Lok Jagruti Kendra University
University with a Difference

Diploma in Civil Engineering

LJ Polytechnic

Course Code:025050304

Fluid Mechanics

Programme / Branch Name			Diploma in Civil Engineering			
Course Name	Fluid Mechanics				**Course Code**	025050304
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ No prerequisites

3. Rationale

Fluid Mechanics is a science subject and helps in solving problems in the fieldof Aeronautical, Civil, Electronics, Electrical, Mechanical, Metallurgical Engineering. In civil engineering, civil, environmental and transportation engineers must understand the behaviour of fluidflow in different conditions in pipes, channels, canals, notches, weirs etc.The subject deals with basic concepts and principles in hydrostatics, hydrokinematics andhydrodynamics and their application in solving fluid flow problems. The basic knowledge about fluid mechanics will be useful in subjects like Irrigation, Water Resources Management and Public Health Engineering.Proficiencies developed by this course would therefore be useful for diploma holderswhile performing jobs in the field of Water Resources / Irrigation / PHE and EnvironmentEngineering.

4. Objectives

- ✓ To understand the fundamental properties of fluids and their applications.
- ✓ Students can measure the pressure and flow of water in different conditions using various measuring devices.
- ✓ Understand and be able to use the energy equations tocompute discharge and loss of head through pipes, open channels, notches andother hydraulic structures.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcomes	% Weightage	Hours
1.	Introduction	1.1.Properties of Fluid 1.1.1. Importance of Fluid Mechanics 1.1.2. Properties of Fluids 1.1.3. Viscosity 1.1.4. Compressibility and Bulk Modulus 1.1.5. Surface Tension and Capillarity 1.1.6. Vapour Pressure 1.1.7. Examples	• Describe Important Termsof Fluid Mechanics. • Classify Different Properties of a Fluid.	15	06
		1.2. Pressure and Its Measurement 1.2.1. Fluid Pressure at a Point 1.2.2. Pascal's Law 1.2.3. Pressure Variation in a Fluid at Rest 1.2.4. Absolute, Gauge, Atmospheric and Vacuum Pressures 1.2.5. Measurement of Pressure 1.2.6. Simple Manometers 1.2.7. Differential Manometers 1.2.8. Examples	• Understand Different Types of Pressure and Methods of Measurements.		
2.	Hydrostatic Forces,Kinematics and Dynamics of Flow	2. 2.1. Hydrostatic Forces on Surface 2.1.1. Introduction 2.1.2. Total Pressure and Center of Pressure 2.1.3. Vertical Plane,Horizontal Plane, and Inclined Plane Surface Sub-merged in Liquid 2.1.4. Examples	• Explain the Relationship Between Pressure and Depth of liquid. • Calculation of Total Pressure and Center of Pressure.	30	11
		2.2. Kinematics of Flow 2.2.1. Introduction 2.2.2. Types of Fluid Flow 2.2.3. Rate of Flow 2.2.4. Continuity Equation 2.2.5. Examples	• Classify Different Types of Flow. • Derive Continuity Equation.		
		2.3. Dynamics of Flow	• Calculate the		

		2.3.1. Introduction 2.3.2. Equations of Motion 2.3.3. Euler's Equation of Motion 2.3.4. Bernoulli's Equation from Euler's Equation 2.3.5. Assumptions 2.3.6. Bernoulli's Equation for Real Fluid 2.3.7. Practical Applications of Bernoulli's Equation 2.3.8. Examples	Pressure and Discharge by Using Bernoulli'sTheorem. • Understand the Applications of Bernoulli's Equation.		
3.	**Flow ThroughOpenings**	3. 3.1. Orifices 3.1.1. Introduction 3.1.2. Classifications of Orifices 3.1.3. Flow Trough an Orifice 3.1.4. Hydraulics Coefficients 3.1.5. Experimental Determination of Hydraulics Coefficients 3.1.6. Flow-Through Large Orifices 3.1.7. Discharge Through Orifices- Fully and Partially SubmergedOrifice 3.1.8. Examples	• Understand Types of Orifices • Relation Between Various Types of Hydraulics Coefficient. • Calculate Discharge from Orifice.	25	12
		3.2. Notches and Weirs 3.2.1. Introduction 3.2.2. Classification of Notches and Weirs 3.2.3. Discharge Over Notch or Weir- Rectangular, Trapezoidal and Triangular 3.2.4. Advantages of Triangular Notch or Weir over Rectangular Notch or Weir 3.2.5. Empirical Formula for Discharge over Rectangular Weir. 3.2.6. Cipolletti Weir	• Classify Different Types of Notches and Weirs. • Calculate Discharge Through Notches and Weirs.		

