

COURSE TITLE : IRRIGATION ENGINEERING
COURSE CODE : 4002
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/SEMESTER : 90
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
I	Nature and Scope of Irrigation, Water Requirement of Crop, Hydrology	22
II	Head Works and Weirs	22
III	Storage Works	22
IV	Distribution Works, Soil Erosion	24
	TOTAL	90

OBJECTIVES

Upon completion of the course the student should be able to

MODULE I

1.1.0 Understand basic methods of irrigation and water requirement of crop

- 1.1.1 Define the term Irrigation
- 1.1.2 States the necessity for irrigation
- 1.1.3 List advantages and disadvantages of irrigation
- 1.1.4 List the various types of irrigation
- 1.1.5 Distinguish between (a) Perennial and inundation irrigation (b) Flow and lift irrigation (c) Storage and direct irrigation

1.2.0 Understand about the water requirement for crops

- 1.2.1 State principal crops in India and their seasons (Rabi & Khaif)
- 1.2.2 State different methods of expressing duty
- 1.2.3 State the relationship between duty and delta.
- 1.2.4 Derive the relation between Duty, Delta and Base period.
- 1.2.5 State the factors affecting duty and Delta
- 1.2.6 Solve simple problems on duty
- 1.2.7 Define Duty, Delta, Base period, Crop Period.

1.3.0 Estimate run off and maximum flood discharge of a catchment

- 1.3.1 Define terms-catchment, intercepted catchment
- 1.3.2 Explain the methods of measuring rainfall with rain gauges
- 1.3.3 State the characteristics of good, average and bad catchment
- 1.3.4 Explain the method of estimating average rainfall over a catchment
- 1.3.5 State the factors affecting run-off
- 1.3.6 Describe gauge, gauge well and automatic water level recorder
- 1.3.7 List the factors for selecting suitable site for a rain gauge station
- 1.3.8 Explain the methods of measuring velocity by floats, velocity rod and current meters
- 1.3.9 Explain the methods of computing maximum flood discharge from daily rainfall records, Ryve's and Dicken's formulae H.F.L marks, gauge readings.

MODULE II

2.1.0 Understand head works for a diversion scheme and protective works for resisting percolation

- 2.1.1 State the classification of head works and their suitability under different conditions
- 2.2.2 List the factors to be considered for selection of site for diversion works.
- 2.1.3 Describe with sketch the general layout of diversion works, showing its component parts.
- 2.1.4 Describe with sketch the component parts of a weir
- 2.1.5 Explain terms: percolation, percolation gradient, up lift, velocity of percolation, creep length, scour.

MODULE III

3.1.0 Understand reservoirs and gravity dams

- 3.1.1 State the different types of dams
- 3.1.2 Explain factors influencing selection of site and surveys required for reservoirs and dams.
- 3.1.3 Explain terms: full reservoir level, maximum water level, top bund level dead storage, live storage, free board, gravity dam, spill way.
- 3.1.5 List forces acting on a gravity dam.
- 3.1.4 Distinguish between low and high dams
- 3.1.5 Explain with sketch the practical profile of a low dam
- 3.1.6 Describe with sketch drainage gallery, construction joints and their functions
- 3.1.7 Explain with sketch different types of spillways.
- 3.1.8 Define saturation gradient, phreatic line.
- 3.1.9 Explain three types of earth dams with sketches of typical cross sections.
- 3.1.10 Explain the causes of failure of earth dams and preventive measures.
- 3.1.11 Briefly explain the drainage arrangements of an earth dam.

3.2.0 Regulating arrangements

- 3.2.1 Describe with sketches the head well and tower head types of tank sluices and regulating arrangements
- 3.2.2 Describe with sketches flush escape, the different types of surplus weirs.

