Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-3

Subject : Hydraulics - DETCV13204

Type of course: Major

Prerequisite: NIL

Rationale:

Fluid Mechanics is a fundamental engineering discipline that aids in the resolution of fluid flow issues in civil engineering. The course covers fundamental ideas and principles in hydrostatics, hydro kinematics, and hydrodynamics, as well as their application to fluid mechanics issues.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weightage
1.	**Fluids And Their Properties** Introduction, Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Shear stress in a moving fluid, Classification of fluids, Hypothesis of continuum, Control volume concept. **Fluid Pressure & Center of Pressure:** Pressure, Pascal's law of pressure at a point, Equality of pressure at the same level in a static fluid, Pressure density height relationship & Measurement, General equation for the variation of pressure due to gravity from a point to point in a static fluid, Hydrostatic paradox, pressure measuring equipments, Hydrostatic Forces on Surface, moment of inertia of geometric shapes.	10	15
2.	**Fundamental of Fluid Flow** Introduction, Fluid flow, Types of flow, analyzing fluid flow, Motion of a fluid particle, path lines and streak lines, Stream lines, Stream Tube, Continuity of flow, Continuity Equation in	10	20

	1-D, Velocity potential and potential flow, Streamlines and the Stream functions, Concept and Application of Flow Net.		
3.	**The Energy Equation and its application** Introduction, Energy of a liquid in motion, H.G.L. and T.G.L., Forces acting on fluid in motion, hydraulic coefficient, Determine the hydraulic coefficient in the laboratory, Euler's equation of motion along a stream line, Mechanical energy of a flowing fluid, Derivation of Bernoulli's Equation from Newton's 2nd Law, Application of Bernoulli's Equation, Measurement devices of discharge, Measurement devices of velocity. **Discharge Measurement Devices** Introduction, Difference between orifice and mouthpieces, Classification of orifices, Classification of mouthpieces, Difference between notch and weir, Classification of notch, Classification of weir	20	35
4.	**Flow Through Pipes** Introduction, Laminar Flow and Turbulent Flow, Types of fluid equations, Energy of a liquid in motion, H.G.L. and T.G.L., Reynolds experiment, Classification of Flows based on Reynolds Number, Equation for head loss in pipes due to major losses, Equation for head loss in pipes due to minor losses, pipes in series, pipes in parallel, Water hammer in pipes, syphon, power transmission through pipe.	10	15
5.	**Open Channel Flow** Flow In Open Channels: Introduction, Difference between pipe flow and channel flow, Types of flow in channels, Basic concept of open channel flow, Geometrical properties of channel Section, Velocity distribution in a channel section. **Uniform Flow in Open Channels:** Steady uniform flow, specific energy diagram, Velocity distribution, and most economical channel section. **Non-Uniform Flow in Open Channels:** Introduction, Hydraulic jump, Location of hydraulic jump, type of Hydraulic jump, Difference between Pumps and turbine, type of pumps, type of turbines.	10	15
	Total	**60**	**100**

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Identification of the various types of fluid based on fluid properties:** Students will go to one of the public market places and study about different types of fluids based on their characteristics (density, viscosity, vapour pressure, etc.). The faculty will educate the students to determine which sort of fluid exists in the actual world using data acquired during	10

	visits to public market places, and each student will submit a brief report. The student will upload the report to the GMIU web portal.	
2.	**Create model for the most economical and Eco-Friendly Channel Section Design:** The faculty will guide and motivate students to work in groups (of at least five) to construct models based on Various Shapes of Open Channels design principles and research findings. Open channel design can help you find the most economical and ecological channel section design. Create a short video to upload to the GMIU online portal.	10
3.	**Virtual lab practical** Student will learn the laboratory practical of Reynold's number on virtual lab. Student will take the reading and prepare experimental report and will upload it on GMIU Web Portal.	10
Total		**30**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understanding fluid properties and behaviour, including viscosity and classification
CO2	Understand fluid pressure, Pascal's law, and hydrostatic forces on surfaces.
CO3	Learn to analyze fluid flow types, continuity, and flow net concepts.
CO4	Apply energy equations to assess mechanical energy and discharge measurements.
CO5	Gain knowledge of discharge measurement devices, pipe flow types, and head losses.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1.	Determination of Viscosity	01	02
2.	Study of Pressure Measuring Devices	01	02
3.	Determination of hydrostatic force and its location on a vertically immersed surface	01	04
4.	Verification of Bernoulli's theorem	03	02
5.	To measure the velocity of flow using orifice meter and venturi meter. OR Determination of C_d of Venturi meter and orifice meter	03	04
6.	To determine the coefficient of discharge through open	03	04

	channel flow over a notch. OR Determination of C_d of Notch		
7.	To determine the different types of flow patterns by Reynolds' experiment.	05	02
8.	To determine the friction factor for the different pipes.	05	04
9.	Uniform flow in open channel	06	04
10.	Mini Project	-	02
		Total	**30**

Instructional Method:

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.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Book:

[1] Engineering Fluid Mechanics, Garde R. J. and Mirajgaonkar, Scitech Pulication
[2] Fluid Mechanics, R.K. Rajput, S Chand Publications
[3] Fluid Mechanics, Modi P.N. and Seth S.M, Standard Book House
[4] Fluid Mechanics, Streeter, V.L., Wylie E. B. and Bedford, K.W, McGraw Hill Book Company.
[5] Fluid Mechanics and Machinery, C.P. Konthadraman, New Age Publications
[6] Hydraulics and Fluid Mechanics and Fluid Machines, Ramamurtham, Dhanpat Rai Publishing Company