FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF

CIVIL ENGINEERING

Marwadi University
Marwadi Chandarana Group

Irrigation Engineering

01CI0620

Objective of the Course:

- Understand the irrigation methods along with their advantages and disadvantages
- Know the function of different hydraulic structures of the Irrigation System
- Determine the depth of irrigation
- Compute uplift pressure on bottom floor of weir
- Design the alluvial and non alluvial channel cross section.

Credit Earned: 04

Prerequisite: Basic knowledge of Hydrology parameters

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Understand functions of hydraulic structure of irrigation system.
2. Calculate irrigation water requirement for various crops.
3. Determine the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory.
4. Compute forces acting on the gravity dam.
5. Design of the lined and unlined irrigation canal using Manning's equation, Kennedy's and Lacy's theory.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	01	00	04	50	30	20	25	25	150

Detailed Syllabus

Sr. No.	Title of the unit	Number of Hours
1	**Introduction**	**10**
	1.1 Definition, Necessity, Scope, Benefits, and Ill Effects of Irrigation, 1.2 Types of irrigation schemes, Social and environmental considerations, 1.3 Irrigation development in India.	**3**
	1.4 Water Requirement of Crops- Duty and delta relation, Soil-water-plant relation- field, capacity, wilting point, available water, Soil moisture extraction pattern, Frequency of irrigation, Consumptive	**3**

	use.	
	1.5 Principal Indian crops, Gross command area, Culturable command area, Intensity of irrigation, Irrigation requirements,	**2**
	1.6 Introduction to various methods of application of irrigation water, Irrigation efficiency, assessment of irrigation water	**2**
2	**Diversion Work; Storage and Outlet Works**	**12**
	2.1 Diversion Works: Different stages of a river and their flow characteristics, Weir and barrages,	02
	2.2 Various parts of a diversion head work and their functions, Exit gradient, Principles of weir design on permeable formations -Bligh's creep theory and Khosla's theory	04
	2.3 Storage and Outlet Works: Types of earthen dams, Gravity dams, Forces acting on a gravity dam, Rock-fill dams,	04
	2.4 Spillways, Types of spillways, Spillways gates, and energy dissipation works.	02
3	**Distribution works**	**10**
	3.1 Types of irrigation canals, contour canal, ridge canal, side sloping canals, canal alignment, Types of channel	02
	3.2 Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, L-section	01
	3.3 Losses of canal water, Silting, and scouring of canals	01
	3.4 Method of design of alluvial and non alluvial canal section	04
	3.5 Silt theories, Lining of irrigation channel, Types of lining, Design of lined canal.	02
4	**Regulating and Cross Drainage Works**	**06**
	4.1 Cross drainage works, Types of cross drainage works, selection of suitable type of CD works	02
	4.2, Necessity and location of canal fall, Types of Canal falls, Canal escapes,	01
	4.3 Head regulator and Cross regulator, Silt ejector or, Flow meters - Parshall flume, Irrigation outlets, and types of outlets.	02
5	**Miscellaneous Topic**	**04**
	5.1 Water logging causes and effect, remedial measure, 5.2 Drainage principles and practice, Land Reclamation	04
	Total	**42**

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	20%	45%	10%	10%	10%

List of Assignments/Tutorials

Sr. No	Topic name
1	Compute depth of water stored in the root zone
2	Determine frequency of irrigation
4	Calculate Duty and Delta for crops
5	Figureout capacity of reservoir for different crops grown in the command area
6	Design non allucial channel section
7	Design most economical Channel section
8	Design alluvial channel using kannedy's theory when Bed slope given
9	Design alluvial channel using kannedy's theory when B/D ratio given
10	Design alluvial channel using Lacy's theory
11	Design lined channel section
12	Design weir using bligh's theory
13	Compute uplift pressure on key points of the bottom floor of weir/barrage using Khosala's specific case 1,2
14	Compute uplift pressure on key points of the bottom floor of weir/barrage using Khosala's specific case 3 and exit gradient

Instructional Method and Pedagogy:

1. Prerequisites of the course and its pattern shall be discussed at the commencement of the course.
2. Lectures shall be conducted in the classroom using various teaching aids.
3. Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4. A minimum of two internal exams will be conducted and an average of two will be considered as a part of a 15% overall evaluation.
5. At the end of each unit/topic, an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
6. The assignments/tutorials/technical visits are planned in such a way that they coverthe practical aspects of the course contents.

Recommended Study Material

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 BookHouse, Delhi
3. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard PublishersDistributors, 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.

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