GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code : DI04006061

Course / Subject Name: Irrigation Engineering

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

Prerequisite:	Basic knowledge of fluid mechanics, surveying, soil mechanics, and mathematics.
Rationale:	Irrigation Engineering equips students with the knowledge and skills to manage water resources efficiently for agriculture and infrastructure. In addition to crop water requirements, soil-water-plant relationships, and techniques to increase irrigation efficiency, the course covers basic concepts, historical development, and types of irrigation projects. Students learn irrigation canals, regulating works, cross-drainage structures, dam and reservoir planning and design, and various irrigation systems and techniques. Hands-on understanding is improved through practical sessions that include field visits, numerical problems, layouts, and sketches. In order to prepare students to effectively analyze and resolve real-world water management challenges, the course also covers water logging and reclamation techniques.

Course Outcome:

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

No	Course Outcomes	RBT Level
01	Recall and explain the fundamental concepts and scope of irrigation.	R & U
02	Understand and recall the water requirements of crops and the basic soil–water–plant relationships.	R, U & A
03	Apply, analyze, and recall knowledge of different irrigation systems and methods to solve practical problems.	R, U & A
04	Analyze and interpret the planning and design aspects of dams and reservoirs.	U & A
05	Demonstrate understanding, recall, and application of canals, regulating works, and cross-drainage structures.	R, U & A
06	Identify water logging problems and propose appropriate reclamation and drainage measures.	U & A

**Revised Bloom's Taxonomy (RBT)*

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Teaching and Examination Scheme:

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

Course Content:

Unit No.	Content	No. of Hours	% of Weight age
1	**Introduction to Irrigation** Definition, Necessity of Irrigation, Scope, Advantages and Disadvantages, purpose of irrigation, Historical development of irrigation in India, Classification of Irrigation Projects, Assessment of charges for irrigation water	05	10
2	**Water Requirement of Crops** Principal Indian crops and their water requirements, cropping seasons in India, Basic Soil-water-plant relationship, frequency of irrigation, Irrigation Efficiency, factors affecting consumptive use of water, Command Areas, Definitions: Duty, Delta, Base Period and relation between them. Factors affecting Duty, Methods for improving Duty	09	20
3	**Irrigation System and Method of Irrigation** **Irrigation System:** Types of irrigation systems, Gravity and Lift Irrigation, Well and Tube well irrigation, Sewage irrigation and Supplemental Irrigation **Methods of irrigation:** Sub-surface irrigation and Surface irrigation, Sprinkler, Buried irrigation, Drip irrigation, layout, component parts, Advantages, precautions and maintenance	09	20
4	**Dams and Reservoirs Planning** **Dams Planning:** Introduction, Selection of dam site, Types of dams, Selection of type of dams and its classification, factors affecting selection of particular type of dam **Reservoirs Planning:** Purpose and Classification of reservoirs, Selection of site for reservoir, Storage zones, Reservoir sedimentation and its control, Reservoir losses, life of reservoir	07	15
5	**Irrigation Canals and Regulating & Cross Drainage works:**	09	20

	Irrigation Canals: Types of canals, Distribution system, Loss of water in canals, Different components of irrigation canals and their functions, Different canal cross sections, Classification of canals according to their alignment, Canal lining-advantages and disadvantages **Regulating & Cross Drainage works:** Canal falls, Various types of Cross-drainage works and their necessity, Head and Cross Regulator, Canal escapes, Silt extractor, Types of irrigation outlets		
6	**Water logging: Reclamation and Drainage** Introduction, Causes and effects of water logging, Anti-water logging measures, Land reclamation	06	15
	Total	**45**	**100**

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory marks			
			R Level	U Level	A Level	Total
1	Introduction to Irrigation	05	03	04	---	07
2	Water Requirement of Crops	09	03	04	07	14
3	Irrigation System and Method of Irrigation	09	03	04	07	14
4	Dams and Reservoirs Planning	07	---	03	07	10
5	Irrigation Canals and Regulating & Cross Drainage works	09	03	04	07	14
6	Waterlogging: Reclamation and Drainage	06	---	04	07	11
	Total	**45**	**12**	**23**	**35**	**70**

