

Subject Code: 01ME0502
Subject Name: Fluid Power Engineering
B.Tech. III Year – (Sem-5) Mechanical Engineering
Type of course: Programme Core
Prerequisite: Elements of Mechanical Engineering, Fluid mechanics.

Rationale: To provide the detailed understanding of fluid power and different major equipment which are dealing with fluid power.

Teaching and Examination Scheme:

Teaching Scheme(Hours)			Credits	Evaluation Scheme					Total Marks
Theory	Tutorial	Practical		Theory Marks			Practical Marks		
				ESE (E)	IA	CSE	Viva (V)	Term Work (TW)	
4	0	2	5	50	30	20	25	25	150

COURSE OUTCOME

Students will be able to

- CO1** Understand the operation and use of different fluid machines like hydraulic turbine, pumps, compressors, hydraulic crane, fluid coupling and fluid torque convertor etc.
- CO2** Learn the benefits and limitations of fluid power technologies compared with other power transmission and generation technologies.
- CO3** Apply their knowledge to calculate various performance parameters related to fluid machines.
- CO4** Analyze the selection of fluid machines.
- CO5** Design different fluid machines depending on various field applications.
- CO6** Predict the performance of fluid machines for the different operating conditions.

Sr. No.	Content	Total Hrs	% Weightage
1	Impact of Jet: ✓ Introduction, Force exerted on flat stationary & moving plate held		

	normal and inclined to jet, Force exerted on stationary & moving curved plate when jet is striking at center, when Jet is striking on curved vane tangentially at one tip and leaving at other end, Jet propulsion in ships	07	20
2	Hydraulic Turbines: <ul style="list-style-type: none"> ✓ Introduction & Classification of hydropower plant, Advantages and disadvantages of hydropower plant, ✓ Introduction & Classification of turbines, construction, working and performance of Pelton, Francis and Kaplan Turbines, Draft tube, Cavitations, Unit quantities, specific speed and model relationships, Governing of hydraulic turbines. 	09	25
3	Centrifugal Pumps: <ul style="list-style-type: none"> ✓ Pump classification and selection criterion, Centrifugal pumps, Pump losses and efficiencies, Net positive suction head, Characteristic curves of centrifugal pumps, priming, maximum suction limit - minimum starting speed to deliver the discharge, Multistage pumps, cavitation, pump selection 	06	12
4	Reciprocating Pumps: <ul style="list-style-type: none"> ✓ Operation of Reciprocating pumps, discharge co-efficient, volumetric efficiency, slip, work done and power required to drive reciprocating pumps, effect of air vessels, effect of friction on performance of reciprocating pump 	04	8
5	Positive displacement compressors <ul style="list-style-type: none"> ✓ Reciprocating Compressors: Construction and working, Multistage, conditions for minimum work, Intercooling, Efficiency and control of air compressors ✓ Rotary Compressors: Introduction, Classification, roots blower, Vane type, Screw compressor, Scroll compressor 	07 02	10
6	Roto-Dynamic Compressors <ul style="list-style-type: none"> ✓ Centrifugal Compressors: Essential parts, Static and total head properties, Velocity diagram, Degree of reaction, surging and choking, Losses in centrifugal compressor ✓ Axial Flow Compressors: Construction of an axial flow compressor, Lift and drag, Performance characteristics 	04 05	10
7	Hydraulic Machines: <ul style="list-style-type: none"> ✓ Construction and working of hydraulic press, Hydraulic accumulator, Hydraulic intensifier, Hydraulic crane, Hydraulic jack, hydraulic lift, Hydraulic ram, Fluid couplings, Fluid torque converter and air lift pump 	04	15

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	25	25	15	10

Legends: **R:** Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze, **and E:** Evaluate **C :** Create

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons.

2. Fluid Power Engineering by R.N. Patel and V.L. Patel Mahajan Publication
3. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan.
4. Fluid Mechanics and Hydraulic Machines by R.K. Rajput , S.Chand & Co.
5. Turbines, Compressors and Fans by S.M. Yahya., TMH Publishers
6. Fluid Mechanics and Turbomachines by Das, Madan Mohan, PHI Learning

List of the Experiment

- 1 To study about hydropower plant.
- 2 To Verify Impulse-momentum principle for impact of jet on stationary vane.
- 3 Performance test and analysis on Pelton turbine.
- 4 Performance test and analysis on Kaplan turbine.
- 5 Performance test and analysis on Francis turbine.
- 6 Performance test and analysis on Centrifugal pump.
- 7 Performance test and analysis on Reciprocating pump.
- 8 Performance test and analysis on Reciprocating compressor.
- 9 Performance test and analysis on Centrifugal compressor.
- 10 Performance test on Hydraulic ram.

List of Open Source Software/learning website:

1. <http://nptel.iitm.ac.in>
2. <http://media.efluids.com/galleries/all>