

# Irrigation Engineering

<b>Course Code</b> CE-463	<b>Credit Hours</b> 2-1
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## Course Description

Irrigation Engineering is studying the technology & methods behind augmenting crop growth. This course is designed to give the concepts of canal irrigation system and diversion head works. Students are also given the concept of canal design, flow measurement, regulation, operation and lining in an irrigation system.

## Text Book:

1. Punmia B.C., "Irrigation & Water Power Engineering", Standard Publishers, Delhi

## Reference Book:

1. Iqbal Ali, "Irrigation & Hydraulic Structures (Theory, Design & Practice)", Allied Book Company, Lahore, Pakistan
2. Santosh Kumar Garg, "Irrigation Engineering & Hydraulic Structures", Khanna Publishers, Dehli
3. R.K. Sharma & T.K. Sharma, "Irrigation Engineering", S. Chand & Company, New Delhi
4. Asawa G.L., "Irrigation Engineering", New Age International Publishers
5. Basak N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co. New Delhi
6. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India, Ltd
7. Gupta B.L. & Amir Gupta, "Irrigation Engineering", Satya Prahashan, New Delhi
8. Michael A.M., "Irrigation Theory & Practical", Vikas Publishing Pvt Ltd
9. FAO IDP 26 Small hydraulic structures

## Prerequisites:

Nil.

### Assessment System for Theory

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

### Assessment System for Lab

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assessment/ Viva	20%

### Teaching Plan

#### Theory:

<u>Week</u>	<u>Topic Covered</u>	<u>Reading Assignment/ Home Work</u>	<u>CLO No</u>	<u>Assessment Methodolog y</u>	
<b>1-3</b>	Introduction to Irrigation Engineering	Chap 1 (Text 1)	1	Assignments, Quizzes, MSE & ESE	
	Introduction				
	Necessity, merits, and demerits of irrigation				
	Indus Basin Irrigation System	Chap 1 (Text 2)			Quiz 1
	Types and Methods of Irrigation	Chap 2 (Text 1)			
	Factors affecting choice of irrigation method				
	Pressurized and non-pressurized methods				
	• Uniformity coefficient				
	Soil-Water-Crop Relationship				
• Soil and its physical and chemical properties					
• Root zone soil water					
<b>4-5</b>	Water Requirements of Crops	Chap 2 & 3 (Text 1)	Quiz-2		
	Crops of Pakistan and crop rotation				
	Functions of irrigation water				
	Standards of irrigation water				
	• Factors affecting and improving duty				

	<ul style="list-style-type: none"> <li>• Classes of soil water</li> <li>• Availability of soil water</li> <li>• Equilibrium points-soil moisture tension</li> <li>• Depth of effective root zone</li> <li>• Depth and frequency of irrigation</li> <li>• Determination of consumptive use of water by equations (Blaney-Criddle, Penman, Hargreaves)</li> <li>• Optimization of Crop Water Requirements by Artificial Intelligence</li> </ul>		Assignment 1		
6	Canal Irrigation System	Chap 13 (Text 1)	Quiz 3	2	
	Canal Structures				
	<ul style="list-style-type: none"> <li>• Alluvial and non-alluvial canals</li> </ul>				
	Alignment of canals				
	<ul style="list-style-type: none"> <li>• Distribution system for canal irrigation</li> <li>• Determination of canal capacity</li> </ul>				
	<ul style="list-style-type: none"> <li>• Canal losses and channel section for minimum seepage loss</li> </ul>				
7-8	Design of Alluvial Canals	Chap 14 & 15 (Text 1)	Assignment 2		
	Kennedy's silt theory				
	Lacey's regime theory		Assignment 3		
	Rational approach				
Channel design software					
9	<b>Mid Semester Exam</b>				
10	Lined Channels	Chap 16 (Text 1)	Assignment 4	2	
	Canal lining and its types				
	Permissible velocities in lined channels				
Design interpretation of lined irrigation channels					
11	Canal Outlets	Chap 17 (Text 1)	Quiz 4		
	Types, essential requirements, and characteristics of outlets				

	Tail cluster and tail escape				
12	Diversion Headworks	Chap 12 (Text 1)	Quiz 5		
	Weir and barrage				
	Types and components of diversion weir				
	Head regulator and cross regulator				
	Canal regulation and silt control at the headworks				
	• Silt excluders and silt ejectors				
13-14	Bligh's Creep Theory		Assignment 5		
	Design of vertical drop weir				
	Khosla's Seepage Theory				
15	Waterlogging and Salinity	Chap 16 (Text 1)	Quiz 6		
	• Causes and effects of waterlogging				
	• Reclamation of waterlogged soils				
	• Drains and tubewells				
	• Causes and effects of salinity and alkalinity of lands in Pakistan				
16	Modern Concepts in Water Management	Chap 17 & 18 (Text 1)	Assignment 6		
	• Virtual Water				
	• Canal Operation and Control				
	• Artificial Intelligence in Flow Metering				
17-18	<b>End Semester Exam</b>				

### Practical

S No.	Practical	Assessment Methodology	Learning Domain/ Taxonomy Level
1	Measurement of Infiltration Rate in Soils	Lab Manual, Lab Quiz, Lab Rubrics	A3
2	Flow Measurements in Venturi Flume		
3	Practically proving the relationship between Manning's and Chezy's Coefficients		
4	Characteristics of Flow over Sharp Cornered Broad Crested Weir		
5	Sluice Gate: Under Free Flow Condition		
6	Sluice Gate: Under Submerged Condition		

7	OEL: Compute thrust on a sluice gate in laboratory flume		
8	WINFLUME: Getting Familiar with the Software		
9	Estimating crop water requirement for Grass (in warm and cold seasons) for a specified location using CLIMWAT and CROPWAT		
10	Flow Measurements in Venturi Flume		
11	Developing irrigation schedules for a certain crop with varying initial moisture content using CLIMWAT and CROPWAT		
12	Developing Irrigation schedules for a certain crop being irrigated by the irrigation systems of varying efficiency using CLIMWAT and CROPWAT		