Course File

Hydraulics Engineering (4CE4-06)

Semester: IV Year: II (2023-24)

Name of faculty: Dr. Kuldeep Swarnkar

Email ID: kuldeep.swarnkar@technonjr.org

Total Number of Lectures: 42

INDEX - COURSE FILE

VISSION & MISSION OF INSTITUTE

Vision

Empowering student with recent and emerging technologies to create innovative technical leaders capable of contributing to industrial and societal needs for betterment of mankind across the globe.

Mission

M1: To provide dynamic learning environment to students by providing constant exposure to latest technologies by linking closely with the industries.

M2: To establish effective interface with industry to obtain live problems to enhance critical thinking and problem solving skills among students and consultancy projects for faculty.

M3: To provide avenues and opportunities to faculty for domain specific trainings and qualification upgradation.

M4: To develop ethical leaders with strong communication skills.

VISION & MISSION OF DEPARTMENT

Department Vision

To increase students learning of fundamentals for designing and planning of buildings and latest technologies through industry-aligned project-based learning which will help in transforming students to be good civil engineering professionals leading to innovation and incubation of new ideas.

Department Mission

M1: To create experimental learning through solving problems of Government, Society, Smart Cities, Industry and other entities.

M2: To teach the latest technologies to the students as beyond the syllabus activity so that they are updated and industry ready.

M3: To enable engineering students understand industry-aligned technologies and learn to find solutions from their early engineering days and this is the only way to produce globally relevant engineers solving real-life problems applying current technologies.

M4: To enable students to generate projects through problem faced by and requirement of Smart cities, industry, Government and other entities whereby those outlined problem statements are to be studied deeply by a group of faculty members to convert them into real-time project format.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs 1: To provide an in-depth understanding of the fundamentals of Civil Engineering and create a foundation for lifelong learning to facilitate a progressive career in the construction Industry, as an entrepreneur and in pursuit of higher studies.

PEOs 2: To equip the students with technical and analytical skills to develop innovative solutions to complex real-life problems using existing and novel technologies. To equip the students with good communication and interpersonal skills, inter-disciplinary teamwork and leadership skills to enable them to fulfill professional responsibilities.

PEOs 3: To expose them to various contemporary issues which will enable them to become ethical and responsible towards themselves, co-workers, Society and the Nation.

PEOs 4: To make the student's industry ready by imparting education related to the latest technologies so that they can grab future industry jobs.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: To be aware of and initiate some-work on future technologies and new developments which may impact the future Industry 4.0.

PSO2: Hands on training on upcoming technologies and project-based learning.

PSO3: Get exposure to BIM (Building Information Modeling).

PROGRAMME OUTCOMES (POs)

A student will develop:

PO01. ENGINEERING KNOWLEDGE: An ability to apply knowledge of Mathematics, Science and Engineering Fundamentals in Electronics and Communication Engineering.

PO02. PROBLEM ANALYSIS: Ability to analyze and interpret data by designing and conducting experiments. Develop the knowledge of developing algorithms, designing, implementation and testing applications in electronics and communication related areas.

PO03. DESIGN/ DEVELOPMENT OF SOLUTION: An ability to Design a system Component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PO04. CONDUCTION OF INVESTIGATION OF COMPLEX PROBLEMS: Ability to Identify, formulate and solve engineering problems.

PO05. MODERN TOOL USAGE: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

PO06. THE ENGINEERING AND SOCIETY: Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

PO07. ENVIRONMENT & SUSTAINABILITY: Understand the impact of professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.

PO08. ETHICS: An ability to understand the professional, social and ethical responsibility.

PO09. INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. COMMUNICATION: An ability to Communicate effectively in order to succeed in their profession such as, being able to write effective reports and design documentation, make effective presentations.

PO11. PROJECT MANAGEMENT & FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in team, to manage projects and in multidisciplinary environment.

PO12. LIFE-LONG LEARNING: Recognize the need and an ability to engage in life-long learning.

Course Overview:

Hydraulic engineering, as a sub-discipline of civil engineering, is concerned with the flow and conveyance of fluids. This course consists of the topic like viscous fluid flow, laminar and turbulent flow, boundary layer analysis, dimensional analysis, open channel flows, flow through pipes, and computational fluid dynamics. The objective of this course is to introduce various hydraulic engineering problems like open channel flows and hydraulic machines.