MODULE IV

4.1.0 Understand basic ideas about canals, cross masonry and cross drainage works

- 4.1.1 State classification of canals.
- 4.1.2 Sketch typical cross section of canal in cutting, partial cutting and partial embankment
- 4.1.3 Explain terms: balanced depth of cutting, regime channel.
- 4.1.4 Explain the necessity and types of canal linings.
- 4.1.5 Explain maintenance required for canal and their regulation.
- 4.1.6 Explain with sketches – canal sluices, drops and escapes and their functions.
- 4.1.7 Describe with sketches aqueduct. Super passage, under tunnel, siphon level crossing, inlet and outlet .
- 4.1.8 Define the term berms .
- 4.2.0 **Understand the causes of soil erosion and methods of prevention of soil erosion**
- 4.2.1 Explain term: soil erosion.
- 4.2.2 Explain causes and effects of soil erosion
- 4.2.3 Explain methods of prevention of soil erosion
- 4.2.4 Explain various modes/methods of irrigation

COURSE CONTENT

MODULE I

Nature and Scope of Irrigation Engineering

Definitions – necessity of irrigation – advantages and disadvantages – perennial and Inundation irrigation – flow and lift irrigation – direct and storage irrigation.

Water requirement of crop

- a)Principle Crops – Kharif and Rabi Crops in India & Kerala – Dry and wet crops – Crop period
- b.) Duty – different methods of expressing duty – base period – relationship between duty and delta -

Factors affecting duty – requirements for precise statement of duty – duty figures for principal crops
– Simple problems on duty.

Hydrology

- a) Rainfall – Types of rain gauges – precautions in setting and maintaining rainfall records – rainfall cycle – average annual rainfall of an area – Methods of estimating average rainfall over a catchment – Thiessen's polygon method.
- b) Catchment basin and catchment area – free catchment, intercepted catchment – runoff – factors Affecting runoff – nature of catchment, runoff coefficient – methods of estimating runoff – empirical formulae.
- c) River gauging – importance – site selection – open gauge well – measurement of velocity by surface floats, velocity rods and current meter
- d) Maximum flood discharge from rainfall records Ryve's and Dicken's formulae, H.F.L marks, Gauge reading

MODULE II

Head works

- a) Classification of head works – storage and diversion head works – their suitability under different conditions – suitable site for diversion works – general layout of diversion works- brief description of component parts of a weir.
- b) Barrage and weirs
- c) Head Regulator – scouring sluice – flood banks and other protective works (only description)
- d) Percolation – percolation gradient – up lift pressure, effect of percolation on irrigation works, up lift pressure and exit velocity – scour – protective works – solid and loose aprons.

MODULE III

- a. Dams – types – selection of site – site investigations – capacity of reservoirs from contours – dead storage – live storage
- b. Evaporation – Evaporation losses in reservoirs (only brief description)
- c. Dams – rigid and non-rigid dams – main types – gravity dams – failure of gravity dams and remedial measures – elementary profile – limiting height of dam – low dam and high dam – free board and top width – practical profiles of low dam — drainage gallery – spill ways (only brief description)
- d. Earth dams – situations suitable for earth dams – types of earth dams – causes of failure of earth dams and precautions - saturation gradient and (phreatic) line – drainage arrangements –
- e. Tank sluices – tower head type – regulating arrangements. (Brief explanation and diagram only)
- f. Tank surplus works – necessity – suitable site – flush escapes – weirs (brief description only)

MODULE IV

Distribution works

- a) Canals – classification – typical cross section of canal in cutting, embankment, partial cutting and embankment – berms – standard dimensions – balancing depth of cutting- canal lining – types – maintenance of canals.(Only in brief)
- b) Canal regulation – sluice – drops – escapes
- c) Cross drainage works – necessity – general description of aqueducts – super passage, under tunnel - siphon – level crossing – inlet and outlet. (Brief explanation and diagram only)
- d) Soil erosion – methods of prevention of soil erosion

Methods of irrigation– border irrigation – check- basin irrigation – furrow irrigation – sprinkler irrigation - drip irrigation.

REFERENCE BOOKS

1. Irrigation Engineering – B.C. Punmia, Laxmi Publishing Co:
2. Irrigation Engineering – Modi & Sethi, Standard Publishing House
3. Irrigation Engineering – S.K.Garg, Khanna Publishers.
4. Irrigation Engineering & Water Power Engg.,- Birdi, Standard Publishing House