GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma Engineering				Branch	Civil Engineering		
Semester	III				Version	1.0.0.0		
Effective from Academic Year		2019-20			Effective for the batch Admitted in			June 2019
Subject code	1CI2303		Subject Name		Hydraulics			
Teaching scheme					Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

- The students should know the basic fundamental and terminology used in physics.
- The students should also know the fundamentals of mathematics i.e. trigonometry, integration, derivation Etc.

Course Learning Outcomes:

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

CO1. To understand the behaviour of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc.

CO2. To apply their basic knowledge to understand the core concept of hydraulics.

CO3. To develop the understanding and visualize the simple concept in large manner.

CO4. To implement the theoretical and practical knowledge in the field of water resources / irrigation / PHE and environment engineering.

CO5. To Verify the theoretical knowledge to practical problems and make them able to work in the area of research and development.

The practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

Course Content

Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 INTRODUCTION	1.1 Technical terms used in Hydraulics – Fluid Mechanics, Hydrostatics, Hydro-kinematics, Hydro-Dynamics-Ideal and Real Fluid. 1.2 Properties of liquid – Viscosity Density-Specific-Gravity-Surface Tension-Capillarity -Vapour Pressure-Elasticity.	1a. State the terms associated with Hydraulics 1b. Describe different properties of liquid	04	03
UNIT – 2 LIQUID PRESSURE AND ITS MEASUREMENT	2.1 Various types of pressure – Atmospheric Pressure-Gauge Pressure-Absolute Pressure Vacuum Pressure-Separation Pressure/s	2a. Describe different types of pressure and methods of measurement	06	05

	2.2 Measurement of pressure/s by different methods 2.3 Measurement of difference of pressure using "U" tube Manometer and inverted "U" tube Manometer			
UNIT – 3 HYDROSTATICS	3.1 Relationship between pressure and depth of liquid 3.1.1 Pressure diagram for different conditions 3.2 Total pressure and center of pressure 3.2.1 Computation of Total Pressure and depth of centre of pressure	3a. State the Relationship between pressure and depth of liquid 3b.Compute total Pressure and Centre of pressure	06	05
UNIT – 4 HYDRO KINEMATICS	4.1 Types of flow - Laminar – Turbulent --Uniform -Non-uniform –Steady-Un-steady – Rotational and irrotational – One, Two and Three Dimensional flow 4.2 Reynold's number 4.3 Continuity Equation	4a. State different types of flow 4b. Derive Continuity Equation	07	04
UNIT – 5 HYDRO DYNAMICS	5.1 Types of Energy – Potential, Pressure and kinematics 5.2 Bernoulli's Equation and its applications. 5.3 Momentum Equation	5a. Explain different kinds of energy 5b. Apply Bernoulli's theorem to measure the pressure and Discharge.	07	05
UNIT – 6 HYDRAULIC COEFFICIENTS	6.1 Definition and types of orifice 6.2 Various Hydraulic Coefficients and its relation - Coefficient of Contraction, Velocity, Discharge.	6a. Compute different Hydraulic Coefficient for different types of orifice.	07	04
UNIT – 7 NOTCHES AND WEIRS	7.1 Types of notches and weirs 7.2 Computation of discharge through notches 7.2.1 Rectangular Notch 7.2.2 V -Notch. 7.3 Computation of discharge through weirs 7.3.1 Discharge through narrow crested and broad Crested weir. 7.3.2 Discharge through Cipolletti weir.	7a. Identify types of Notches and weirs. 7b. Calculate discharge through notches and weirs.	06	06
UNIT – 8 FLOW THROUGH PIPES	8.1 Characteristics of flow through pipes 8.2 Major and Minor Energy (Head) losses in pipe Flow-frictional loss, loss of head at entry , exit, Sudden enlargement and contraction and at bend. 8.2.1 Computation of major head by	8a. Explain Energy (Head) losses 8b. Draw Hydraulic Gradient Line (HGL) and Total Energy Line(TEL) 8c. Design Pipeline network using Formula and nomogram	09	06

