



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-4(Diploma)

Subject: Mechanics of fluid and machinery- DETME14211

Type of course: Major

Prerequisite: Introduction of Mechanical Engineering

Rationale: The main objective of this course is to understand the fundamentals of the fluid mechanics such as fluid and flow properties, fluid behavior at rest and in motion and fundamental equations like mass, energy and momentum conservation of the fluid flow thereby developing an understanding of fluid dynamics in variety of fields. Applications of these basic equations have been highlighted for flow measurements. Hydraulic machinery plays an important role in the conversion of hydraulic energy to mechanical energy and vice-versa. Hydraulic turbines are used for meeting our day-today power emends. Also, different types of pumps are essential equipment in all the industries. It is also tried to develop an understating of hydraulic & pneumatic devices generally used in industries through this course. Hydraulic systems have a wide range of applications in machine tools, material handling, marine, mining, metal processing, equipment and other fields. Similarly pneumatic control is extensively used as an effective method of automation technique.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Unit No	Course content	Hrs.	% Weightage
1	Fluid and fluid properties: Concept and classification of fluid, Properties of fluid, Newton's law viscosity, Simple numerical examples. Fluid Statics: Introduction, Laws of fluid statics, Types, working and applications of pressure measuring devices Construction & Working of Different Types of Manometers and Mechanical Gauges Selection criteria for pressure measuring devices. Simple numerical examples	10	20
2	Fluid Kinematics: Concept of control volume, Continuity and energy equation, Momentum equations and its application in impact of jet, Types of fluid flow. iv. Flow patterns for ideal, laminar, turbulent and compressible fluid flow of one dimension. Simple numerical problems on all of the above. Fluid Dynamics and Flow Measurement: Fluid energy-types and interrelations, Euler's equation. i. Concept and definition. ii. Understanding various terms in Euler's equation, Bernoulli's equation. Flow measurement. Parameters and units of measurements related to following devices. Devices-classifications, principle, working, applications without derivation. (Pitot tube, Venturi meter, Flow nozzle, Rota meter, Orifice, Notch).	15	30
3	Flows through Pipes: Introduction to pipe and pipe flow. Reynolds's experiment, friction factor, Darcy's equation, Moody's chart. Water hammer effect. Selection criteria for pipes and pipe sizes. Simple numerical examples.	10	15
4	Hydraulic Pumps & Turbines: Concept and classification of pumps. Detailed study of Centrifugal pump, Reciprocating pump. Submersible pump. Rotary positive displacement type pumps like Gear pump and Van pump. Vacuum pump. Performance of centrifugal pump and reciprocating pump, Classification, construction, Working principle and applications Pelton Wheel Turbine Francis Turbine Kaplan Turbine Performance of hydraulic turbine Hydro-Pneumatic Elements and Devices: - Types, sketch, working, specifications, symbols and applications of hydraulic and pneumatic elements like: Cylinder, Valve, Manifolds, etc. Hydraulic devices Hydraulic press, Hydraulic accumulator, Hydraulic lift, Hydraulic ram, Hydraulic crane, Hydraulic coupling, Hydraulic intensifier.	25	35



Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Summary on Common Fluids Prepare a tabulated summary for types of fluid which is available around you and upload a report on the GMIU web portal.	10
2	Case Studies Identify any one hydraulic pump and one prime mover available in market in a group of five students with detailed specifications and current price. Upload a report on the GMIU web portal	10
3	Presentations Faculty will assign a topic for presentation to promote independent learning and communication skills. Upload presentation on the GMIU web portal	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	25%	25%	20%	5%	-

Course Outcome:

After learning the course, the students should be able to:	
CO1	Identify fluid properties and their effect on the flow system.
CO2	Apply various laws of fluid mechanics to various real-life applications.
CO3	Estimate various flow losses to select suitable pipe as per the given situation.
CO4	Select a hydraulic machine for a particular application.



List of Practical:

Sr. No	Descriptions	Unit No	Hrs.
1	Demonstration of Various Fluid Properties: Explore and measure properties such as viscosity, density, and surface tension using appropriate equipment.	1	2
2	Pressure Measurement: i. Various Manometers: Use U-tube and digital manometers to measure fluid pressure. ii. Various Pressure Gauges: Measure pressure using Bourdon gauges and electronic pressure sensors.	1	4
3	Verification of Bernoulli's Theorem: Conduct experiments to demonstrate Bernoulli's principle using a flow channel and measuring devices.	2	2
4	Fluid Flow Measurement by Venturimeter and Nozzle: Measure the flow rate of a fluid using a Venturimeter and a flow nozzle, analyzing pressure changes.	2	2
5	Fluid Flow Measurement by Orifice Meter and "V" Notch: Determine flow rates using an orifice meter and measure flow over a V-notch weir.	2	4
6	Estimation of Reynolds Number: Use a test rig to measure flow velocity, density, and viscosity to calculate the Reynolds number.	2	2
7	Determination of Major and Minor Head Loss in Pipes: Analyze head loss due to friction (major) and fittings (minor) in a piping system using experimental data.	2	2
8	Testing of Centrifugal Pump as per BIS: Perform tests to evaluate the performance and efficiency of a centrifugal pump following Bureau of Indian Standards (BIS) guidelines.	3	4
9	Testing of Reciprocating Pump as per BIS: - Conduct tests to assess the characteristics and efficiency of a reciprocating pump according to BIS standards.	3	4
10	Demonstration of Hydraulic and Pneumatic Devices: - Showcase various hydraulic and pneumatic systems, explaining their functions and applications.	4	4
		Total	30



Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan.
- [2] Fluid mechanics& hydraulic Machines by R.S.Khurmi, S.chand&Co.Ltd.
- [3] Hydraulic & Hydraulic machines by R.C. Patel & A.D. Pandya, Acharya Book Depot.
- [4] Fluid mechanics& hydraulic by A.R. Basu, DHANPAT RAI.
- [5] Fluid mechanics& hydraulic machines by S.C. Gupta, PERSON Education.
- [6] Fundamental Fluid mechanics by Dr. D.S. Kumar Ketson Pub. House