Hydraulic engineering is a sub-discipline of Civil Engineering. It deals with the flow of fluid, typically water and sewage conduits and uses the force of gravity for the movement of the same. It is used extensively in the construction of dams, bridges, canal, sewers etc. Hydraulic engineering uses fluid mechanics as its foundation, to deal with problems of collection, storage, segregation, measurement, transport, control and use of water.

Course Outcome:

CO. NO.	Cognitive Level	Course Outcome
1	Comprehension	Students will be able to analyze the process of deriving equation by using dimensional methods.
2	Analysis	Students will analyze the problems related to flow of fluids in channel.
3	Synthesis	Students will be able to explain and remember the different types of turbines & pumps used.
4	Synthesis	Student will be able to create economic sections for fluid channels.
5	Synthesis	Students will be able to remember the concepts of Hydrology.

Prerequisites:

- Student must have knowledge of basics of Fluid Mechanics.
- Students with basic knowledge of mathematical geometry can understand the topics clearly.
- Students with understanding of basic physics principle can grasp the topics of this course.
- Students with basic calculation methodologies can perform surveying calculations.

Mapping COs, POs and PSOs:

Course Outcome	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO24406.1	3	2	2	2	0	0	1	0	0	0	0	0	1	2	1
CO24406.2	3	2	3	1	0	0	1	0	0	0	0	0	1	2	1
CO24406.3	3	2	3	2	0	0	1	0	0	0	0	0	1	2	1
CO24406.4	3	3	3	3	0	0	1	0	0	0	0	0	2	2	1
CO24406.5	3	3	2	3	0	0	2	0	0	0	0	0	1	2	1

UNIVERSITY ACADEMIC CALENDAR

Academic Calendar for Even Semester for Session

Course : Bachelor of Technology (B.Tech) for Even Semester				
Semester	II	IV	VI	VIII
Commencement of Classes	03-02-2025	02-01-2025	02-01-2025	02-01-2025
First Mid Term	24-03-2025	17-02-2025	17-02-2025	17-02-2025
Second Mid Term	28-04-2025	24-03-2025	24-03-2025	24-02-2025
Last Working Day	10-05-2025	19-04-2025	19-04-2025	19-04-2025
Commencement of Practical Exams	12-05-2025	21-04-2025	21-04-2025	21-04-2025
Commencement of Theory Exams	26-05-2025	06-05-2025	05-05-2025	06-05-2025
Project (VIII)	15-05-2025 to 24-05-2025			
Practical Training (After II Sem.)	16-06-2025 to 30-06-2025			
Practical Training (After IV Sem.)	19-05-2025 to 02-07-2025			
Practical Training (After VI Sem.)	19-05-2025 to 02-07-2025			

ACADEMIC CALENDAR OF INSTITUTE

Academic Calendar for even Semester for Session 2023-24 (Even Semester)

Course: Bachelor of Technology (B.TECH.)				
Semester	**II**	**IV**	**VI**	**VIII**
Commencement of Classes	26-02-2024	15-02-2024	15-02-2024	2-01-2024
Commencement of First Mid Term	20-04-2024	25-03-2024	25-03-2024	15-02-2024
Commencement of Second Mid Term	05-06-2024	24-05-2024	24-05-2024	21-03-2024
Last Working Day	15-06-2024	31-5-2024	31-5-2024	20-04-2024
Commencement of Practical Exams	01-07-2024	04-6-2024	03-6-2024	22-04-2024
Commencement of Theory Exams	19-6-2024	15-6-2024	14-6-2024	02-05-2024
Project (VIII)	06.05.2024 to 15.05.2024			
Practical Training (After II Sem.)	15.07.2024 To 31.07.2024			
Practical Training (After IV Sem.)	01.07.2024 To 17.08.2024			
Practical Training (After VI Sem.)	01.07.2024 To 17.08.2024			

Evaluation Scheme

FACULTY DETAILS:

Name of the Faculty : Dr. Kuldeep Swarnkar

Designation : Assistant Professor

Department : Civil Engineering

1. TARGET

a) Percentage Pass : 100 %
b) Percentage I class: 70 %

2. METHOD OF EVALUATION

2.1. Continuous Assessment Examinations (Mid-Term 1 & 2)

2.2. Assignments / Seminars

2.3. Mini Projects

2.4. Quiz

2.5. Semester Examination
Others_____

3. List out any new topic(s) or any innovation you would like to introduce in teaching the subject in this Semester.
1. Take the help of creative tools to stimulate creativity. Include slide presentations, demonstration or forms of visual exercises that will excite the young minds and capture their interest.

