



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code: DI04006041

Subject Name: Water Resources Engineering

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	Professional Elective - I

Prerequisite:	Students must have adequate knowledge of Environmental science and Mathematics. Students should have a keen interest in problem-solving skills.
Rationale:	Water Resource Engineering is a vital branch of civil engineering focused on the sustainable planning, design, and management of water systems. For civil engineers, it provides the expertise to develop infrastructure such as dams, irrigation networks, flood control systems, and urban water supply, ensuring reliable access to clean water and protection from water-related hazards. This specialization supports national priorities like the Jal Jeevan Mission and global goals such as Sustainable Development Goal 6 (SDG 6), while equipping engineers with technical, analytical, and environmental stewardship skills essential for addressing water scarcity, climate impacts, and growing demand.

Course Outcome:

After Completion of the Course, the Student will able to:

No	Course Outcomes	RBT Level
01	Learn estimation of hydrological parameters.	R, U, & A
02	Understand water demand of crops and provisions to meet the same.	R, U, & A
03	Know planning of reservoirs and dams.	R, U, & A
04	Design irrigation projects, canals and other diversion works.	R & U
05	Understand GIS and remote sensing in water resource planning.	R & U

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA (M)	PA (I)	ESE (V)	
03	00	02	04	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	Introduction to Hydrology 1.1 Hydrology: Definition and Hydrological cycle. 1.2 Rain Gauge: Recording rain gauge, Non recording rain gauge. 1.3 Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Thiessen polygon method. 1.4 Runoff, Factors affecting Run off, Computation of run-off. 1.5 Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems. 1.6 Yield and Dependable yield of a catchment, determination of dependable yield.	07	16
2	Crop water requirement and Reservoir Planning 2.1 Irrigation and its classification. 2.2 Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal. 2.3 Methods of application of irrigation water and its assessment. 2.4 Surveys for irrigation project, data collection for irrigation project. 2.5 Area capacity curve. 2.6 Silting of reservoir, Rate of silting, factors affecting silting and control measures. 2.7 Control levels in reservoir, Simple numerical problems on Fixing Control levels.	10	22
3	Dams and Spillways 3.1 Dams and its classification: Earthen dams and Gravity dams (masonry and concrete). 3.2 Earthen Dams-Components with function, typical cross section, seepage through embankment and foundation and its control. 3.3 Methods of construction of earthen dam, types of failure of earthen dam and preventive measures. 3.4 Gravity Dams-Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam. 3.5 Spillways-Definition, function, location, types and components, Energy dissipaters.	10	22
4	Minor and Micro Irrigation 4.1 Bandhara irrigation: Layout, components, construction and	06	



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	working, solid and open bandhara. 4.2 Percolation Tanks – Need, selection of site. 4.3 Lift irrigation Scheme-Components and their functions, Lay out. 4.4 Drip and Sprinkler Irrigation- Need, components and Layout. 4.5 Well irrigation: types and yield of wells, advantages and disadvantages of well irrigation. 4.6 Soil Moisture zone of distribution below ground surface.		13
5	Diversion Head Works & Canals 5.1 Weirs – components, parts, types, K.T. weir – components and construction. 5.2 Diversion head works – Layout, components and their function. 5.3 Barrages – components and their functions. Difference between weir and Barrage. 5.4 Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section. 5.5 Canal lining - Purpose, material used and its properties, advantages. 5.6 Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing. 5.7 Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets	10	22
6	GIS Application & software used in water Resources Engineering 6.1 Fundamentals of Geographical Information system and Geospatial data. 6.2 Uses of GIS in water resource engineering. 6.3 Software used for GIS application in the water resource field and its Primary function.	02	05
Total		45	100

Suggested Specification Table with Marks (Theory): (in %)

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	50	30	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Book	Author	Publication with place, year, and ISBN
1	WATER RESOURCES ENGINEERING (Theory and Practice)	Prof. Prakash Chandra Swain, Dr. Dillip Kumar Ghose	All India Council for Technical Education, Ministry of Education, GOI & KHANNA BOOK PUBLISHING CO. (P) LTD. ISBN: 978-93-55384-28-7, First Edition: 2025
2	Irrigation and Water Power Engineering	Punmia, B.C., Pande, B. Lal.	Laxmi Publications
3	Engineering Hydrology	Subramanayan	McGraw Hill Education
4	Applied Hydrology	Mutreja K N	McGraw Hill Education
5	Irrigation Engineering	Sharma, R.K. and Sharma, T.K.	S.Chand
6	Irrigation Engineering	Basak, N.N.	McGraw Hill Education
7	Irrigation and water resource Engineering	Asawa, G.L.	New Age
8	Irrigation Engineering	Dahigaonkar, J.G.	Asian Book Pvt. Ltd., New Delhi
9	Irrigation and Hydraulic Structures	Garg, S K	Khanna Publishers, Delhi
10	Irrigation Engineering	Priyani V.B.	Charotar Book Stall, Anand.
11	GIS in water resource engineering	Dr. Gajraj Singh	SBS Publishers Pvt Ltd.

(b) Open-source software and website:

1. <https://nptel.ac.in/courses/105105110>
2. <https://www.nptelprep.in/courses/105104103/materials>
3. <https://bhuvan.nrsc.gov.in/home/index.php>
4. <https://swhydrology.gujarat.gov.in/>
5. <https://gwrdc.gujarat.gov.in/maps.html>
6. <https://gwilws.gujarat.gov.in/>
7. <https://guj-nwrws.gujarat.gov.in/>
8. <https://qgis.org/>



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Suggested Course Practical List:

Exp No.	List of Practicals	Unit No.	Approx. Hrs. required
1	<ul style="list-style-type: none">• Draw a labeled sketch of the given masonry/earthen dam section.• Draw the theoretical and practical profile of the given gravity dam section.• Draw a labeled sketch of the given diversion head works and Cross Drainage works.	3,5	6*
2	Calculate average rainfall for the given area using arithmetic mean method, Isohyetal, Thiessen polygon method.	1	8*
3	Estimate crop water requirement for the given data.	2	2*
4	Estimate capacity of the canal for the given data.	2	2*
5	Calculate reservoir capacity from the given data.	2	2*
6	Calculate control levels for the given data for a given reservoir.	2	2*
7	Visit the site of any existing water resource project in the vicinity of your area & prepare report of the technical details.	2,3,5	8*
		Total	30

Suggested Project List: As per the Suggested Course Practical List

Suggested Activities for Students:

- Visit the nearer site at of any existing water resource project and prepare detailed visit report.
- Deliver a seminar on a relevant topic of your choice.
- Visit nearby Rain gauge station and prepare report.
- Visit nearby Agricultural area and prepare a report of crops grown and irrigation methods adopted.
- Study Bhuvan website and any open source GIS Package.

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