal (Khanna Publications)
- 3) Numerical methods – E Balguruswamy (Tata McGraw Hill Publications)
- 4) Numerical Heat transfer and Fluid flow - S.U. Patankar (McGraw Hill Publications)
- 5) Applied Finite Element Analysis – Larry J. Segerlind (John Wiley & Sons)
- 6) Introductory Methods of Numerical Analysis- S. S. Sastry (Prentice Hall Publication)

S.E. (MECHANICAL AND AUTOMATION) PART-II

3. METROLOGY AND QUALITY CONTROL

Teaching Scheme:

Lectures: 3 hrs/week
Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks
Term work: 25 marks

SECTION – I

1. Measurements:

International standards of length-Line and end measurement, Need of measurement, possible errors in measurement, slip gauges, precision & accuracy, Sources of errors in measurement. **04**

2. Tolerances and Gauging:

Unilateral and bilateral tolerances, Limits, Fits, Types of Fits, IS specifications of limits. Importance of limits, System in mass production, limit gauges used for plain and taper works. **04**

3. Magnification :

Venires, Micrometers, Dial gauges, Mechanical, Optical, electrical, Pneumatic method of magnification, Mechanical and pneumatic types of comparators, Use of comparators in inspection. **03**

4. Measurement of Angles, Tapers and Radius:

Bevel Protractor, Spirit level, Clinometers, angle Decker, standard balls and rollers for angle measurement, angle slip gauges, radius measurement of circular portion, measurement of concave and convex surface radius. **03**

5. Flat Surface Measurement :

Flatness Measurement, straight edges, surface plates, optical flat and auto collimator. **02**

6. Surface Roughness Measurement:

Differences between surface roughness and surface waviness – Numerical assessment of surface finish – CLA, RMS Values, Ra & Rz value, Methods of measurement of surface finish – profilograph. Talysurf, ISI symbols for indication of surface finish. **04**

SECTION – II

7. Optical Measuring Instruments:

Tool maker's microscope and its uses – collimators, optical projector, interferometer, Coordinate Measuring Machine - Types and applications. **03**

8. Measurement of External Threads:

Different errors in screw threads, measurement of forms of thread with profile projector, pitch measurement, measurement of thread diameter with standard wire. **03**

9. Measurement of Spur Gears:

Run out, Pitch, profile, backlash & tooth thickness measurement, alignment, errors in gears, checking of composite errors. **03**

10. Quality Control:

A) Concept of quality and quality control, elements of quality and its growth, purpose, policy and objectives, quality controlling factors, quality of design and conformance, value & cost of quality. **03**

B) Quality management, TQM, Total Quality Control, Process quality, QS9000 / TS, CAQC, Zero defect, KAIZEN, quality circles. **03**

11. Statistical Quality Control:

Importance of statistical methods in quality control, measurement of statistical control variables and attributes, measurement/inspection, different types of control charts (X Bar, R & P charts) and their constructions and their applications. **03**

12. Acceptance Sampling:

Sampling inspection and percentage inspection, basic concept of sampling inspection, operating characteristic curves, conflicting interests of consumer and producer, producer and consumers risks, AWQL, LTPD, ADGL, single and double sampling plans. **02**

TERM WORK:

1. Demonstration and use (care & maintenance) of various measuring instruments

2. Measurement of automobile components – piston, connecting rod, cylinder liner.
3. Demonstration on Pneumatic comparator
4. Screw thread measurement using floating carriage diameter measuring machine
5. Gear measurement using gear tooth caliper.
6. Measurement of template using tool makers microscope
7. Angle measurement using sine bar
8. Measurement of angle of V – Groove and determines its width using standard balls and rollers
9. Thread measurement by Tool Makers microscope
10. Use of X Bar and R chart
11. Use of P chart
12. O.C. curves

REFERENCE BOOKS:

1. Text Book of Engg. Metrology- I.C. GUPTA, Dhanpat Rai & Sons, New Delhi
2. Practical Engg. Metrology, Sharp K.W.B. Pitman, London
3. Statistical Quality Control- E.L. Grant, Tata McGraw Hill Book Co Ltd., New Delhi
4. Engg. Metrology, R.K.Jain, Khanna Publishers, Delhi
5. Statistical Quality Control –R.C. Gupta, Khanna Publishers, Delhi, Third Edition
6. I.S. 919/1963
7. I.S. 2709/1964
8. Engg. Metrology-Hume K.J.,MC Donald, Technical & Scientific ,London
9. Total Quality Management-Dalela
10. Statistical Quality Control-Mahajan A.K., Dhanpat Rai & Co., New Delhi
11. Statistical Quality Control, Eugene I. Grant and Richard S. Levanworth, Tata McGraw
12. Total Quality management, K Shridhara Bhat, Himalaya Publication House
13. Juran's Quality Planning and Analysis, Frank M. Gryna, Richard C.H. Chua, Joseph a. Defeo

