

# **IRRIGATION ENGINEERING**

## **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.

## **LEARNING OUTCOME**

After undergoing the subject, students will be able to:

- Explain concept of necessity of irrigation in India
- Recognize different crops and their water requirements
- Define rainfall and runoff
- Measure rainfall and read rain gauges and hydrographs
- Monitor construction and maintenance work of canal and canal linings
- Monitor installation of tube wells and water harvesting techniques
- Supervise maintenance and construction work of canal head works and cross regulators
- Supervise construction of various river training works
- Carry out desilting operation of canals

## **DETAILED CONTENTS**

### **THEORY**

1. Introduction:
  - 1.1 Definition of irrigation
  - 1.2 Necessity of irrigation
  - 1.3 History of development of irrigation in India
  - 1.4 Major, medium and minor irrigation projects
2. Water Requirement of Crops

- 2.1 Principal crops in India and their water requirements
  - 2.2 Crop seasons – Kharif and Rabi
  - 2.3 Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship
  - 2.4 Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Irrigable area
3. Hydrological Cycle Catchment Area and Run-off
- Rainfall, definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall (Arithmetic system); catchment area runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.
4. Methods of Irrigation
- 4.1 Flow irrigation - its advantages and limitations
  - 4.2 Lift Irrigation – Tube well, submersible and well irrigation advantages and disadvantages
  - 4.3 Sprinkler irrigation conditions favorable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts
  - 4.4 Drip irrigation, suitability of drip irrigation, layout, component parts, advantages
5. Canals
- 5.1 Classification, appurtenances of a canal and their functions, sketches of different canal cross-sections
  - 5.2 Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal x-sections
  - 5.3 Breaches and their control
  - 5.4 Maintenance of lined and unlined canals
6. Tube Well Irrigation

- 6.1 Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation
  - 6.2 Tube wells, explanation of terms: water table, radius of influence, depression head, and cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well
  - 6.3 Types of tube wells and their choice-cavity, strainer and slotted type;
  - 6.4 Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance
  - 6.5 Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.
7. Dams
- 7.1 Classification of dams; earth dams - types, causes of failure; cross-section of zoned earth dam, method of construction, gravity dams – types, cross-sections of a dam, method of construction
  - 7.2 Concept of small and micro dams
  - 7.3 Concept of spillways and energy dissipators
8. Canal Head Works and Regulatory Works
- Definition, object, general layout, functions of different parts of head works.  
Difference between weir and barrage
9. Cross Drainage Works
- 9.1 Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet
  - 9.2 Sketches of the above cross drainage works
10. Definitions of following Hydraulic Structures with Sketches
- 10.1 Falls
  - 10.2 Cross and head regulators
  - 10.3 Outlets

10.4 Canal Escapes

11. River Training Works

Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

12. Water Logging and Drainage and Ground Water Re-charge

12.1 Definition of water logging – its causes and effects, detection, prevention and remedies

12.2 Surface and sub-surface drains and their layout

12.3 Concept and various techniques used for ground water re-charge