Subject Name: IRRIGATION ENGINEERING 4 (3+1)

COURSE OUTLINE

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Module 1: Water Resources Utilization & Irrigation Development

Lesson 1: Water Resources of India and its Demand in Various Sectors

1.1 Definition
1.2 Purpose of Irrigation
1.3 Sources of Water
1.4 Present status, Development and Utilization of Water Resources

Lesson 2: Irrigation Development

2.1 Irrigation Development
2.2 Plan Development
2.3 Irrigation Potential Created and Utilized
2.4 Causes for Gap in Potential Created and Utilized

Lesson 3: Irrigation Projects

3.1 Irrigation Projects
3.2 Irrigation Projects Classification
3.3 Some of the Major Irrigation Projects
3.4 Environmental Impact of Irrigation Projects

Lesson 4: Environmental Impact Assessment & Inter Basin Water Transfer

4.1 Environmental Impact Assessment
4.2 Inter Basin Water Transfer

Module 2: Measurement of Irrigation Water

Lesson 5: Methods of Water Measurements in Open Channels

5.1 Units of Water Measurement
5.2 Volume Methods of Water Measurement

Lesson 6: Weirs

6.1 Introduction
6.2 Classification of Weirs

6.3 Rectangular Weirs
6.4 Cipoletti Weirs
6.5 V-notch Weir
6.6 Operation & Limitation

Lesson 7: Flumes

7.1 Parshall Flume
7.2 Cut-throat Flume

Lesson 8: Orifices

8.1 Free Flow Orifice
8.2 Submerged Orifice

Lesson 9: Water Flow Measurement in Pipes

9.1 Difference between Pipe Flow and Open Channel Flow
9.2 Venturimeter
9.3 Pitot Tube

Lesson 10: Pipe Orifice, Water Meter and Propeller Meter

10.1 Pipe Orifice
10.2 Water Meter
10.3 Propeller Meter

Module 3: Irrigation Water Conveyance Systems

Lesson 11: Open Channels

11.1 Open Channels
11.2 Types of Open Channels
11.3 Types of Open Channel Flow
11.4 Sate of Flow
11.5 Seepage in Canals and Field Channels
11.6 Measurement of Seepage in Canals
11.7 Materials for Lining Canals and Field Canals

Lesson 12: Design of Open Channel

12.1 Introduction
12.2 Discharge Capacity of a Channel
12.3 Economical Section of a Channel
12.4 Energy Depth Relationship
12.5 Velocity Distribution in a Channel Section

Lesson 13: On-Farm Structures for Water Conveyance

13.1 Drop Structures
13.2 Chute Spillways
13.3 Pipe Drop Spillways

Lesson 14: Structures for Diversions and Channel Crossings

14.1 Check Gates
14.2 Portable Check Dams
14.3 Turnouts
14.4 Siphon Tubes
14.5 Flumes
14.6 Culverts
14.7 Inverted Siphons

Lesson 15: Underground Pipeline Systems

15.1Advantages of underground pipeline system
15.2 Low-head pipelines
15.3 Types of irrigation water conveyance pipeline system
15.4 Pressure variations in irrigation pipe lines
15.5 Components of underground pipelines
15.6 Underground pipeline materials

Lesson 16: Design and Operation of Underground Pipeline System

16.1 Design of Underground Pipeline Systems
16.2 Laying out of Underground Pipeline System
16.3 Operation and Maintenance of Underground Pipeline Systems

Module 4: Land Grading Survey and Design

Lesson 17: Land Grading Survey and Design

17.1 Land Levelling
17.2 Leveling Layout of Field for Irrigation and Drainage Systems
17.3 Survey and Staking

Lesson 18: Land Leveling Methods

18.1 Plane Method
18.2 Profile Method
18.3 Plan Inspection Method
18.4 Contour Adjustment Method

Lesson 19: Contour Bench Leveling and Earthwork Quantities Computation

19.1 Contour Bench Leveling

19.2 Earthwork quantities computation

Lesson 20: Equipment for Land Grading

20.1 Equipments Operated with Animal Power
20.2 Equipments Operated with Mechanical Power
20.3 Laser Guided Land Levelling

Module 5: Soil –Water – Atmosphere – Plants Interaction

Lesson 21: Soil Water

21.1 Introduction
21.2 Soil Water Relations
21.3 Kinds of Soil Water

Lesson 22: Infiltration

22.1 Infiltration Process
22.2 Infiltration Equations
22.3 Measurement of Infiltration
22.4 Factors Affecting Infiltration

Lesson 23: Soil Water Movement

23.1 Types of Water Movement
23.2 Soil Water Movement in Saturated Condition
23.3 Unsaturated Water Movement
23.4 Hydraulic Conductivity

Lesson 24: Soil Water Constants

24.1 Soil Moisture Constants
24.2 Soil Water Potential
24.3 Soil Moisture Measurement Methods

Lesson 25: Evapotranspiration

25.1 Evaporation and Transpiration
25.2 Concept of Reference Crop Evapotranspiration
25.3 ET Estimation Methods
25.4 Crop Evapotranspiration

