

4.5 IRRIGATION ENGINEERING

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RATIONALE

Diploma holders in Civil Engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tube wells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

- CO1: Recognise different crops and their water requirements
- CO2: Supervise maintenance and construction work of canal head works and cross Regulators
- CO3: Supervise constructions of various river training works
- CO4: Monitor installation of water harvesting techniques

DETAILED CONTENTS

UNIT I

- 1. Introduction: Irrigation Engineering, Hydrological Cycle, Run-off and Catchment Area**
 - 1.1 Definition and necessity of irrigation
 - 1.2 Major, medium and minor irrigation projects
 - 1.3 Hydrology and hydrological cycle
 - 1.4 Rain-gauges – automatic and non-automatic (Symons rain gauge)
 - 1.5 Methods of estimating average rainfall (Arithmetic system)
 - 1.6 Runoff and Factors affecting runoff, Catchment area
 - 1.7 Hydrograph and basic concept of unit hydrograph.

UNIT II**2. Water Requirement of Crops**

- 2.1 Principal crops in India and their water requirements
- 2.2 Crop seasons – Kharif and Rabi
- 2.3 Crop period, base period, Duty, Delta and their relationship.
- 2.4 Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Irrigable area

3. Methods of Irrigation

- 3.1 Flow irrigation – Definition and its types (only description)
- 3.2 Lift Irrigation – Tube well, Types of tube wells (only description)
- 3.3 Explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers, advantages and disadvantages of tube well irrigation.
- 3.4 Sprinkler irrigation- Conditions favourable, Types and component parts, advantages and disadvantages of sprinkler irrigation.
- 3.5 Drip irrigation- layout, component parts, advantages and disadvantages of drip irrigation.

UNIT III**4. Canals, Canal Head Works, Regulatory Works and Cross Drainage Works**

- 4.1 Definition and Classification of canal. (Visit to a Canal)
- **4.2 Appurtenances of a canal and their functions.
- 4.3 Various types of canal lining - their related advantages and disadvantages,
- 4.4 Canal breaches and their control.
- 4.5 Maintenance of lined and unlined canals
- 4.6 Definition, objectives and general layout of different parts of head works.
- 4.7 Difference between weir and barrage
- **4.8 Definition and necessity of Cross Drainage Works (Visit to a Cross Drainage Works)
- **4.9 Concept of Aqueduct, super passage, level crossing, inlet and outlet.

UNIT IV**5. Dams and hydraulic Structures**

- 5.1 Dam and its Classification
- **5.2 Earth dams - types, causes of failure; cross-section of zoned earth dam, method of construction,
- **5.3 Gravity dams – types, cross-sections of a dam, method of construction
- 5.4 Concept of spillways and energy dissipators

5.5 Concept of Canal Falls, Outlets and Escapes

UNIT V

6. River Training Works

- 6.1 Definition, function of river training works.
- 6.2 Types of river training- Embankments or levees.
- 6.3 Concept of Guide bank, Groynes or spurs, Pitched island, Cut-off
- 7. Water Logging and Drainage and Ground Water Re-charge
- 7.1 Definition of water logging – its causes and effects.
- 7.2 Detection, prevention and remedies
- 7.3 Surface and sub-surface drains and their layout (only description)
- 7.4 Water Harvesting Techniques: Need and requirement.
- 7.5 Various methods of rain water harvesting.

NOTE: ** A field visit may be planned to explain and show the relevant things

RECOMMENDED BOOKS

- 1. Santosh Kumar Garg, “Irrigation Engineering and Hydraulics Structures”, Khanna Publishers, Delhi.
- 2. BC Punmia, and Brij Bansi Lal Pande, “Irrigation and Water Power Engineering”, Standard Publishers Distributors, Delhi.
- 3. SR Saharsabudhe, “Irrigation Engineering and Hydraulic Structures”.
- 4. BIS Codes.
- 5. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.
- 6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

- 1. <http://swayam.gov.in>

INSTRUCTIONAL STRATEGY

The teaching of the subject should be supplemented by field visits at regular intervals of time to expose the students to irrigation works. Students should be asked to prepare and interpret drawings of various irrigation works. This subject contains five units of equal weightage.