

DME 401: HYDRAULICS & HYDRAULIC MACHINES

Credits: 4

Semester IV

Module No.	Contents	Teaching Hours
I	<p>Properties of Fluids:</p> <p>Fluid : Real fluid, ideal fluid., Fluid Mechanics, Hydraulics, Hydrostatics, Hydro kinematics., Mass density, specific weight, specific gravity, cohesion, adhesion, viscosity, surface tension, capillarity, vapor pressure and compressibility. Hydrostatic Pressure: Pressure, intensity of pressure, pressure head, Pascal's law and its applications..</p> <p>Measurement of Pressure: Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. Use of simple manometer, differential manometer and mechanical gauges. Measurement of pressure by manometers and pressure gauges. Fundamental of Fluid Flow, Types of Flow, Steady and unsteady flow, Laminar and turbulent flow Uniform and nonuniform flow. Discharge and continuity equation (flow equation) Types of hydraulic energy.</p> <p>Potential energy, Kinetic energy, Pressure energy Bernoulli's theorem; statement and description (without proof of theorems). Venturimeter (horizontal and inclined)</p>	12
II	<p>Orifice: Definition of Orifice, and types of Orifices, Hydraulic Coefficients. Large vertical orifices. Free, drowned and partially drowned orifice. Time of emptying rectangular/circular tanks with flat bottom.</p> <p>Flow through Pipes: Definition, laminar and turbulent flow explained through Reynold's Experiment. Reynolds Number, critical velocity and velocity distribution. Head Losses in pipe lines due to friction, sudden expansion and sudden contraction entrance, exit, obstruction and change of direction (No derivation of formula). Hydraulic gradient line and total energy line.</p>	12
III	<p>Flow Measurements: Measurement of velocity by Pitot tube , Measurement of Discharge by a Notch Difference between notches and orifices.</p> <p>Dimension less numbers types (definition only)</p> <p>Pumps & Turbines: Reciprocating pumps (parts, working, discharge, work done, %slip only), Centrifugal pumps (parts, working), Reciprocating v/s Centrifugal pumps, Turbine (layout, efficiency, classification), Construction & working of (Pelton turbine, reaction turbine, Kaplan turbine, Francis turbine only)</p> <p>Hydraulic & Pneumatic system with block diagram.</p>	12

Text Books:

1. Fluid Mechanics & Hydraulic Machines, Laxmi Publaction (P) Ltd., New Delhi.
2. Vijay Gupta & Gupta S.K., Fluid Mechanics, New Age International Publishers, New Delhi.
3. Kapoor J.K., Hydraulics, Bharat Bharti Prakashan, Merrut.
4. Likhi S.K., Hydraulics Laboratory Manual, New Age International Publishers, New Delhi.

Ref Books:

1. Garde R.J., Fluid Mechanics, New Age International Publishers, New Delhi.
2. Jagdish Lal, Hydraulics & Hydraulic Machines, Metropolitan Book Depot, Delhi.
3. Modi P.N., Fluid Mechanics, New Age International Publishers, New Delhi

DME 402: MATERIALS AND METALLURGY

Credits: 4

Semester-IV

Module No.	Contents	Teaching Hours
I	<p>Introduction Material, History of Material Origin, Scope of Material Science, Overview of different engineering materials and applications, Classification of materials, Thermal, Chemical, Electrical, Mechanical properties of various materials, Present and future needs of materials, Overview of Biomaterials and semi-conducting materials, Various issues of Material Usage- Economical, Environment and Social.</p> <p>Crystallography Fundamentals Crystal, Unit Cell, Space Lattice, Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals, Number of Atoms per unit Cell, Atomic Packing Factor.</p> <p>Failure Mechanisms Overview of failure modes, fracture, fatigue and creep.</p>	12
II	<p>Metals And Alloys Introduction History and development of iron and steel, Different iron ores, Raw Materials in Production of Iron and Steel, Basic Process of iron-making and steel-making, Classification of iron and steel,</p> <p>Cast Iron Different types of Cast Iron, manufacture and their usage.</p> <p>Steels Steels and alloy steel, Classification of plain carbon steels, Availability, Properties and usage of different types of Plain Carbon Steels, Effect of various alloying on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel)</p> <p>Concepts and effects of Heat Treatment Purpose of heat treatment, Cooling Curves Iron –carbon diagram , TTT Diagram various heat treatment processes hardening, tempering, annealing, normalizing, Case hardening and Surface hardening.</p> <p>Composites Classification, properties, applications</p>	12
III	<p>Non Ferrous Materials: Properties and uses of Light Metals and their alloys, properties and uses of White Metals and their alloys, Bearing Metal.</p> <p>Miscellaneous materials Important sources of plastics, Classification-thermoplastic and Thermo set and their uses, Various Trade names of Engg. Plastics, Plastic Coatings.</p>	12