Lesson 26: Crop Water Requirement

26.1 Crop Water Requirement
26.2 Methods of Crop Water Requirement Determination

Lesson 27: Irrigation Scheduling

27.1 Irrigation Scheduling Concept
27.2 Methods of Irrigation Scheduling

Lesson 28: Irrigation Efficiency

28.1 Definition of Various Efficiencies
28.2 Irrigation Uniformity
28.3 Deep Percolation Ratio and Tail Water Ratio
28.4 Overall Project Efficiency

Module 6: Surface Irrigation Methods

Lesson 29: Surface Irrigation

29.1 Introduction
29.2 Surface Irrigation Process (Hydraulic Phases)
29.3 Factors Affecting Performance of Surface Irrigation
29.4 Intake Opportunity Time

Lesson 30: Surface Irrigation Methods

30.1 Surface Irrigation Methods
30.2 Furrow Irrigation Method
30.3 Criteria for Surface Irrigation Method Selection

Lesson 31: Surface Irrigation Hydraulics

31.1 Flow Regimes and Models
31.2 Volume Balance Concept
31.3 Advance Time Determination
31.4 Intake Opportunity Time Determination

Lesson 32: Furrow Irrigation System

32.1 General Adoptability
32.2 Furrow Irrigation Design Consideration

Lesson 33: Border Irrigation System

33.1 General Adoptability
33.2 Design Consideration
33.3 Design of Border Irrigation System

Lesson 34: Basin Irrigation System

34.1 General Adoptability
34.2 Design Consideration
34.3 Hydraulics of Check Basin

Module 7: Pressurized Irrigation

Lesson 35: Sprinkler Irrigation

35.1 Critical Appraisal of the Adaptability of Sprinkler Irrigation
35.2 Advantages and Limitations of Sprinkler Irrigation
35.3 Scope and Status of Sprinkler Irrigation in India

Lesson 36: Types and Components of Sprinkler System

36.1 Types of Sprinkler System
36.2 Components of Sprinkler System

Lesson 37: Design of Sprinkler Irrigation System – I

37.1 General Consideration
37.2 Inventory of the Land and Water Resources
37.3 Types of Sprinkler Systems Layout
37.4 Sprinkler System Design Parameters

Lesson 38: Design of Sprinkler Irrigation System – II

38.1 Hydraulic Design of Pipe Network
38.2 Pumps and Power Units

Lesson 39: Application of Fertilizers and Chemicals through Sprinkler System

39.1 Advantages of Fertigation / Chemigation
39.2 General Points Consideration for Fertigation
39.3 Fertigation/Chemigation Devices
39.4 Dosing Patterns
39.5 Prevention and Precautions
39.6 Fertilizer Quantity Computation

Lesson 40: Evaluation of Rotating Head Sprinklers and Operation of Sprinkler System

40.1 Evaluation of a Sprinkler Head
40.2 Moisture Distribution Pattern and Uniformity of Coverage
40.3 Uniformity of Coverage
40.4 Operation and Maintenance
40.5 Common Troubles and Remedies in Operation of Sprinkler System

Lesson 41: Drip Irrigation

41.1 Introduction
41.2 Advantages and Limitations of Drip Irrigation
41.3 Critical Appraisal of the adaptability of drip irrigation
41.4 Scope and Status of Drip Irrigation in India

Lesson 42: Components of Drip Irrigation System-I

42.1 Introduction
42.2 The Source
42.3 The Pumping Devices
42.4 The Pipe Network
42.5 Control and Monitoring Devices
42.6 Control Head
42.7 Emitters

Lesson 43: Description of Drip System Components and their Selection-II

43.1 Fertigation
43.2 Filtration System
43.3 Selection of Emitters
43.4 The Flow Characteristics of the Emitters

Lesson 44: Planning and Design of Drip Irrigation System

44.1 Inventory of Resources and Data Collection
44.2 Peak Crop Water Requirement
44.3 Layout of the drip Irrigation System
44.4 Selection of Emitters
44.5 Hydraulic Design of Pipe Network
44.6 Horsepower Requirement of Pump

Lesson 45: Evaluation of Drip Emitters and Design of Drip Irrigation System

45.1 Performance Evaluation of Drip Emitters
45.2 Evaluation of Emission Uniformity
45.3 Design of Drip Irrigation System

Lesson 46 Installation, Operation and Maintenance of Drip Irrigation Systems

46.1 Installation
46.2 Operation of Drip Irrigation System
46.3 Maintenance of Drip Irrigation System

Module 8: Economic Evaluation of Irrigation Project and Participatory Irrigation Management

Lesson 47: Project Planning and Financial Analysis of Irrigation Project

47.1 Project Planning
47.2 Financial Analysis of an Irrigation Project
47.3 Irrigation Project Costs
47.4 Basic Concepts and Terminologies in Economic Analysis

Lesson 48: National Water Policy and Participatory Irrigation Management

48.1 National Water Policy (NWP)
48.2 Water Distribution in Canal Irrigation Systems
48.3 Participatory Irrigation Management (PIM)
48.4 People's Participation in Managing Irrigation System in India