S.E. (MECHANICAL AND AUTOMATION) PART-II

4. MACHINE TOOL SYSTEMS

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks

Term work: 25 marks

SECTION-I

1. Introduction to metal cutting and machine tools (3)

Metal cutting principle, orthogonal and oblique cutting, machine tool - definition and purpose, characteristics, classification, elements, cutting motions (primary and feed).

2. Lathe (6)

Working principles, types specifications, principal parts, accessories and attachments, various lathe operations, introduction to automats.

3. Capstan and Turret Lathes (3)

Principle parts, working, comparison with centre lathe, turret indexing mechanism, bar feeding mechanism, turret tool holders.

4. Drilling, Boring, Shaping Machine (6)

Classification of drilling machines, construction and working of radial drilling machine, various accessories, various operations.

Horizontal and vertical boring machine, construction and operation, boring tools and bars.

Introduction to Jig boring-machine.

Types-crank shaper, hydraulic shaper, Crank and slotted link quick return mechanism. Table feed mechanism, various operations.

SECTION-II

5. Milling Machine (6)

Classification of milling machines, construction and working of column and knee type milling machines, milling operations, study of standard accessories- dividing head, rotary table, gear cutting on milling machine, vertical milling attachment for horizontal milling machine.

6. Grinding & Broaching Machine (9)

Classification - cylindrical (external/internal), centerless, surface grinder, tool and cutter grinder, gear grinding, Grinding wheels- Abrasives, bonds and bonding processes, grit, grade and structure of wheel, wheel shapes, wheel specifications. Selection, mounting, glazing, loading, truing, wheel balancing (Introduction only).

Classification of broaching machines, various operations, advantages and limitations.

7. Gear Manufacturing Processes (5)

Study of various processes like gear shaping, gear hobbing. Gear finishing processes -gear shaving, gear burnishing and gear rolling.

Note: The Workshop practice IV should cover the practical based on this syllabus, the load of which shall be allotted to teaching staff.

REFERENCE BOOKS

- 1) W. A. J. Chapman,. Workshop Technology vol. I, II, III, CBS Distributor New Delhi.
- 2) Raghuvansrii, Workshop Technology vol. II, Dhanpat Rai and Sons.
- 3) Gupta/Kaushik, Workshop Technology vol.. New Heights, Delhi.
- 4) Hajra Choudhary, Workshop Technology vol. II, Media promoters and Publications
- 5) P. C. Sharma, Production Technology, S. Chard publication.
- 6) Dalela, Manufacturing Science and Technology vol. II
- 7) R. K. Jain, Production technology, Khanna Publications.
- 8) Kundra, Rao, Tiwari, Computer Aided Manufacturing,
- 9) Manufacturing Processes and System 9E P. Ostwald, J. Munoz, John Wiley & Sons (asia) Pvt.Ltd.

S.E. (MECHANICAL AND AUTOMATION) PART-II

5. THEORY OF MACHINES

Teaching Scheme:

Lectures: 3 hrs/week

Practical: 2 hrs/ Alternate week

Examination Scheme:

Theory Paper: 100 marks (4 Hrs)

Term work: 25 marks

POE: 25 marks

SECTION-I

1. Basic Concept of Mechanisms: (3)

Links, kinematic pair (lower and higher), kinematic chain, mechanism, inversion, types of constraints, Grubler's criterion, slider crank chain and its inversions, double slider crank chain and its inversions, four bar chain and its inversions.

2. Velocity and Acceleration in Mechanisms: (7)

Velocity and acceleration diagram for different mechanisms using relative velocity and acceleration method, Coriolis' component of acceleration, Klein's construction for slider crank mechanism, velocity analysis by Instantaneous center method for four bar chain and slider crank chain.

3. (A) Mechanisms with Lower Pairs: (10)

Pantograph, exact straight-line mechanisms- Paucellier and Hart Mechanism, Approximate straight line mechanism Tchebicheff and Grass-Hopper Mechanism, steering gear mechanisms, Hooke's joint.

(B) Kinetic analysis of Mechanisms:

Velocity and acceleration of slider crank mechanism by analytical method, Inertia force and torque, D'Alembert's principle, Dynamically equivalent system.