Signature of Faculty: **Signature of HOD**

UNIVERSITY SYLLABUS

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE4-06: HYDRAULICS ENGINEERING

Credit: 3 **Max. Marks: 100 (IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to scope, objective and outcome of subject	1
2	**Dimensional Analysis & Models:** Dynamical Similarity and Dimensional Homogeneity Model experiment, geometric, Kinematic and Dynamic similarity. Reynold's, froudes, Weber's, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect. Principle of dimensional analysis Rayleigh method, Buckingham theorem.	4
3	**Turbulent flow**, Reynolds equations, Prandtl's mixing length theory, Equations of velocity distribution and friction coefficient **Boundary Layer Theory**: Concept of boundary layer, laminar and turbulent boundary layers, boundary layer thickness, von Karman integral equation, laminar sub-layer, hydro-dynamically smooth and rough boundaries, separation of flow and its control, cavitation.	6
4	**Open channel Flow** Uniform, Non-Uniform and variable flow. Resistance equations of Chezy and Manning. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections. Velocity distribution in open channels.	5
5	**Gradually varied flow** in Prismatic channels. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation	4
6	**Rapidly varied flow**: Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. velocity distribution in open channels. Energy correction factor. Moment correction factor	4
7	**Impact of free Jets:** Impact of a jet on a flat or a curved vane, moving and stationary vane. **Introduction of Hydraulic machine –** Type of pumps and turbine and its brief description. Draft tube and its principle	3

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8	**Hydrology:** Definition, Hydrologic cycle, Application to Engineering problems, measurement ofrainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Floodhydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination,Estimation of run off.	8
9	**Ground Water**: Aquifers and its types, Confined and unconfined aquifer, Darcy's Law, hydraulic conductivity, transmissivity, well hydraulics.	3
10	**Canal Hydraulics:** Types of canals, parts of canal irrigation system, channel alignment,assessment of water requirements, estimation of channel losses, design of channels, regime andsemi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, siltcontrol in canals.	4
	TOTAL	42

WEEKLY TIME TABLE OF THE TEACHER

First Time Table: with effect from (Date): Effective from 15 Feb. 2024

Day	1	2	3	4	5	6	7
Monday	HE						
Tuesday	HE						
Wednesday	HE						
Thursday	HE						
Friday	HE						
Saturday							

COURSE-PLAN

Lect. No.	Unit	Topics	Teaching methods
1.	1	Introduction: objective, scope and outcome of the course.	White board, ppt,
2.	2	Dimensional analysis & models: dynamical similarity and dimensional homogeneity model experiment. Geometric, kinematic and dynamic similarity.	White board, ppt, demonstration
3.	2	Reynold's, froude's, weber's, euler and mach numbers. Distorted river models and	White board
4.	2	Scale effect. Principle of dimensional analysis rayleigh method.	White board
5.	2	Buckingham theorem	White board
6.	3	Turbulent flow: reynolds equations, prandtl's mixing length theory	White board, ppt
7.	3	Equations of velocity distribution and friction coefficient.	White board
8.	3	Boundary layer theory: concept of boundary layer, laminar and	White board
9.	3	Boundary layer thickness, von karman integral equation, laminar sub-layer.	White board, ppt
10.	3	Hydro-dynamically smooth and rough boundaries	White board
11.	3	Separation of flow and its control, cavitation.	White board
12.	4	Open channel flow: uniform, non-uniform and variable flow, resistance	White board, ppt,
13.	4	Section factor for uniform flow. Most efficient rectangular section	White board
14.	4	Most efficient trapezoidal section and its numerical.	White board, ppt, demonstration
15.	4	Most efficient triangular section and its numerical.	White board
16.	4	Velocity distribution in open channels.	White board
17.	5	Gradually varied flow: specific energy of flow. Critical depth in prismatic	White board
18.	5	Numerical based on specific energy of flow	White board