		3.2.7. Discharge Over Weir Broad Crested, Narrow Crested,Ogee and Sub-merged Weir 3.2.8. Examples			
4.	**FlowThrough Pipes**	4. 4.1. Introduction 4.2. Loss of Energy in Pipes 4.3. Loss of Energy Due to Friction 4.4. Minor Energy Losses 4.5. Hydraulics Gradient and Total Energy Line 4.6. Flow Through Pipe in Series or Compound Pipes 4.7. Equivalent Pipes 4.8. Examples	• UnderstandLosses of Energy in Pipes. • Draw Hydraulics Gradient Line (HGL) and Total Energy Line (TEL). • Understand the Concepts of Flow in Compound and Equivalent Pipes.	15	06
5.	**Flow Through Channels**	5.1. Introduction 5.2. Classification of Flow in Channels 5.3. Discharge Through Open Channel by Chezy's Formula 5.4. Empirical Formula for the Value of Chezy's Constant 5.5. Most Economical Section of Rectangular and Trapezoidal Channels 5.6. SpecificEnergy and Specific Energy Curve-Critical Depth(h_c) and Critical Velocity (V_c) 5.7. Hydraulics Jump 5.8. Examples	• Classify Different Types of Open Channels Flow. • Calculate Discharge Through Open Channels by Using Chezy's and Manning's Formula.	15	07
				Total Hours	**42**

6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/program outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	To determine the pressure of water in a pipe by using manometers.	Laboratory Test toDetermine the Water Pressure in Pipe.	4
2.	To determine the Reynolds Number.	Laboratory Test to Classify the Type of Flow.	2
3.	To verify Bernoulli's theorem.	Laboratory Test to Understand the Concepts of Pressure Head, Velocity Head and Datum Head.	4
4.	To measure the discharge through a venturimeter.	Laboratory Test to Determine theDischarge through Venturimeter.	4
5.	To determine the coefficient of discharge, contraction and velocity of an orifice.	Laboratory Test toDetermineHydraulic Coefficients.	6
6.	To determine the coefficient of discharge of V- Notch.	Laboratory Test to Determine Discharge using V-Notch.	2
7.	To determine the coefficient of discharge of rectangular Notch.	Laboratory Test to Determine Discharge using Rectangular Notch.	2
8.	To determine the loss of head in the pipes fitting at various water flow rates.	Laboratory Test toDetermine Head Losses in Pipes.	4
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Introduction	30	50	10	00	00	10
2.	Hydrostatic Forces, Kinematics and Dynamics of Flow	10	40	25	00	10	15
3.	Flow Through Openings	05	40	35	00	00	20
4.	Flow Through Pipes	10	60	10	00	00	20
5.	Flow Through Channels	10	50	20	00	00	20

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Fluid Mechanics and Hydraulics Machines by Dr. R.K. Bansal, LaxmiPublications (P) LTD.

9. Reference Books

1) Hydraulics, Fluid Mechanics and Hydraulic Machine by R.S.Khurmi, S.Chand.
2) Fluid Mechanics by A.K.Jain, Khanna Publishers.
3) Fluid Mechanics & Hydraulic Machines by S.C.Gupta, Pearson Education.

10. Open Sources (Website, Video, Movie)

1) www.nptel.ac.in
2) LJP-Civil-Hydraulics (YouTube)