SECTION-II

4. Synthesis of Mechanism: (3)
Chebychev method to find precision points for four bar mechanism and slider crank mechanism, Freudenstein's Equation.

5. (A) Cams: (12)
Types of cams and followers, profiles of cams for specified motion of different followers, spring load on the follower, jumping of follower.

(B) Governors:
Types of governors. Porter and Hartnell governor, controlling force and stability of governor, hunting, sensitivity, isochronism, governor effort and power, Insensitiveness of governors.

6. Belts and Ropes: (4)
Types of belt and rope drives, calculation of length and power transmitted, belt tension ratio, actual tension in a running belt, centrifugal and initial tension in belt, slip and creep of belt.

TERM WORK

A term work shall consist of report on any six of the following.

- 1) One A3 size sheet of Velocity and acceleration problems by relative velocity and acceleration method.
- 2) One A3 size sheet of problems on Instantaneous center method and Klein's construction.
- 3) Verification of ratio of angular velocities of shafts connected by Hooks joint.
- 4) Determination of M.I. by Bifilar suspension, Trifilar suspension, compound pendulum.
- 5) Synthesis of mechanism –Two position for slider crank and Three position for four bar Mechanism
- 6) One A3 size sheet of Problems on cam profile. (Minimum four problems)
- 7) Governor characteristics for Porter or Hartnell governor.

TEXT BOOKS

- 1) Ratan S.S, Theory of Machines, Tata McGraw Hill New Delhi.
- 2) P.L.Ballany, Theory of Machines, Khanna Publication, New Delhi.
- 3) V.P. Singh, Theory of Machines, Dhanpat Rai and Sons.
- 4) Phakatkar, Theory of Machines I and II, Nirali Publication. Pune
- 5) Dr. R.K.Bansal, Theory of machines, Laxmi Publication.

REFERENCE BOOKS

- 1) Thomas Bevan, Theory of Machines, CBS Publishers, New Delhi.
- 2) Shigley, Theory of Machines and Mechanism, McGraw Hill, New York
- 3) G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int. Publications Ltd. New Delhi.

- 4) Shah and Jadhawani, Theory of Machines, Dhanpat Rai & Sons
- 5) Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.

S.E. (MECHANICAL AND AUTOMATION) PART-II

6. FLUID AND TURBO MACHINERY

Teaching Scheme:

Lectures: 3 hrs/week
Practical: 2 hrs/ week

Examination Scheme:

Theory Paper: 100 marks
Term work: 25 marks

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SECTION I

1 Impulse Water Turbines:

(07)

Impact of Jet, Euler's equation for work done in Rotodynamic Machines, classification of water turbines, Pelton wheel, its construction and working, velocity triangles. Types, Pelton wheel design bucket dimensions, number of buckets, jet diameter, wheel diameter, jet ratio, speed ratio, number of jets, calculation of efficiency, power, discharge etc.

Governing of Pelton wheel, Model Testing, Unit quantities, Specific speed of turbine & performance characteristics of turbine.

2 Reaction Water Turbines:

(07)

Principle of operation, construction and working of Francis and Kaplan Turbine, effect of modification of velocity triangles on runner shape, draft tube, cavitation calculation of various efficiencies, power, discharge, blade angles, runner dimensions etc. Governing of Francis and Kaplan turbine. Draft tube-types and analysis. Model Testing, Specific speed of turbine & performance characteristics of turbine.

3 Centrifugal Pumps:

(06)

Working principles, Construction, types, various heads, multistage pumps, velocity triangles, minimum starting speed, cavitation, Maximum permissible suction head (MPSH) and Net positive suction head (NPSH). Methods of priming, calculations of efficiencies, discharge, blade angles, head, power required, impeller dimensions etc. Specific speed & performance characteristics of pumps.

SECTION II

4 Air compressors: (08)

Application of compressed air, classification of compressor, reciprocating compressors, construction, work input, necessity of cooling, isothermal efficiency, heat rejected, effect of clearance volume, volumetric efficiency, necessity of multistaging, construction, optimum intermediate pressure for minimum work required, after cooler, free air delivered, air flow measurement, capacity control. Roots blower and vane blower (descriptive treatment)

5 Rotodynamic Air Compressors: (07)

Centrifugal compressor, velocity diagram. Theory of operation, losses, Adiabatic efficiency, effect of compressibility, diffuser, pre-whirl, pressure coefficient, slip factor, performance. Axial flow compressors, velocity diagram, degree of reaction, polytropic efficiency, surging, choking, stalling, performance, comparison with centrifugal compressor.

