

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (MECHANICAL ENGINEERING)
SEMESTER	3
COURSE TITLE	FLUID MECHANICS AND HYDRAULIC MACHINE
COURSE CODE	09ME2302
COURSE CREDITS	4

Objective:

- 1 This subject introduces in mechanical to understand the fundamental of the fluid mechanics such as behaviour and flow properties of fluid, fundamental equation like mass, energy and momentum conservation of fluid flow thereby developing an understanding of fluid dynamics in variety of fields. The application of these basic equations has been highlighted for flow measurements. There is an important role of hydraulic machinery in the conversation of hydraulic energy to mechanical energy and vice-versa. Hydraulic turbine is used for meeting our day-to-day power demands. Hydraulic system has wide range of applications in machine tools and other field. Similarly pneumatic control is extensively used as an effective method of automation technique.

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

- 1 To provide the students with a solid foundation in fluid flow principles.
- 2 To provide the students' knowledge in calculating performance analysis in turbines and pumps and can be used in power plants.
- 3 To impart knowledge in measuring pressure, discharge and velocity of fluid flow.
- 4 To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head.
- 5 Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design.

Pre-requisite of course:NA

Teaching and Examination Scheme

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

Contents : Unit	Topics	Contact Hours
1	Fundamental of Fluid Classification and Concept of fluid, properties of fluid, Newton's law, simple numerical example, surface tension and capillarity	5

Contents : Unit	Topics	Contact Hours
2	Fluid pressure & Measuring Device fluid pressure at point Pascal's law, Absolute and gauge pressure, measurement of pressure, simple manometer, differential manometer	7
3	Fluid kinematics Description of fluid Motion, types of fluid flow, types of flow lines, Continuity Equation, momentum equation (without derivation), Simple numerical problems	6
4	Fluid Dynamics various types of head, Euler's equation for motion (Concept and definition. Understanding various terms in Euler's equation (No derivation)), Bernoulli's Equation and it's practical application, Venturimeter, Orificemeter, Rotameter	8
5	Fluid flow through pipes Reynolds's experiment, friction factor, Darcy-weisbach formula, Moody's chart, Water hammer effect, minor energy losses, Simple numerical examples	6
6	Hydraulic pumps & prime movers classification and concept of pumps, Detailed study (construction, working and applications) of Centrifugal pump, Reciprocating pump, Rotary positive displacement pumps, Gear pump and Van pump, vacuum pump, Simple numerical to calculate performance of pump, working principal and application pelton wheel, Francis turbine, Kaplan turbine, Concept of hydraulic system	10
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Demonstrate various fluid properties Demonstrate various fluid properties	4
2	Demonstrate and measure the pressure using manometer Demonstrate and measure the pressure using manometer	4
3	Demonstrate and measure the pressure using various Pressure gauges Demonstrate and measure the pressure using various Pressure gauges	2
4	Measure fluid flow using Venturi meter Measure fluid flow using Venturi meter	2
5	Measure fluid flow using Orifice meter Measure fluid flow using Orifice meter	2
6	Verify Bernoulli's theorem Verify Bernoulli's theorem	2
7	Measure fluid flow using Rectangular and Triangular Notches Measure fluid flow using Rectangular and Triangular Notches	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
8	Estimate Reynolds number using given test rig Estimate Reynolds number using given test rig	2
9	To determine Darcy-Weisbach Fluid friction factor for the give pipes To determine Darcy-Weisbach Fluid friction factor for the give pipes	2
10	Determine major and minor head loss through pipes Determine major and minor head loss through pipes	2
11	Perform testing of centrifugal pump as per BIS Perform testing of centrifugal pump as per BIS	2
12	Perform testing of reciprocating pump as per BIS Perform testing of reciprocating pump as per BIS	2
Total Hours		28

Textbook :

- 1 Fluid mechanics & hydraulics, R.P. Rethaliya, Atul Prakashan, 2018

References:

- 1 Fluid mechanics & hydraulic Machines, Fluid mechanics & hydraulic Machines, R.K. Bansal, Lakshmi publication, 1989
- 2 Fluid mechanics & hydraulic Machines, Fluid mechanics & hydraulic Machines, R. S. Khurmi, S.Chand Publication, 2012

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
28.00	35.00	37.00			

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <https://fmc-nitk.vlabs.ac.in/>
- 2 <https://servicios.inii.ucr.ac.cr/hidraulica/build/>