	Classification, properties, applications of composites.	
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	Classification, properties, applications of ceramics... Heat insulating materials. Properties and uses of Asbestos, Glass wool, thermo Cole, cork, mica. Refractory materials.	
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Text Books:-

1. Habra Choudhury S.K., Materials Science & Processes, Indian Book Distributing Company, Kolkata.
2. Bhavnagar S.K., Material & Materials Science, Nave Bharat Prakash an, Meerut.
3. Gupta K.M., Book of Materials Science.

Ref. Books

1. Kashia K.T., Materials Science for Engineers, I.K. International Publishing House Pvt. Ltd., New Delhi.
2. Profit R.K., Materials Science & Processes, Standard Publishers Distributors, Delhi.

DME 403: MEASUREMENT AND METROLOGY INSTRUMENTS

Credits: 4

Semester-IV

Module No.	Contents	Teaching Hours
I	<p>INTRODUCTION: Meaning and scope of metrology in field of engineering. Standards and types of measurements (Line and Wave length, Primary, Secondary and Tertiary measurement concept only). Interchangeability, Limits, Fits and Tolerances. Precision and Accuracy, Sources of error.</p> <p>TRANSDUCERS Definition, various types of transducers such as resistive, strain gauges capacitive, inductive, electromagnetic, photo Electric, piez-electric and their use in instrumentation.</p>	12
II	<p>COMPARATORS General principles of constructions, balancing and graduation of measuring instruments, characteristics of comparators, use of comparators, difference between comparators, limit gauges And measuring instruments. Classification of comparators, construction and working of dial indicator, Johansson "Mikrokator", read type mechanical comparator, mechanical-optical, zees opt test, electro limit, electromechanical, electronics, pneumatic comparators, gauges, tool makers microscope.</p> <p>TEMPERATURE MEASUREMENT Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both).</p>	15
III	<p>SURFACE FINISH Geometrical characteristics of surface roughness- Waviness. Lay, flaws. Effect of surface quality on its functional properties. Factor affecting the surface finish. Drafting symbols for surface roughness. Evaluation of surface finish. RMS and CLA values. Methods of measuring surface roughness. Qualitative and quantitative methods. Comparison of surfaces produced by common production methods.</p> <p>VARIOUS TYPES OF INSTRUMENTS USED FOR Measurement Physical Measurements such as -Length, Depth height, Thickness, Gaps, Curvature , Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement., Liquid Level & Viscosity - Liquid level measuring methods and devices Viscometer - Plate and Cone viscometer, Two float viscometer, Rhea viscometer. couple, vacuum gauges.</p> <p>Strain Gauge Use of strain gauge and load cells.</p>	15

Text Books:

1. Bhatnagar S., Metrology & measuring Instrument, Nav Bharat Prakshan, Meerut.
2. Vikram Sharma, Measurement, Metrology and Control, S.K. Kataria & Sons, New Delhi.

Ref. Books:

1. Rajput R.K., Mechanical Measurement and Instrument, S.K. Kataria & Sons, New Delhi.

DME 404: WORKSHOP TECHNOLOGY-II

Credits: 4

Semester-IV

Module No.	Contents	Teaching Hours
I	<p>Cutting Tools and Cutting Materials</p> <p>Cutting Tools Various types of single point cutting tools and their uses application.</p> <p>Cutting Tool Materials Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.</p> <p>Cutting Fluids and Lubricants Function of cutting fluid, Types of cutting fluids, Difference between cutting fluid and lubricant, Selection of cutting fluids for different materials and operations, Common methods of lubrication of machine tools.</p>	10
II	<p>Lathe Function and operations of various parts of a lathe, Classification and specification of various types of lathe, Work holding devices, Lathe tools and operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.</p> <p>Cutting parameters Speed, feed and depth of cut for various materials and for various operations, machining time. Speed ratio, preferred numbers of speed selection.</p> <p>Lathe accessories Centers, dogs, different types of chucks, collets, faceplate, angle plate, mandrel, steady rest, follower rest, taper turning attachment, tool post grinder, milling attachment, Quick change device for tools.</p> <p>Introduction to capstan and turret lathe.</p> <p>Drilling Principle, Classification of drilling machines and their description. Drilling machine operations – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping. Speeds and feeds during drilling, impact of these parameters on drilling, machining time. Types of drills and their features, nomenclature of a drill, Drill holding devices.</p> <p>Boring Principle, Classification and their brief description. Boring tools, boring bars and boring heads.</p>	14
	<p>Shaping, Planing and Slotting Working principle of shaper, planer and slotter. Type of shapers, Type of planers, Types of tools used and their geometry, Speeds and feeds in above processes.</p>	