19.	5	Rapid, critical and sub critical flow mild, steep and critical slopes.	White board, ppt
20.	5	Classification of surface curves in prismatic channels and elementary computation	White board
21.	6	Rapidly varied flow: hydraulic jump or standing wave in rectangular Channels.	White board, ppt
22.	6	Conjugate or sequent depths, losses in jump, location of jump.	White board
23.	6	Numerical based on above topics. Velocity distribution in open channels.	White board, ppt,
24.	6	Energy correction factor. Moment correction factor	White board
25.	7	Impact of free jets: impact of a jet on a flat or a curved vane, moving and	White board, demonstration
26.	7	Introduction of hydraulic machine: type of pumps and its brief description.	White board
27.	7	Type of turbine and its brief description. Draft tube and its principle	White board
28.	8	Hydrology: definition, hydrologic cycle, application to engineering problems	White board, ppt
29.	8	Measurement of rainfall, rain gauge.	White board
30.	8	Peak flow, flood frequency method.	White board, ppt
31.	8	Catchment area formulae, flood hydrograph.	White board
32.	8	Rainfall analysis, infiltration, run off.	White board, ppt,
33.	8	Numerical based on above topics.	White board
34.	8	Unit hydrograph and its determination	White board, demonstration
35.	8	Estimation of run off.	White board
36.	9	Ground water: aquifers and its types, confined and unconfined aquifer	White board, ppt
37.	9	Darcy's law, hydraulic conductivity	White board
38.	9	Transmissivity, well hydraulics and numerical.	White board, ppt

39.	10	Canal hydraulics: types of canals, parts of canal irrigation system, Channel	White board
40.	10	Assessment of water requirements. Estimation of channel losses and numerical.	White board, ppt,
41.	10	Design of channels, regime and semi theoretical approaches (kennedy's theory)	White board
42.	10	Design of channels, regime and semi theoretical approaches (lacey's theory), cross	White board, demonstration

TEXT/REFERENCE BOOKS:

1. Fluid Mechanics & Hydraulics by Dr. K.R, Arora, Standard Publishers & Distributers, Delhi.
2. Fluid Mechanics & Hydraulics by Dr. R.K. Bansal, Laxmi Publications (P) Ltd.
3. Fluid Mechanics & Hydraulics by Modi & Seth, Standard Publishers & Distributers, Delhi.
4. Fluid Mechanics & Machinery by C.S.P.Ojha, R.Berndtsson and P.N. Chandramauli, Oxford Publishers, Delhi.

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Assignment Sheet

ASSIGNMENT NO. 1

Q1. Explain Buckingham Pi theorem with example.
Q2. What do you understand by Dimensional Homogeneity? Explain with example. Q3. State what Dimensionless number are and explain each of them.

ASSIGNMENT NO. 2

Q1. Explain what the types of similarities considered in Model analysis are?

Q2. Derive the formulae for loss of head due to friction in pipes.

Q3. Write about Shear Stress in turbulent flow.

SAMPLE QUIZ QUESTIONS

1. A pitot tube is used to measure
   - pressure
   - difference in pressure
   - velocity of flow
   - None of these.

2. The thickness of a sharp crested weir is kept less than
   - one-third of the height of water on the sill
   - one-half of the height of water on the sill
   - one-fourth of the height of water on the sill
   - two-third of the height of water on the sill
   - None of these.

3. The property of steam function ψ is:
   - ψ is constant everywhere on any stream line
   - the flow around any path in the fluid is zero for continuous flow
   - the rate of change of ψ with distance in an arbitrary direction, is proportional to the component of velocity normal to that direction
   - the velocity vector may be found by differentiating the stream function
   - All the above.

4. The maximum vacuum created at the summit of a syphon is
   - 1 m of water
   - 7.4 m of water
   - 5.5 m of water
   - None.

5. If the atmospheric pressure on the surface of an oil tank (sp. gr. 0.8) is 0.1 kg/cm2, the pressure at a depth of 2.5 m, is
   - 1 metre of water
   - 2 metres of water
   - 3 metres of water
   - 3.5 metres of water
   - 4.0 metres of water.

