Program : **Diploma in Automobile Engineering**	
Course Code : **3059**	Course Title: **Fundamentals of Fluid Mechanics Lab**
Semester : **3**	Credits: **No Credit**
Course Category: **Program Core**	
Periods per week: **4 (L:0, T:0, P:4)**	Periods per semester: **60**

Course Objectives:

- To measure discharge of fluid through pipes, orifices and notches.
- To get familiar with various applications of fluid mechanics and achieve the proficiency to test the performance of pumps.
- To apply their knowledge in fluid systems.

Course Pre-requisites:

Topic	Course code	Course Title	Semester
Knowledge of Engineering Mathematics		Mathematics I	1
Knowledge of Engineering Mathematics		Mathematics II	2
Basic knowledge of fundamentals in physics		Applied Physics I	1
Basic knowledge of fundamentals in physics		Applied Physics II	2

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Make use of Bernoulli's theorem apparatus, orifices and notches.	15	Applying
CO2	Organize experiments on Venturi meter and pipe friction apparatus.	14	Applying
CO3	Experiment with centrifugal pump and reciprocating pump.	14	Applying
CO4	Experiment with hydraulic circuits and pneumatic circuits.	14	Applying

	Lab Exam	3	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			2			
CO2	3			2		2	2
CO3	3			3			
CO4	2			2		2	2

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Make use of Bernoulli's theorem apparatus, orifices and notches.**		
M1.01	• Recall the Bernoulli's theorem • Demonstrate the use of Bernoulli's theorem apparatus • Verify Bernoulli's theorem using the apparatus • Construct the graph, total energy Vs Length of pipe • Interpret the curve.	5	Applying
M1.02	• Demonstrate the Orifice apparatus. • Find the coefficient of discharge of orifice. • Construct and interpret the graph- coefficient of discharge Vs discharge. • Calibration of the orifice. • Comments on graph	5	Applying
M1.03	• Demonstrate various notch apparatus- Rectangular and Triangular notch. • Find the coefficient of discharge of Notch. • Construct and interpret the graph- coefficient of discharge Vs discharge. • Calibration of the Notches.	5	Applying
Contents: • Experiment with Bernoulli's theorem Apparatus. • Experiment with Orifice apparatus.			

• Experiment with Notch apparatus			
CO2.	**Organize experiments on Venturi meter and pipe friction apparatus.**		
M2.01	• Demonstrate the Venturi meter. • Develop coefficient of discharge of venturi meter. • Construct and interpret the graph- coefficient of discharge Vs discharge.	5	Applying
M2.02	• Explain the various types of pipe fittings, joints and valves	4	Understanding
M2.03	• Recall the term coefficient of friction in pipes. • Demonstrate the pipe friction apparatus. • Find the coefficient of friction of pipes of different diameters.	5	Applying
	Lab Exam -I	1.5	
Contents: • Experiment with Venturi meter. • Experiment with pipe friction apparatus.			
CO3	**Experiment with centrifugal pump and reciprocating pump.**		
M3.01	• Illustrate the working centrifugal and reciprocating pumps	4	Understanding
M3.02	• Make use of performance test procedure on centrifugal pump • Find various efficiencies of centrifugal pump. • Construct various characteristics curves.	5	Applying
M3.03	• Utilize performance test on reciprocating pump • Solve various efficiencies of reciprocating pumps • Construct various characteristics curves.	5	Applying
Contents: • Experiment with centrifugal pump.			

• Experiment with reciprocating pump.			
CO4	**Experiment with hydraulic circuits and pneumatic circuits.**		
M4.01	• Recall the symbols used in Fluid systems • Illustrate the hydraulic circuit • Illustrate the pneumatic circuit	3	Understanding
M4.02	• Identify the controlling method of a single acting cylinder of hydraulic system • Identify the controlling method of double acting cylinder of hydraulic system	5	Applying
M4.03	• Identify the controlling method of single acting cylinder of pneumatic system • Identify the controlling method of a double acting cylinder of pneumatic system	6	Applying
	Open Ended Projects**		Applying
	Lab Exam -II	1.5	
Contents: • Experiment with hydraulic system • Experiment with pneumatic system			

**Suggested Open Ended Projects

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 2-3. There is no duplication in experiments between groups.

1. Identification of various fluid power machineries/linkages in special purpose vehicles.
2. Find out pipe friction coefficients of different diameter pipes.

Text / Reference:

T/R	Book Title/Author
R1	KC John- Fluid mechanic laboratory experiments- PHI Learning Pvt. Ltd
R2	T.S Desmukh-Fluid Mechanics and Hydraulic Machines (A Lab Manual)
R3	S.K Likhi- Hydraulics Laboratory Manual- New age International

Online Resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/112/105/112105171/
2	https://fm-nitk.vlabs.ac.in/
3	https://www.newtondesk.com/fluid-mechanics-study-notes-hand-written/