Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
6MERC3 **FLUID MACHINES**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objective:

The course is designed

1. To fundamentally understand the principle of fluid machines.
2. To understand the working and operation different fluid machines.
3. To model and simulate flow situations.
4. To extend the theory to .related machines.

Pre requisite(s): Fluid Mechanics, Applied Mechanics, Engineering Thermodynamics, Applied Mathematics

COURSE CONTENTS

UNIT-I

Fundamental Principles: Newton's Laws of Motion and Reynolds Transport Theorem; Conservation of Momentum: Linear Momentum Equation, Angular Momentum Equation; Forces on stationary and moving vanes, Forces on closed conduits: Reducer and Expanders, Bends, Torque on Sprinklers

UNIT-II

Modelling and Similitude: Dimensional Homogeneity, Dimensionless parameters, Methods to find Dimensionless numbers, Buckingham π Theorem applications, Similitude: Modelling Criteria; Modelling Laws; Distorted Models. Conservation of Mass and Momentum

UNIT-III

Turbines: Hydraulic Turbines: Impulse and Reaction Turbines; Velocity triangles, Euler's Equation of Work Done, Efficiencies; Pelton, Francis, Kaplan, Propeller and Bulb turbine: Constructional details and Performance characteristics, Unit quantities, Specific Speed; Governing; Comparison with other Turbines: Steam Turbines, Gas Turbines, Jet Engines

UNIT-IV

Pumps: Rotodynamic Pumps: Centrifugal, Axial; Constructional details, Performance Characteristics, Losses and Efficiencies, Net Positive Suction Head, Specific speed, Pumps in series and parallel; Multistage and Specific purpose pumps

Positive Displacement Pumps: Types; Reciprocating Pumps: Indicator Diagram, Acceleration Head, Friction head, Air-Vessels, Double Acting Pumps

UNIT-V

Cavitations and Water Hammers: Cavitations: Definition and Genesis, Effects on pumps and turbines, Thoma-Cavitation Factor, Measurement of Cavitation: Apparatus, Cavitation test, Prevention; Water Hammer: Physical phenomenon, fundamental equation, arithmetic integration, Prevention; Surge tanks; types and Role

Course Outcome:

Students earned credits will develop ability to

CO1. Apply well-established concepts of the theory of fluid machines.

CO2. Select Proper fluid machines.

CO3. Operate and develop insight in maintenance.

CO4. Develop a base for Computational Fluid Dynamics (CFD).

BOOKS RECOMMENDED:

[1] Douglas John F., *Fluid Mechanics*, Pearson Education, 2005.
[2] Dixon S.L., *Fluid Mechanics and Thermodynamics of Turbomachinery*, Elsevier, 5e, 2002, London.
[3] Modi and Seth, Hydraulics and *Fluid Mechanics including Hydraulic Machines*, Rajsons Publication Pvt Ltd, N Delhi, 5e, 2000.
[4] Lal Jagdish, *Hydraulic Machines*, Metropolitan Book Company, 1995.

LIST OF PRACTICAL ASSIGNMENT

1. To determine the coefficient of impact of water jet on vanes
2. Performance evaluation of Pelton wheel using Pelton Wheet test rig
3. Performance evaluation of Kaplan Turbine using Kaplan Turbine test rig
4. Performance evaluation of Centrifugal Pump using Centrifugal Pump test rig
5. Performance evaluation of Reciprocating Pump using Reciprocating Pump test rig.
6. Measure forces on different shapes model using a wind Tunnel.
7. Performance evaluation of Francis Turbine using Francis turbine test rig
8. Numerical Study of modelling and similitude of rotodynamic fluid machines.
9. Study the phenomenon of water hammer in pipes

Course Objective:

The course is designed

1. To fundamentally understand the principle of fluid machines.
2. To understand the working and operation different fluid machines.
3. To model and simulate flow situations.
4. To extend the theory to .related machine

Course Outcome:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	Apply well-established concepts of the theory of fluid machines.	PO1, PO2, PO5
CO2	Select Proper fluid machines.	PO1, PO3, PO4
CO3	Operate and develop insight in maintenance.	PO1, PO2, PO5, PO12
CO4	Develop a base for Computational Fluid Dynamics (CFD).	PO1, PO4, PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3			3							
CO2	3		3	3								
CO3	3	3			3							2
CO4	3			3								2
CO5												

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)

1→ relevant and small significance 2 → medium or moderate and 3 →strong