COURSE TITLE : IRRIGATION ENGINEERING

COURSE CODE : 4012
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/SEMESTER: 65
CREDITS : 4

TIME SCHEDULE

Module	Topics	Period
1	Fundamentals of irrigation & Hydrology Water requirements of crops	18
2	Diversion Head works	16
3	Storage Head works	16
4	Irrigation canals &Soil Erosion	15
TOTAL		65

COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Know the importance of irrigation
	2	Understand the Principles involved in fixing the capacity of irrigation scheme
	3	Comprehend on hydrology
2	1	Understand diversion head works and its component parts
	2	Comprehend on the storage head works
	3	Know the design principles of gravity dam and earth dam and their component parts
3	1	Understand the details of irrigation canals and cross drainage works
	2	Identify the causes of soil erosion and methods of prevention

SPECIFIC OUTCOME

Upon completion of the study, the student should be able to:

MODULE –I

1.1.0 Understand the 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 & Kharif)
1.2.2 State different methods of expressing duty
1.2.3 Define Duty, Delta, Base period, Crop Period.
1.2.4 State the relationship between duty and delta.

1.3.0 Apply the concept of water requirements

1.3.1 Derive the relation between Duty, Delta and Base period.
1.3.2 State the factors affecting duty and Delta
1.3.3 Solve the problems on duty

1.4.0 Understand the runoff and maximum flood discharge of a catchment

1.4.1 Define the terms rain fall, run-off
1.4.2 State the factors affecting run-off
1.4.3 List the factors for selecting suitable site for a rain gauge station
1.4.4 Explain the methods of measuring rainfall with rain gauges
1.4.5 Explain the setting and maintaining rain gauge stations
1.4.6 Define terms-catchment, intercepted catchment
1.4.7 State the characteristics of good, average and bad catchment
1.4.8 Explain the method of estimating average rainfall over a catchment
1.4.9 Describe gauge, gauge well and automatic water level recorder
1.4.10 Explain the methods of measuring velocity by floats, velocity rod and current meters
1.4.11 Describe the maximum flood discharge from rainfall records by Ryves and Dickens formula.
1.4.12 Explain H.F.L marks, and gauge reading

MODULE II

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

2.1.1 Classify the head works and their suitability under different conditions
2.1.2 Identify the suitable site for diversion works
2.2.3 List the factors to be considered for selection of site for diversion works.
2.1.4 Describe with sketch the general layout of diversion works, showing its component parts.
2.1.5 Describe with sketch the component parts of a weir
2.1.6 Distinguish between barrage and weirs, Head regulator and Scouring sluice
2.1.7Desribe the flood banks and other protective works
2.1.8 Explain the percolation, Percolation gradient, Up-lift pressure, Exit velocity, scour, solid and loose aprons
2.1.9 Describe the effect of percolation on irrigation works

MODULE- III

3.1.0 Understand the reservoirs and gravity dams

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

3.2.0 Understand the 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 the basic ideas about canals, cross masonry and cross drainage works

4.1.1 State classification of canals.
4.1.2 Define the term berms .
4.1.3 Sketch typical cross section of canal in cutting, partial cutting and partial embankment
4.1.4 Describe terms: balanced depth of cutting, regime channel.
4.1.5 Describe the necessity and types of canal linings.
4.1.6 Describe maintenance required for canal and their regulation.
4.1.7 Describe with sketches – canal sluices, drops and escapes and their functions.
4.1.8 Describe with sketches aqueduct. Super passage, under tunnel, siphon level crossing, inlet and outlet

4.2.0 Know the causes of soil erosion and methods of prevention of soil erosion

4.2.1 Define term soil erosion.
4.2.2 Describe causes and effects of soil erosion
4.2.3 Describe methods of prevention of soil erosion

CONTENT DETAILS

MODULE - I

Fundamentals of Irrigation and Hydrology: Basic methods of irrigation, Nature and Scope of Irrigation Engineering: Definition of irrigation – 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 -Run off and maximum flood discharge of a catchment: a) Rainfall – Types of rain gauges –Factors for selecting suitable site for rain gauge station. precautions in setting and maintaining rainfall records – rainfall cycle – average annual rainfall of an area –Methods of estimating average rainfall over a catchment- Thiess's polygon method. b)Catchment basin and catchment area, Characteristics of catchment-good, average, bad – 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

Diversion 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

Storage head works:

a. Dams – types – selection of site-types of survey for site selection – Factors influencing in site selection- site investigations – Describe the terms – full reservoir level, maximum water level, top bund level, dead storage, live storage, free board.

b. Evaporation – Evaporation losses in reservoirs (only brief description)

c. Dams – rigid and non-rigid dams – main types – gravity dams-forces acting on a gravity dam – failure of gravity dams and remedial measures – elementary profile – limiting height of dam – low dam and high dam – free board and top width – sketch practical profiles of low dam –– drainage gallery – construction joints and their functions - 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 of an earth dam.

e). Tank sluices – head wall, tower head type – regulating arrangements. (Brief explanation and diagram only. Tank surplus works – necessity – suitable site – flush escapes – surplus weirs (brief description only)

MODULE -IV

Irrigation canals and soil erosion: Distribution works.

a) Canals – classification – typical cross section of canal in cutting, embankment, partial cutting and embankment – berms – standard dimensions – balancing depth of cutting- regime channel, necessity and types of canal lining – maintenance of canals.(Only in brief).

b) Canal regulation – sluice – drops – escapes and their functions,

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 – causes and effects of soil erosion, methods of prevention of soil erosion.

REFERENCE BOOKS

1. B.C. Punmia : Irrigation Engineering ; Laxmi Publishing Co:
2. Modi & Sethi : Irrigation Engineering ; Standard Publishing House
3. S.K.Garg : Irrigation Engineering ; Khanna Publishers.
4. B S Birdi : Irrigation Engineering & Water Power Engg ; Standard Publishing House
5. N.N. Basak : Irrigation Engineering ; McGraw Hill Publishing