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
17	33	50	-	-	-

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

References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Book	Author	Publication with place, year, and ISBN
1	Elementary Irrigation Engineering	G.L. Asawa	New Age International, 1999. ISBN 8122412025
2	Irrigation Engineering	S. K. Mazumder	Galgotia Publications Pvt. Ltd., New Delhi, 2008. ISBN 8175155353
3	Irrigation Engineering	N. N. Basak	Tata McGraw-Hill Publishing Company Limited, New Delhi. ISBN 0-07-463538-7
4	Irrigation Engineering and Hydraulic Structures	S. K. Garg	Khanna Publishers, Delhi ISBN: 81-7409-047-9
5	Irrigation, Water Resources, and Water Power Engg.	Dr. P.N. Modi	Standard Book House, Delhi. ISBN: 9788189401290, 2008
6	Irrigation Engineering (Including Hydrology)	R. K. Sharma and T. K. Sharma	S Chand Publishing, S Chand and Company Limited, 2008. ISBN 8121921287
7	Irrigation Engineering: Theory and Practices	Balram Panigrahi	New India Publishing Agency, 2021. ISBN 9390175135
8	Irrigation Engineering: Principles, Processes, Procedures, Design, and Management	Vijay P. Singh, Qiong Su	Cambridge University Press, 2022. ISBN 1316511227
9	Irrigation theory and practice	A.M. Mitchel	Vikas Pub. House Pvt. Ltd, Delhi. ISBN: 9780706924848, 2008

(b) Open-source software and website:

https://nptel.ac.in/courses/126105010

Suggested Course Practical List:

Exp .No.	List of Practical	Unit No.	Approx Hrs. required	Type
1	Estimation of irrigation water charges for a small command area	1	2	Numerical
2	Measurement of duty of crops	2	2	Numerical
3	Measurement of delta and base period of crops	2	2	Numerical
4	Determination of crop water requirement using soil-water-plant relationship	2	2	Numerical
5	Study of different irrigation methods (surface, sprinkler, drip)	3	2	Sketches

6	Preparation of layout for a simple drip irrigation system	3	2	Sketches
7	Comparative study of lift irrigation and well/tube well irrigation	3	2	Visit
8	Study of dam planning parameters (site selection, types, storage zones)	4	2	Sketches
9	Study of reservoir planning parameters (storage zones, losses, sedimentation)	4	2	Sketches
10	Mini-project: Design of a small irrigation system (layout + method selection)	3,5	2	Sketches
11	Analysis of canal cross-sections and calculation of discharge	5	2	Numerical
12	Visit/Study of a small irrigation canal and its components	5	2	Visit
13	Identification of water logging problem areas	6	2	Sketches
14	Suggestion of reclamation and drainage measures	6	2	Seminar
		Total	**28**	

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name	Experiment No.
1	Computing Devices	1,2,3,4,11
2	Drawing Instruments	5,6,8,9,10,13
3	Seminar and presentation materials (projector, boards)	14

Note
*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry-relevant skills/outcomes to match the COs. The above table is only a suggestive list.*
*ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above-listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.*

S. No	Sample Performance Indicators (PrOs)	Weight age (%)
1	Ability to explain basic concepts, history, and types of irrigation	10
2	Accuracy in calculating crop water requirements, duty, delta, and base period	15
3	Skill in applying different irrigation systems and methods in practical exercises	15
4	Understanding of planning and design of dams and reservoirs	15

5	Competence in analyzing canals, cross-drainage works, and regulating structures	15
6	Identification and suggestion of solutions for water logging and drainage problems	10
7	Quality of sketches, layouts, and numerical solutions in practical's	10
8	Active participation in field visits, mini-projects, and seminars	10

Suggested Project List:

1. Model Making: Prepare small working models of irrigation methods such as drip and sprinkler systems.
2. Case Study: Collect data on a nearby irrigation project/dam and prepare a brief report.
3. Field Visit Report: Visit an irrigation canal, lift irrigation scheme, or reservoir and document observations.
4. Mini Project: Design a simple layout of an irrigation system for a given command area.
5. Numerical Assignments: Solve problems on duty, delta, base period, irrigation efficiency, and canal discharge.
6. Poster/Chart Preparation: Prepare posters showing types of dams, reservoirs, or irrigation methods.
7. Seminar/Presentation: Present on topics like water logging, canal lining, or modern irrigation techniques.
8. Survey of Crops: Collect information on local crops and their water requirements during different seasons.
9. Group Discussion: Discuss advantages and disadvantages of different irrigation systems in Indian conditions.
10. Learning Diary: Maintain a diary/logbook of all practicals, visits, and activities with reflections.

Suggested Activities for Students:

(A) Visit a nearby canal, dam, or irrigation project to observe water distribution, canal components, and operation of regulators.
(B) Conduct a survey of local farms to study the irrigation methods used and report on their efficiency and advantages.
(C) Organize and deliver a seminar or group discussion on the historical development of irrigation in India or modern irrigation techniques.
(D) Visit a waterlogged area to investigate the causes, observe the effects on crops, and discuss reclamation and drainage measures with peers.

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