6. The total pressure force on a plane area is equal to the area multiplied by the intensity of pressure at its centroid, if
   - area is horizontal
   - area is vertical

- area is inclined
- All the above.

7. If the volume of a liquid weighing 3000 kg is 4 cubic metres, 0.75 is its
   - specific weight
   - specific mass
   - specific gravity
   - None of these.

8. Bernoulli's equation assumes that
   - fluid is non-viscous
   - fluid is homogeneous
   - flow is steady
   - flow is along the stream line
   - All the above.

10. A syphon is used
   - to connect water reservoirs at different levels intervened by a hill
   - to supply water to a town from higher level to lower level
   - to fill up a tank with water at higher level from a lower level
   - None of these.

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TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

B. TECH 2nd – YEAR (IV SEM.) – MT-I

Hydraulics Engineering (4CE4-06)

Time: 2 Hours **Max. Marks:** 70

Note:

1) The paper is divided into 2 parts: Part-A and Part-B.
2) Part-A contains 10 questions and carries 2 marks each.
3) Part-B contains 5 questions. Each question has two options and carries 10 marks each.

Part- A (20 Marks)

A.	Define a model and a prototype.	CO1
B.	What is the principle of dimensional homogeneity?	CO1
C.	Explain Euler's number with its formula?	CO1
D.	Explain Reynold's number with its formula?	CO1
E.	Write down types of precipitation.	CO2
F.	Define infiltration.	CO2
G.	Explain hyetograph?	CO2
H.	Define Aquifer.	CO3
I.	Explain unit hydrograph.	CO3
J.	Define rain gauge and list down types of rain gauges.	CO3

Part- B (50 Marks)

1. Define similitude and explain its types.	CO1
OR	
1. Explain Buckingham's π-theorem and selection of repeating variables.	CO1

2. What do you mean by dimensional analysis? Explain methods of dimensional analysis.	CO1
OR	
2. The time period (t) of a pendulum depends upon the length (L) of the pendulum and acceleration due to gravity (g). Derive an expression for the time period using Rayleigh's method.	CO1

3. Explain method for estimation of missing rainfall data.	CO2
OR	
3. Explain Thiessen Polygon Method.	CO2

4. Explain w-index and ϕ-index.	CO2
OR	
4. Explain confined and unconfined aquifer with diagram.	CO2

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5. The annual rainfall at station X and the average of annual rainfalls at 10 surrounding base stations in cm are given below for a period of 16 years, starting from 1970.	CO3

Year	Rainfall at X (cm)	10 station average (cm)
1970	95	75
1971	75	55
1972	90	70
1973	85	65
1974	95	75
1975	90	70
1976	100	70
1977	90	70
1978	75	75
1979	65	65
1980	70	90
1981	87	86
1982	67	68
1983	62	67
1984	55	62
1985	69	77

(i) Check whether the data at station X is consistent.
(ii) In which year a change in regime is indicated?
(iii) Compute the adjusted annual rainfalls at X for the affected period.

OR

5. Explain factors affecting runoff.	CO3

Marks and Gap Analysis of Mid-Term 1

S.No.	University Roll No.	Name of Student	Mid-Term 1 MM-70	Remark (Remedial Class need or not – Y/N)
1.	22ETCCE001	ANKIT KUMAR	51	N
2.	22ETCCE002	ARMAAN CHAUHAN	42	N
3.	22ETCCE003	AYUSH SINGH JHALA	44	N
4.	22ETCCE004	PARIDHI NINAMA	65	N
5.	22ETCCE005	PRAVEEN DANGI	40	N
6.	22ETCCE006	ROSHNI TABIYAR	63	N

*(Y, if obtained marks are <50%)

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Remedial Action Taken to Remove the Gaps (After Mid- Term 1)

S.no.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Outcome Achieved
1.	NIL				
2.					

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TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

B. TECH 2nd – YEAR (IV SEM.) – MT-II

Hydraulics Engineering (4CE4-06)

Time: 3 Hours **Max. Marks:** 70

Min. Marks: 25

Note:

1) The paper is divided into 3 parts: Part-A, Part-B and Part-C.
2) Part-A contains 10 questions and carries 2 mark each.
3) Part-B contains 7 questions and carries 4 marks each. Attempt any 5 questions.
4) Part-C contains 5 questions and carries 10 marks each. Attempt any 3 questions.

