

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BRANCH NAME: CIVIL ENGINEERING**  
**SUBJECT NAME: IRRIGATION ENGINEERING**  
**SUBJECT CODE: 2170609**  
**B.E. 7<sup>th</sup> SEMESTER**

**Type of course:** Civil Engineering

**Prerequisite:** Knowledge of Fluid Mechanics, Hydrology and Water Resources Engineering

**Rationale:**

To develop understanding about water requirement of crops, irrigation methods, and irrigation engineering works like weir/barrage, storage and outlet works, distribution works, regulating and cross drainage works and importance of drainage in irrigated areas.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks	
L	T	P		Theory Marks			Practical Marks		
			ESE (E)	PA (M)		ESE (Viva)	PA (I)		
				PA	ALA				
3	2	0	5	70	20	10	30	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<p><b>Module I</b></p> <p>Introduction- Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development in India.</p> <p>Water Requirement of Crops- Soil-water-plant relation- field capacity, wilting point, available water, consumptive use, Irrigation requirements – Net irrigation requirement, Field irrigation requirement, Gross Irrigation requirement, Soil moisture extraction pattern, Frequency of irrigation, Principal Indian crops, Gross command area, Culturable command area, Intensity of irrigation, Duty and delta relation, Introduction to various methods of application of irrigation water, Irrigation efficiency, assessment of irrigation water</p>	10	25
2	<p><b>Module 2</b></p> <p><b>Diversion Works:</b> Different stages of a river and their flow characteristics, Weir and barrages, Various parts of a weir and their functions, Exit gradient, Principles of weir design on permeable formations -Bligh's creep theory and Khosla's theory</p>	12	25

	<b>Storage and Outlet works:</b> Types of earthen dams, Seepage in earth dams, Gravity dams, Forces acting on a gravity dam, Rock-fill dams, Spillways, Types of spillways, Spillways gates and energy dissipation works.		
<b>3</b>	<b>Module 3</b> <b>Distribution works:</b> Modes of conveying irrigation water- Types of irrigation canals- contour canal, ridge canal, side sloping canals, Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, L-section, Losses of canal water, Silting and scouring of canals, Method of design of unlined section of irrigation canal, Silt theories, Lined canals, Design of lined canal, Link canals	11	20
<b>4</b>	<b>Module 4</b> <b>Regulating and Cross Drainage Works:</b> Canal falls, Cross drainage works, Types of cross drainage works, Canal escapes, Head regulator and Cross regulator, Silt ejector, Flow meters - Parshall flume, Irrigation outlets and types of outlets.	8	20
<b>5</b>	<b>Module 5</b> Water logging-causes, Reclamation, Drainage principles and practice	4	10

**Note:** Term work shall be based on above mentioned syllabus.

**Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>15</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>15</b>	<b>10</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

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.

**Reference Books:**

1. Irrigation & Water Power Engineering - Dr. B.C.Punmia & B.B.Pande, Laxmi Publications, (P) Ltd, New Delhi
2. Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi, Standard Book House, Delhi
3. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard Publishers Distributors, Delhi
4. Irrigation Engineering and Hydraulic Structures - S.K.Garg, Khanna Publishers, Delhi
5. Irrigation Engineering, S.K. Mazumder, Galgotia Publications Pvt Ltd., New Delhi

**Course Outcome:**

After learning the course the students should be able to:

1. Understand the irrigation methods and duty-delta relation for crops
2. Calculate Net Irrigation Requirement (NIR), Field Irrigation Requirement (FIR) and Gross Irrigation Requirement (GIR)
3. Calculate the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory
4. Plot seepage line of earthen dam with corrections at entry and exit
5. Calculate forces on gravity dam.
6. Understand function of spillway and energy dissipation
7. Design unlined canal using silt theories
8. Design a lined irrigation canal
9. Understand functions of regulating and cross drainage works
10. Understand drainage principles

**List of Open Source learning website:**

[www.nptel.ac.in](http://www.nptel.ac.in)

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.