Subject Code and Name	Instruction Hours Per Week			Credits			
5VLRC2: Fluid Mechanics - II	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 hours	3	1	2	3	1	1	5

Course Objectives:

The course is designed

1. To understand about velocity distribution in turbulent flow
2. To understand the various pipe flow problems.
3. To study open channel flow & irregular flows.
4. To understand the components, function, and uses of centrifugal and reciprocating pumps
5. To understand the components, function, and uses of Pelton wheel, Kaplan and Francis turbines.

COURSE CONTENTS

Unit-I

Turbulent flow: Laminar and turbulent boundary layers and laminar sublayer, hydrodynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes.

Pipe flow problems: Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes.

Pipe Network: Water Hammer (only quick closure case). Transmission of power. Hardy Cross Method

Unit-II

Uniform flow in open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow, and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Vegnet equation.

Unit-III

Non uniform flow in open channels: Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit-IV

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Unit-V

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.

Pumps: Centrifugal pumps: Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working, and characteristic curves. Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single-acting and double-acting pump, Manometric head, Acceleration head.

Course Outcome:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	Understand the velocity distribution in turbulent flow	PO-2, PO-3, PO-4
CO2	Analyze various pipe flow problems.	PO-1, PO-2
CO3	Analyze open channel flow & irregular flows	PO-1, PO-2
CO4	Apply knowledge of centrifugal and reciprocating pumps	PO-4
CO5	Apply the knowledge of Pelton wheel, Kaplan and Francis turbines.	PO-4

List of Experiments:

1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine
3. Study the performances charactristics of Kaplan Turbine
4. Caliration of multistage (Two) Pump & Study of characteristic of variable speed pump
5. To study the performance & details of operation of Hyd. Ram
6. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir
7. Study of the characteristics of the Reciprocating pump **Suggested Books & Study Material:**

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New D
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stempanoff A.J. New York
9. Relevant IS codes.

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1		2	3	3								
CO2	3	2										
CO3	2	3										
CO4				3								
CO5				3								