Program :	**Diploma in Automobile Engineering**
Course Code : **3051**	Course Title: **Fundamentals of Fluid Mechanics**
Semester : **3**	Credits: **3**
Course Category: **Program Core**	
Periods per week: **3 (L:2, T:1, P:0)**	Periods per semester: **45**

Course Objectives:

- To identify the properties of fluids and various pressure measurement techniques.
- To understand the principle of fluid flow and its applications and acquire the basic skills to find out the losses in pipe flow.
- To understand the construction and working of pumps and acquire the knowledge to test their performance.
- To know the fundamentals of fluid power systems.

Course Prerequisites:

Topic	Course code	Course Title	Semester
Knowledge of basic science		Mathematics I	1
Knowledge of basic science		Mathematics II	2
Knowledge of basic science		Applied Physics I	1
Knowledge of basic science		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 various fluid properties and pressure measurement techniques.	15	Applying
CO2	Choose the principle of fluid flow, its applications and various losses.	15	Applying
CO3	Select the working, construction and performance of pumps.	14	Applying
CO4	Summarize the working and applications of fluid power systems.	14	Understanding
	Series Test	2	

CO-PO Mapping:

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

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

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Make use of various fluid properties and pressure measurement techniques**		
M1.01	Appreciate the properties of fluids	2	Understanding
M1.02	Solve simple problems related to density, specific weight, specific volume, and specific gravity.	3	Applying
M1.03	Explain pressure head and solve simple problems.	2	Applying
M1.04	Explain Pascal's law, Absolute pressure, Gauge pressure, Atmospheric pressure,Vacuum pressure and solve simple problems.	3	Applying
M1.05	lllustrate the principle of working of piezometer, simple U-tube manometer, differential manometer, inverted differential manometer, bourdon's tube pressure gauge and solve simple problems on those.	5	Applying

Contents:

Introduction to fluid mechanics Properties of fluid: Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility. FluidPressure& Pressure Measurement: Fluid pressure, Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Piezometer, Simple and differential manometers, Bourdon pressure gauge - Concept only.

CO2	**Choose the principle of fluid flow, its applications and various losses.**		
M2.01	Explain the types of fluid flowandrate of discharge.	2	Understanding

	Explain the continuity equation of fluid flow. State and derive Bernoulli's equation. Listout the limitations of Bernoulli's theorem . solve problems using Bernoulli's equation.	3	Applying
M2.02	Explain the continuity equation of fluid flow. State and derive Bernoulli's equation. Listout the limitations of Bernoulli's theorem . solve problems using Bernoulli's equation.	3	Applying
M2.03	Illustrate Venturimeter, Pitot Tube and solve problems.	3	Applying
M2.04	Explain the types of notches and orifices. Discuss the equations for discharge over notches. Mention hydraulic coefficients. Solve simple problems.	3	Applying
M2.05	List the major and minor head losses in pipes.	1	Understanding
M2.06	Derive Darcy's formula and Chezy's formula for loss of head in pipes. Solve Numerical problems to estimate major and minor losses.	3	Applying
	Seriest Test 1	1	

Contents:

Fluid Flow: Types of fluid flows, Path line and Stream line, Continuity equation, Bernoulli's theorem, Principle of operation of Venturimeter, Orifice meter and Pitot tube, Derivations for discharge, coefficient of discharge and numerical problems.Types of Notches and Orifice, Equations for dischargeover a notch. Hydraulic coefficients.

Flow Through Pipes: Laminar and turbulent flows; Darcy's equation and Chezy's equation for frictional losses, Major and Minor losses in pipes, Numerical problems to estimate major and minor losses.

CO3	Select the working, construction and performance of pumps		
M3.01	Explain the use and classification of pumps.	1	Understanding
M3.02	Utilize the working, types and constructional details of centrifugal pumps.	1	Applying
M3.03	Understand priming and cavitation in centrifugal pumps.	2	Understanding
M3.04	Explain the work done, manometric efficiency and overall efficiency of centrifugal pump and solve numerical problems.	2	Applying
M3.05	Explain the working principle, types, construction and applications ofreciprocating pumps.	3	Applying

M3.06	Understand cavitation and slip of reciprocating pumps.	2	Understanding
M3.07	Explain the work done, manometric efficiency and overall efficiency of reciprocating pump and solve numerical problems.	3	Applying

Contents:

Centrifugal Pumps: Principle of working and applications, Types of casings and impellers, Concept of multistage, Priming and its methods, Cavitation, Manometric head, Work done, Manometric efficiency, Overall efficiency. Numerical ProblemsOverall efficiency and power required to drive pumps. Reciprocating Pumps:Construction, working principle and applications of single and double acting reciprocating pumps. Concept of slip, Negative slip, cavitation and separation. Work done, power required, simple problems.

CO4	**Summarize the working and applications of fluid power systems.**		
M4.01	Explain the elements and applications fluid power systems	3	Understanding
M4.02	Understand the basic concepts of hydraulic system, basic elements and its working	4	Understanding
M4.03	Understand the basic concepts of pneumatic system, identify the basic elements and its working.	4	Understanding
M4.04	Compare Hydraulic power system and Pneumatic power system	1	Understanding
M4.05	Outline the principle of hydro - pneumatic system.	2	Understanding
	Series Test -II	1	

Contents:

Fluid power systems - hydraulic and pneumatic systems

Fluid Power Introduction - Applications of fluid power, hydraulic system - Basic elements of hydraulic system, Flow control valves, pressure control valves, direction control valves. Pneumatic System - basic elements of pneumatic system - control valves, air filter, pressure regulator, lubricator, air compressor, accumulator, intensifier, air cylinders - types. Identification of standard hydraulic and pneumatic symbols, Comparison of pneumatic system with hydraulic system. Elements of hydro- pneumatic systems, advantages.

Text /Reference:

T/R	BookTitle/Author
T1	Fluid mechanics and hydraulic machines – Dr. R.K. Bansal.
T$_2$	Hydraulic, Fluid mechanics and Hydraulic machines– R.S.Khurmi
R3	Hydraulics and Fluid mechanics - Dr.P.N.Modi&Dr.S.M.Seth
R4	Hydraulics, Fluid mechanics and fluid machines – S.Ramamurtham
R5	Fluid Mechanics by Yunus A Cengel& John M Clmbala

Online Resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/112/104/112104118/
2	https://nptel.ac.in/content/storage2/courses/101103004/pdf/mod1.pdf
3	https://nptel.ac.in/courses/112105183/