

ME305: FLUID MACHINES
CREDITS = 5 (L=3, T=0, P=2)

Course Objective: To apply principles of fluid mechanics for design and analysis of fluid machines for efficient energy transfer.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

Course Contents:

Sr. No	Topics	Teaching Hours
1	<p><u>Ideal Fluid Flow:</u></p> <p>Superposition of basic flows to obtain flow around cylinder, Concept of circulation and coefficient of lift.</p> <p><u>Impact of Jet</u> Force exerted by jet on stationary flat plate and curved plate, Force exerted and work done by jet striking on moving plate, introduction of jet propulsion.</p>	08
2	<p><u>Hydropower plant:</u></p> <p>Introduction and classification of hydropower plants, components, advantages and disadvantages of hydropower plant.</p> <p><u>Hydraulic Turbines:</u> Classification; moment of momentum equation to estimate work done on blade; Construction, working and analysis of Pelton, Francis and Kaplan turbine; Efficiencies of turbine; Governing, Performance, Cavitation and Scale effect of hydraulic turbine.</p>	10
3	<p><u>Hydraulic Pumps:</u></p> <p>Classification; Construction of rotodynamic pumps, manometric head, efficiencies and performance of centrifugal pump; pressure rise in pump impeller; multistage pump; cavitation in pump.</p>	07

4	<u>Reciprocating Pump:</u>	04
	Construction and working; discharge coefficient, slip and energy transfer in pump; effect of air vessels.	
5	<u>Centrifugal Compressor:</u>	09
	Working principle and components; Work done and pressure rise; Enthalpy- Entropy diagram of compressor stage; influence of impeller blade shape; surging and choking.	
	<u>Axial flow compressor:</u>	
	Working principle; Blade arrangement, velocity triangles and performance of Axial flow compressor.	
6	<u>Hydraulic System:</u>	04
	Construction, working and application of hydraulic press, hydraulic accumulator, hydraulic intensifier and hydraulic crane; Fluid coupling and torque converter.	

TOTAL	42
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List of References:

1. D.S.Kumar, “*Fluid Mechanics and Fluid Power Engineering*”, Sixth Edition, S. K. Kataria & Sons.
2. Frank M. White, “*Fluid Mechanics*”, McGraw Hill Book Company Ltd.
3. S. M. Yahya, “*Turbines, Compressors and Fans*”, Fourth Edition, Tata McGraw Hill.
4. B. K. Venkanna, “*Fundamentals of Turbomachinery*”, First Edition, PHI Learning Pvt. Ltd.
5. B. F. Massey, “*Mechanics of Fluid*”, Seventh Edition, ELBS.

Course Outcomes (COs):

At the end of this course students will be able to ...

- 1) To analyze ideal fluid flow and impact of jet.
- 2) To illustrate hydro-power plant and to analyze performance of hydraulic turbines and sizing.
- 3) To investigate rotodynamic pumps for construction, operation, performance and sizing.
- 4) To examine reciprocating pumps for its construction and working.
- 5) To analyze compressors for their construction and performance.
- 6) To interpret hydraulic systems for their working and applications.