Part- A (20 Marks)

K.	Define cavitation.
L.	What is a rain gauge?
M.	Discuss hydraulic jump.
N.	What are the various losses in the pump?
O.	Explain the draft tube.
P.	What is an aquifer?
Q.	What are silt extruders?
R.	Define unit hydrograph.
S.	Write down different types of rain gauges.
T.	Define the hydrologic cycle.

Part- B (20 Marks)

1.	Describe parts of the centrifugal pump.
2.	What do you mean by run-off? Explain factors affecting run-off.
3.	Find the slope of the free water surface in a rectangular channel of width 20m, having depth of flow 5m. The discharge through the channel is 50 cumec. The bed of the channel has a slope of 1 in 4000. Take the value of Chezy's constant c = 60.
4.	A nozzle of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from jet at 5 m/s. Find: A. The force on the plate, B. The work done, C. The efficiency of jet.
5.	What are various types of similarities?
6.	The resistance force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l, velocity V, air viscosity μ, air density ρ, and bulk modulas of air K. Express the functional relationship between these variables and resisting force by dimensional analysis.

7.	A jet of water of diameter 50 mm strikes a fixed plate in such a way that the angle between plate and jet is 30°. The force in the direction of the jet is 1471.5 Newton. Determine the rate of water.

Part- C (30 Marks)

8.	State Buckingham's π theorem. What do you mean by repeating variables and how are these selected in dimensional analysis.
9.	Explain Lacey's Regime Theory, along with the important terms involved. Also discuss its drawbacks.
10.	Describe hydrological cycle with neat sketch.
11.	Describe various types of rain gauges for the measurement of rainfall with simple sketches.
12.	A 4m wide rectangular channel conveys 20 cumec of water with a velocity of 5 m/s. Check is there a condition for hydraulic jump to occur. If the hydraulic jump takes place in downstream side, find the depth of flow after the jump.

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Marks and Gap Analysis of Mid-Term II

Sr. No.	University Roll No.	Name of Student	Mid-Term 2 MM-70	Remark (Remedial Class need or not – Y/N)
1.	22ETCCE001	ANKIT KUMAR	53	N
2.	22ETCCE002	ARMAAN CHAUHAN	44	N
3.	22ETCCE003	AYUSH SINGH JHALA	41	N
4.	22ETCCE004	PARIDHI NINAMA	60	N
5.	22ETCCE005	PRAVEEN DANGI	45	N
6.	22ETCCE006	ROSHNI TABIYAR	60	N

*(Y, if obtained marks are <50%)

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Remedial Action Taken to Remove the Gaps (After Mid- Term II)

Sr. No.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Course Outcome
1.	NIL				

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University Question Paper

b) Explain the terms (i) slope of the bed (ii) Hydraulic mean depth (iii) wetted perimeter. **(6)**

OR

3. a) A trapezoidal channel with side slopes of 1 to 1 has to be designed to convey 10 m^3/sec. at a velocity of 2m/sec. So that the amount of concrete lining for the bed and sides is the minimum. Calculate the area of lining required for one metre length of canal. **(10)**

b) Explain the terms

i) specific energy of a flowing fluid

ii) critical depth

iii) and critical velocity as applied to non uniform flow. **(6)**

Unit - IV

4. What do you mean by hydraulic jump. Derive expressions for the depth of hydraulic jump and loss of energy due to hydraulic jump. **(16)**

OR

4. A 7.5 cm diameter jet having a velocity of 30 m/sec. Strikes a flat plate, the normal of which is inclined at 45^0 to the axis of the jet. Find the normal force on the plate.

i) When the plate is stationary and

ii) When the plate is moving with a velocity of 15 m/sec and away from the jet.

