SEMESTER S7

FLUID MECHANICS & MACHINERY

Course Code	PEMRT741	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None/ (Course code)	Course Type	Theory

Course Objectives:

1. Gain fundamentals knowledge of fluid physical properties, pressure and its measurements, fluid statics, kinematics, dynamics and turbo machines.
2. Understand the concepts of Fluid statics, Fluid dynamics, Fluid kinematics, Dimensional analysis, turbo machines, Hydraulic turbines.
3. Apply the principles of turbo machines, fluid mechanics and machines

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Fundamental concepts:** Properties of fluid - density, specific weight, viscosity, surface tension, capillarity, vapour pressure, bulk modulus, compressibility, velocity, rate of shear strain, Newton's law of viscosity, Newtonian and non-Newtonian fluids, real and ideal fluids, incompressible and compressible fluids. **Fluid statics:** Atmospheric pressure, gauge pressure and absolute pressure. Pascal's Law, measurement of pressure - piezo meter, manometers, pressure gauges, energies in flowing fluid, head - pressure, dynamic, static and total head, forces on planar and curved surfaces immersed in fluids, centre of pressure, buoyancy, equilibrium of floating bodies, metacentre and metacentric height.	9
2	**Fluid Kinematics:** Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function, problems. **Fluid Dynamics:** Introduction, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of	9

	Bernoulli's equation, problems.	
3	**Equations of fluid dynamics:** (Euler's equation), Navier-Stokes equations Bernoulli's equation and its applications: Venturimeters and Orifice meters, Hydraulic coefficients, **Flow through pipes**: Laminar and Turbulent flow, Reynold's experiment, loss of head due to friction, Darcy – Weishbach Equation, Chezy's formula, Minor losses in pipes. **Turbomachines:** Definition of a Turbomachine, parts of a Turbomachine **Hydraulic Turbines:** Classification; Constructional features.	**9**
4	**Pumps:** Classifications-types of casing and impellers, Velocity triangle for pumps, Head of pump, Losses and efficiency, Minimum starting speed, Specific speed, NPSH, Multistage pump, Pumps in parallel and series, selection of pumps. Positive displacement pumps – working principle, types of reciprocating pumps, Indicator diagram- work done, effect of acceleration and frictional resistance, slip and coefficient of discharge., separation in suction and delivery pipes, Air vessel, Gear pump, Lobe pump, Vane pump, Screw pump.	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

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Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the concept of fluid statics	**K2**
CO2	Calculate pressure variations in accelerating fluids using Euler's and Bernoulli's equations and become conversant with the concepts of flow measurements and flow through pipes	**K2**
CO3	Understand applications of Fluid flow measurements, dimensional analysis, turbo machines, hydraulic turbines	**K2**
CO4	Discuss the characteristics of different type of pumps.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	-	1	-	-	-	-	-	2
CO2	2	-	-	-	-	1	-	-	-	-	-	2
CO3	2	1	-	-	-	1	-	-	-	-	-	2
CO4	3	2	2	-	-	1	-	-	-	-	-	2
CO5												

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Hydraulics & Fluid Mechanics	Modi P. N. and S. M. Seth	Standard Book House	22nd Edition 2019
2	Fluid Mechanics and Fluid Power Engineering	Kumar D. S	S. K. Kataria & Sons, New Delhi	2013

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Fluid Mechanics and Fluid Machines	Dr. Bansal, R.K.	Lakshmi Publications	2019
2	A Textbook of Turbomachines	M S Govinde Gowda	M M Publishers	2018
3	Fluid Mechanics (SI Units)	Yunus A. Cengel John M.Oimbala	Tata McGraw Hill	2nd Ed. 2006
4	Fluid Mechanics	,John F.Douglas, Janul and M.Gasiosek and john A.Swaffield	Pearson Education Asia	5th ed., 2006

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/112/105/112105171/
2	https://www.youtube.com/watch?v=5H0euuo1PGQ https://youtu.be/vXPtNNLEOUc
3	https://www.youtube.com/watch?v=5aDa30ym8RI
4	https://archive.nptel.ac.in/courses/112/103/112103249/