III

12

Broaching & Hobbing

Introduction, Types of broaching machines – Single ram and



[Diploma in Engineering]

	duplex ram horizontal type, vertical type pull up, pull down, push down. Elements of broach tool, broach tooth details – nomenclature, types, and tool material.	
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LIST OF RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuvanshi : Dhanpat Rai and Sons Delhi
2. Elements of Workshop Technology by SK Choudhry and Hajra : Asia Publishing House
3. Manufacturing Technology by M Adithan and A.B. Gupta; Wiley Eastern India Ltd. New Delhi.
4. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi
5. Foundry Technology by KP Sinha and DB Goel; Roorkee Publishing House, Roorkee.

DME 405: MACHINE DESIGN AND DRAWING

Credits: 4

Semester-IV

Module No.	Contents	Teaching Hours
I	<p>Introduction Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.</p> <p>Design against Static Load Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.</p> <p>Design against Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria</p>	12
II	<p>Shafts Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity</p> <p>Keys and Couplings Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings- Design of rigid and flexible couplings</p>	12
III	<p>Gears Nomenclature of gears and conventional representation Drawing the actual profile of involute teeth gear by different methods</p> <p>Power Screws Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack</p>	12

RECOMMENDED BOOKS

1. Machine Design by R.S. Khurmi and JK Gupta, Eurasia Publishing House (Pvt.) Ltd, New Delhi.

2. Machine Design by V.B.Bhandari, Tata McGraw Hill, New Delhi.
3. Engineering Design by George Dieter; Tata McGraw Hill Publishers, New Delhi.
4. Mechanical Engineering Design by Joseph Edward Shigley; McGraw Hill, Delhi.
5. Machine Design by Sharma and Agrawal; Katson Publishing House, Ludhiana.
6. Design Data Handbook by D.P. Mandali, SK Kataria and Sons, Delhi.

DME 451: HYDRAULICS & HYDRAULIC MACHINES LAB.

Credits: 2

Semester-IV

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1	To verify Bernoulli's Theorem.	24
2	To find out venturimeter coefficient.	
3	To determine coef. of velocity (C_v), Coef. of discharge (C_d) Coef. of contraction (C_c) and verify the relation between them.	
4	To perform Reynold's Experiment.	
5	To determine Darcy's coefficient of friction for flow through pipes.	
6	To verify loss of head due to: I - Sudden enlargement	
7	II - Sudden Contraction. Study of the following I - Reciprocating Pumps II - Centrifugal Pumps. III - Pressure Gauge / Pitot tube.	



DME 452: MATERIALS AND METALLURGY LAB.

Credits: 2

Semester-IV

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1	Study of diamond polishing apparatus.	24
2	Study metallurgical microscope.	
3	a)- To prepare specimens for microscope examination (For Polishing and etching).	
	b)- To examine the microstructure of the above specimens under metallurgical microscope.	
	c)- To know composition of alloy steel by speller stereoscope	
4	d)- To know carbon in steel by carbon steel estimation apparatus Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.	
	a)- Brass.	
	b)- Bronze.	
	c)- Grey Cast Iron.	
	d)- Malleable Cast Iron.	
	e)- Low Carbon Steel.	
	f)- High Carbon Steel.	
	g)- High Speed Steel.	
	h)- Bearing Steel.	
5	To perform heat treatment process on materials of known carbon percentage: a)- Annealing b)- Normalizing c)- Case Hardening	

DME 453: MACHINE DESIGN AND DRAWING LAB.

Credits: 2

Semester-IV

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1	Design & drawing of Key.	48
2	Design & drawing of Shaft with keyways.	
3	Design of machine components subjected to combined steady and	
4	variable loads	
5	Design of shaft for combined constant twisting and bending	
6	loads	
7	Design of shaft subjected to fluctuating loads	
8	Design and drawing of flanged type rigid coupling	
9	Design and drawing of flexible coupling	
10	Design and drawing of screw jack	
11	Design and drawing of gears.	
	Keys and Cotters (3 sheets)	
	1. Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position	
	2. Various types of joints (3 sheets)	
	- Spigot and socket joint	
	- Gib and cotter joints	
	- Knuckle joint	

