

<b>COURSE TITLE</b>	<b>FLUID POWER ENGINEERING</b>
<b>COURSE CODE</b>	<b>01ME1502</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 Fluid Power Engineering is a subject that deals with the study of fluids and the application of this knowledge to various mechanical and industrial systems
- 2 provide the detailed understanding of fluid power and different major equipment which are dealing with fluid power.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Students will be able to apply the principles of fluid mechanics to power producing and generating devices.
- 2 Students will be able to compare the force and power exerted on curved and flat vanes
- 3 Students will be able to select and performance of hydraulic turbines
- 4 Students will be able to analyze the operating and performance parameters of hydraulic pumps and air compressors
- 5 Students will be able to apply the working principles of hydraulic systems to industrial applications

**Pre-requisite of course:** Elements of Mechanical Engineering, Fluid Mechanics

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	2	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Impact of Jet</b> Introduction, impact of jet on fixed and moving vane flat and curved vane	6
2	<b>Hydraulic Turbines</b> Introduction & Classification of turbines, construction, working and performance of Pelton turbine, construction, working and performance of Francis turbine , construction, working and performance of Kaplan turbine , Unit quantities, specific speed and model relationships	7
3	<b>Hydraulic Pump</b> Pump classification, Pump losses and efficiencies, priming, maximum suction limit - minimum starting speed to deliver the discharge, cavitation, NPSH, Operation of Reciprocating pumps, performance parameters of reciprocating pumps	7

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
4	<b>Positive displacement compressors</b> Construction and working of reciprocating compressor, Multistage, conditions for minimum work, Intercooling for reciprocating compressor, Efficiency and control of air compressors, Introduction, Classification of rotary compressor, roots blower, Vane type, Screw compressor, Scroll compressor	10
5	<b>Roto-Dynamic Compressors</b> Essential parts, Static and total head properties for centrifugal compressor, Velocity diagram, Degree of reaction, surging and choking, Losses in centrifugal compressor, Construction of an axial flow compressor, Lift and drag, Performance characteristics of axial flow compressor	8
6	<b>Hydraulic Machines</b> Construction and working of hydraulic press and Hydraulic accumulator, Construction and working of Hydraulic intensifier, Hydraulic crane, Hydraulic jack, Construction and working of hydraulic lift and Hydraulic ram, Fluid couplings, Fluid torque converter and air lift pump	4
<b>Total Hours</b>		<b>42</b>

**Suggested List of Experiments:**

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>To Verify Impulse-momentum principle for impact of jet on stationary vane</b> To Verify Impulse-momentum principle for impact of jet on stationary vane	2
2	<b>To perform experiment on Pelton Turbine</b> To perform experiment on Pelton Turbine	2
3	<b>To perform experiment on kaplan Turbine</b> To perform experiment on kaplan Turbine	2
4	<b>To perform experiment on francis Turbine</b> To perform experiment on francis Turbine	2
5	<b>To perform experiment on centrifugal pump</b> To perform experiment on centrifugal pump	2
6	<b>To perform experiment on Reciprocating pumps</b> To perform experiment on Reciprocating pumps	2
7	<b>To perform experiment on a double stage reciprocating air compressor</b> To perform experiment on a double stage reciprocating air compressor	2
8	<b>To perform experiment on a centrifugal air compressor/blower</b> To perform experiment on a centrifugal air compressor/blower	2
9	<b>To perform experiment on Hydraulic ram</b> To perform experiment on Hydraulic ram	2

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
10	<b>To determine the equivalent length of the different fitting arrangements in pipe flow</b> To determine the equivalent length of the different fitting arrangements in pipe flow	2
11	<b>To determine the bursting pressure of PVC pipe</b> To determine the bursting pressure of PVC pipe	2
12	<b>To determine the frictional losses encountered in a hydraulically smooth pipe under laminar and turbulent flow situations</b> To determine the frictional losses encountered in a hydraulically smooth pipe under laminar and turbulent flow situations	2
<b>Total Hours</b>		<b>24</b>

### Textbook :

- 1 Fluid Power Engineering, M. Galal Rabie, McGraw-Hill Education, 2017
- 2 Fluid Power Circuits and Controls: Fundamentals and Applications, John S. Cundiff and John L. Fandrich, Prentice Hall, 2014

### References:

- 1 Fluid Mechanics and Fluid Power Engineering, Fluid Mechanics and Fluid Power Engineering, D.S. Kumar, S.K. Kataria & Sons, 2018
- 2 Turbines, Compressors and Fans, Turbines, Compressors and Fans, S.M. Yahya, TMH Publishers, 2011
- 3 Fluid Mechanics and Turbomachines, Fluid Mechanics and Turbomachines, Das, Madan Mohan, PHI Learning, 2008
- 4 Fluid Mechanics and Hydraulic Machines, Fluid Mechanics and Hydraulic Machines, R.K. Rajput, S.Chand & Co, 2013
- 5 Fluid Power with Applications, Fluid Power with Applications, Anthony Esposito, Pearson, 2016
- 6 Fluid Power Systems, Fluid Power Systems, Patrick J. Klette, CRC Press, 2010
- 7 Fluid Power Design Handbook, Fluid Power Design Handbook, Frank Yeaple, Industrial Press, Inc., 2019

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	15.00	25.00	25.00	15.00	10.00

**Instructional Method:**

- 1 PPT

**Supplementary Resources:**

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