	Darcy Weisbach Equation. 8.3 Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) 8.4 Design of Pipeline-using formula & Nomo gram			
UNIT – 9 FLOW THROUGH OPEN CHANNEL	9.1 Characteristics of open channel flow 9.1.1 Comparison of pipe flow and channel flow. 9.1.2 Field examples of open channel 9.2 Analyse uniform flow 9.2.1 Froud's number, 9.2.2 Hydraulic mean depth-concept & computation 9.2.3 Use of Chezy's and Manning's Formula. 9.2.4 Most economical sections of channel 9.2.4.1 Rectangular, Trapezoidal and circular shapes. 9.3 Specific Energy Diagram 9.4 River Gauging 9.4.1 Measurement of mean velocity using surface float, velocity rod and current meter.	9a. Analyse uniform flow 9b. Understand Specific Energy Diagram 9c. Describe Procedure for Measuring Velocity of flow 9d. Calculate discharge.	08	07
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	I	Introduction to Hydraulics and study of fluid properties
2	II	Measure the pressure of water in pipe using (a) Piezometer (b) Different types of manometers.
3	IV	Determine discharge through a given venturimeter
4	IV	Demonstrate use of Reynold's number
5	V	Demonstrate functioning of Bernouli's apparatus
6	VI	Determine coefficient such as Cc, Cv and Cd for different types of orifices
7	VII	Compute coefficient of discharge for V notch and preparation of calibration graph for interpolation and extrapolation
8	VIII	Determine loss of head in various diameter of pipes and effect of material of pipe on loss of head

List of Instruments/Equipment/TrainerBoard	
1	U tube Manometer
2	Venturimeter
3	Orificemeter
4	Rectangular / V-notch
5	Reynold's Number
6	Friction losses in pipe
7	Bernoulli's Apparatus

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Hydraulics, Fluid Mechanics and Hydraulic machine	R K Bansal	S.Chand
2	Fluid Mechanics	A K Jain	Khanna Publishers
3	Hydraulics, Fluid Mechanics and Hydraulic machine	S.Ramamrutham	Dhanpat Rai
4	Hydraulics, Fluid Mechanics and Hydraulic machine	R. S. Khurmi	S.Chand

Link of Learning Web Resource	
1	https://nptel.ac.in/books_on_nptel.php
2	https://www.tudelft.nl/en/ceg/about-the-faculty/departments/hydraulic-engineering/
3	https://www.shiksha.com/

PO & CO Mapping							
Sr.No.	**Name of PO**	**Description**	Co1	Co2	Co3	Co4	Co5
1	PO 1	Acquire fundamental knowledge of mathematics, science, and civil engineering.	None	Moderate	Slight	None	None
2	PO 2	Design and conduct experiments, as well as analyze and interpret data.	Moderate	Moderate	Moderate	Moderate	Slight
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Slight	Moderate	Slight	Moderate	Slight
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	Slight	None	Slight	Slight	Substantial
5	PO 5	Clear understanding of his duties and responsibilities as a civil engineer.	Moderate	Moderate	Moderate	Slight	Slight
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Slight	Moderate	Slight	Slight	Moderate
7	PO 7	Engage in life-long learning in civil engineering field and comprehend issues related to environment and sustainable development.	None	None	None	Moderate	Moderate
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	None	Slight	None	None	Slight
9	PO 9	Incorporate economics and business practice including project and risk management.	None	None	Slight	None	Slight
10	PO 10	Graduated are able to share their knowledge to the industries as well as society.	Slight	None	Slight	Moderate	Moderate
11	PO 11	Graduated will be able to apply their skill and knowledge for the sustainable development of nation.	Slight	None	None	Moderate	Moderate
12	PO 12	Graduated are able to learn to work with the team and also with the inter discipliners.	None	Slight	Slight	Slight	Slight