Also determine the horse power and the efficiency of the jet when the plate is moving. **(6+6+2+2=16)**

Unit - V

5. Differentiafe followings in respect to turbines

a. Gross head and net head

b. Impulse turbine and reaction turbine.

c. Specific speed and unit speed

d. Speed ratio and flow ratio

e. Draft tube and pen stock

f. Turbine and pump

g. Cavitation and watter hammer

h. Hydraulic efficiency and mechanical efficiency. **(2x8=16)**

OR

5. a) Obtain an expression for the workdone by impeller of a centrifugal pump on water per second per unit weight of water.

b) Obtain an expression for the minimum speed for starting a centrifugal pump. **(8+8=16)**

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STUDENT PERFORMANCE REPORT

Roll No.	Name of Student	I Mid-Term	II Mid-Term	Average
22ETCCE001	ANKIT KUMAR	51	53	52
22ETCCE002	ARMAAN CHAUHAN	42	44	43
22ETCCE003	AYUSH SINGH JHALA	44	41	42.5
22ETCCE004	PARIDHI NINAMA	65	60	62.5
22ETCCE005	PRAVEEN DANGI	40	45	42.5
22ETCCE006	ROSHNI TABIYAR	63	60	61.5

Signature of Faculty: **Signature of HOD**

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RESULT ANALYSIS

S.NO.	RTU ROLL NUMBER	NAME OF STUDENT	END TERM MARKS	SESSIONAL MARKS	TOTAL
		MAX MARKS	**70**	**30**	**100**
1.	22ETCCE001	ANKIT KUMAR	Result pending	22	
2.	22ETCCE002	ARMAAN CHAUHAN		18	
3.	22ETCCE003	AYUSH SINGH JHALA		19	
4.	22ETCCE004	PARIDHI NINAMA		28	
5.	22ETCCE005	PRAVEEN DANGI		17	
6.	22ETCCE006	ROSHNI TABIYAR		27	

TOTAL	PASS	FAIL	ABSENT	PASS %
6				

Indirect Assessment:

Overall Teacher Self-Assessment (at the completion of course) in terms of course objective and outcomes

Course Objectives:

Hydraulic engineering, as a sub-discipline of civil engineering, is concerned with the flow and conveyance of fluids. This course consists of the topic like viscous fluid flow, laminar and turbulent flow, boundary layer analysis, dimensional analysis, open channel flows, flow through pipes, and computational fluid dynamics. The objective of this course is to introduce various hydraulic engineering problems like open channel flows and hydraulic machines.

Hydraulic engineering is a sub-discipline of Civil Engineering. It deals with the flow of fluid, typically water and sewage conduits and uses the force of gravity for the movement of the same. It is used extensively in the construction of dams, bridges, canal, sewers etc. Hydraulic engineering uses fluid mechanics as its foundation, to deal with problems of collection, storage, segregation, measurement, transport, control and use of water.

Course Outcomes:

At the end of this course students will be able to:

1. Students will be able to analyze the process of deriving equation by using dimensional methods.
2. Students will analyze the problems related to flow of fluids in channel.
3. Students will be able to explain and remember the different types of turbines & pumps used.
4. Student will be able to create economic sections for fluid channels.
5. Students will be able to remember the concepts of Hydrology.

Methodology to identify bright student

Considered a range of criteria, including academic performance, creativity, critical thinking, problem-solving skills, and enthusiasm for learning. Bright students often excel in multiple areas. Observed how students perform in the classroom. In terms of active participation, engagement in discussions, leadership, and the ability to grasp complex concepts.

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Efforts to keep students engaged

1. Active Learning:
   - Incorporate active learning strategies, such as group discussions, problem-solving activities, and hands-on projects. Active participation keeps students engaged and encourages critical thinking.
2. Varied Teaching Methods:
   - Use a variety of teaching methods, including lectures, group work, multimedia presentations, and interactive activities to cater to different learning preferences.
3. Technology Integration:
   - Leverage technology, such as online platforms, educational apps, and interactive software, to make lessons more engaging and interactive.

Methodology to identify weak student

Considered a range of criteria, including classroom observation, formative assessment, summative assessment, assignment review e.t.c. Weak students are struggling students with sensitivity and a desire to support their learning. Some measures, such as additional tutoring, personalized assignments, or alternative assessment methods, to help students succeed.

Targeted inventions for weak student

1. Additional Resources

Offer supplementary learning materials, such as textbooks, online resources, or multimedia content, to provide alternative explanations and reinforce key concepts.

2. Remedial classes

Establish a tutoring program where students can receive extra help from teachers.

3. Flipped classroom

Students are assigned pre-class learning materials, often in the form of videos, readings, or online modules, to cover the foundational concepts before coming to class.