6 Gas turbines: (05)

Working principles, applications, open, closed cycle and their comparison. Cycle modified to regeneration, reheat, intercooling performance. Calculation of gas turbine work ratio, efficiency etc. Types of fuels for gas Turbine.

TERM WORK

Any seven experiments from 1 to 9.

1. Study and trial on Pelton wheel.
2. Study and trial on Francis Turbine
3. Study and trial on Kaplan turbine
4. Trial on Centrifugal pump
5. Study and demonstration of reciprocating pump and hydraulic ram
6. Study and trial on reciprocating compressor
7. Study and trial on centrifugal blower
8. Study of hydraulic devices- Intensifier, Accumulator, Hydraulic jacks, press, Crane.
9. Study of other types of pumps- Gear pump, Jet pump, submersible pump, air lift pump.
10. Industrial visit to pump/turbine manufacturing industry or hydro power plant.

REFERENCES:

1. Hydraulic Machines by V.P. Vasantdani
2. Fluid flow machines by N.S. Govindrao
3. Turbo machines by S.M. Yahya
4. Fans, compressor & turbine by S. M. Yahya
5. Steam & gas Turbines by R. Yadav
6. Gas Turbines by V. Ganeshan
7. Thermal Engg. By Kumar vasantdani
8. Thermal Engg. By P.L. Balleny
9. Gas turbines & Compressor by Cohen & Rogers
10. Thermodynamics & Heat Engines – Vol-II by R. Yadav
11. Fluid mechanics and hydraulic machines by Modi and Seth

12. Thermal Engineering by R K Rajput
13. Fluid Mechanics & Hydraulic Machines S.C. Gupta 1e Pearson Education
14. Fluid Mechanics & hydraulic machines by R. K. Rajput
15. Fluid Mechanics & hydraulic machines by R. K. Bansal
16. Turbo Machines by Pai, Willey India

S.E. (MECHANICAL AND AUTOMATION) PART-II

7. COMPUTER AIDED MACHINE DRAWING

Teaching Scheme:

Practical: 2 hrs/week

Examination Scheme:

Term work: 25 marks

1. Basic command to draw 2- D objects like line, point, circle, arc, ellipse, polygon, polyline, spline etc.
2. Editing: Erase, extension, breaking, fillet, chamfer, trimming, scaling etc.
3. Viewing and other: Zoom pan, mirroring, rotating, moving objects, arrange blocks, offset etc.
4. Hatching of sections.
5. Use of layers in drawing
6. Plotting of drawing.
7. Introduction to 3-D drawing. Elevation, thickness, viewpoint, UCS, paper space etc.

TERM WORK

1. Computer aided drafting of four simple components like engine piston, crankshaft, connecting rod, screw jack, crane hook, tail stock, tool post etc. and print out of the same.
2. Drawing of details and assembly containing 6 – 8 component with tolerance, machining symbol etc. and plotting the same on paper of size not less than A-3
3. 3-D drawing of one simple component and printing its 2-D views along with 3 D object drawing.

Note: Latest computer aided drafting software like Auto CAD and any 3D modeling software are to be used.

BOOKS

1. George Omura, Mastering Auto CAD, BPB Publication.
2. George Omura, ABC's of Auto CAD, BPB Publication.
3. Bethune, Engineering graphic with Auto CAD 2002, Pearson Publication
4. Machine drawing with Auto CAD Goutam Purohit & Goutam Ghosh, Pearson Edition.

S.E. (MECHANICAL AND AUTOMATION) PART-II

8. WORKSHOP PRACTICE -IV

Teaching Scheme:

Practical: 2 hrs/ week

Examination Scheme:

Term work: 25 marks

The load of workshop practice IV will be allotted to the teaching staff and will be assisted by workshop staff for completing the jobs.

- 1) One job of plain turning, taper turning, external threading and knurling operation with its process sheet.
- 2) Description on thread manufacturing processes and gear train calculations.
- 3) Assignments Consist of Following:
 - a. Process sheet and tool layout on Capstan /Turret lathe.
 - b. Setting of milling machine for gear cutting.
 - c. Study and demonstration of grinding machine (Surface, cylindrical and center less).
 - d. Study and demonstration of shaper/planer (mechanisms and stroke).

Assessment of journal based on above term work is to be done by the teaching staff member assisted by workshop staff.

[Jobs carry 15 marks and journal carries remaining 10 marks.]

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