

Branch Name:	CIVIL ENGINEERING
Program Code:	ET106
Course Title:	Irrigation Engineering
Course Code:	2ET1060501T
Pre-requisite Course:	Knowledge of Fluid Mechanics, Hydrology and Water Resources Engineering.

Course Objective:

- CO-1: 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.
- CO-2: To take up the basic concepts of irrigation and construction of various hydraulic structures.
- CO-3: To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	3	1	-	4	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction: Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development in India.	3	10
2	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.	7	15
3	Diversion Head works: 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.	7	15
4	Storage and Outlet works: 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.	5	15

5	Distribution works: 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.	10	20
6	Regulating and Cross Drainage Works: 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.	7	15
7	Water logging: Water logging-causes, Reclamation, Drainage principles and practice.	3	10

List of 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 successful completion of the course the students shall be able to:

1. Understand the benefits and ill effects of irrigation.
2. Understand the irrigation methods and duty-delta relation for crops.
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 and Calculate forces on gravity dam.
5. Understand function of spillway and energy dissipation.
6. Understand functions of regulating and cross drainage works.
7. Understand the water logging and drainage principles.

Activities: Visit different hydraulic structures and submit the report to the institute.

E-Resources (If any):

<http://nptel.ac.in/>

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the benefits and ill effects of irrigation.	L1
CLO2	Understand the irrigation methods and duty-delta relation for crops.	L2
CLO3	Calculate the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory.	L3
CLO4	Plot seepage line of earthen dam with corrections at entry and exit and Calculate forces on gravity dam.	L3
CLO5	Understand function of spillway and energy dissipation.	L2
CLO6	Understand functions of regulating and cross drainage works.	L2
CLO7	Understand the water logging and drainage principles.	L2

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H	M	M	M			M					L	M	M	
CLO2	H	M	M	M			M					M	M	M	
CLO3	M	M	M	M		M	M							M	
CLO4	H	M	M			M	M					M	M		
CLO5	M	M	M	M		M	L						M	M	
CLO6	H	M	M			M	M					M		M	
CLO7	H	M	M	M		M	M						M	M	

H: High, M: Medium, L: Low