

16CE305 WATER RESOURCES ENGINEERING - I

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
48	15	-	20	48	6	12	3	2

Course Description and Objectives:

This course offers an introduction to essential concepts, theories and design aspects of Hydrology, Ground water and Irrigation engineering. The objectives of this course describes components of hydrologic cycle, rainfall – runoff calculations with Hydrograph analysis and unit quantifies of ground water movement and introduces irrigation and its methods.

Course Outcomes:

The Students will be able to:

- *understand hydrologic cycle, its components and hydrograph analysis.*
- *understand the different methods of estimation of rainfall and runoff.*
- *understand calculation of water requirement of crops and planning an irrigation system.*
- *design irrigation canals and canal network.*

SKILLS:

- ✓ *Estimate the quantity of water available.*
- ✓ *Estimate irrigation requirement.*
- ✓ *Design of safe irrigation canals.*
- ✓ *Design safe diversion head works.*

UNIT - 1**L-9, T-3**

HYDROLOGY: Hydrologic cycle, Precipitation types, Rain gauges, Computation of average rain fall over a basin, Run off, Factors affecting run off, Computation of run-off, Estimation of maximum rate of run-off.

HYDROGRAPHS: Hydrograph analysis, Unit hydrograph, S-hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration, Application of unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall, Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration.

UNIT - 2**L-9, T-3**

GROUND WATER: Introduction, Aquifer, Aquicludes, Aquifuge, Specific yield, Specific retention, Divisions of sub-surface water, Water table, Types of aquifers, Well hydraulics, Steady radial flow to a well, Dupuit's theory for confined and unconfined aquifers, Yield of an open well - Constant level pumping test, Recuperation test.

INTRODUCTION TO IRRIGATION: Definition, Necessity, Scope of irrigation science, Benefits of irrigation, Ill-effects of irrigation, Types of irrigation.

METHODS OF IRRIGATION: Methods of applying water to crops, Uncontrolled or wild flooding, Free flooding, Contour laterals, Border strip method, Check flooding, Basin flooding, Zig zag method, Furrow method, Contour Farming, Sub-surface irrigation, Sprinkler irrigation, Drip irrigation.

UNIT - 3**L-9, T-3**

WATER REQUIREMENT OF CROPS: Functions of irrigation water, Classes and availability of soil water, Saturation capacity, Field capacity, Wilting point, Available moisture and readily available moisture, Moisture equivalent, Soil moisture deficiency, Limiting soil moisture conditions, Depth and frequency of irrigation, Duty and Delta, Base period, Relation between Duty and Delta, Factors affecting Duty, Methods of improving Duty, Gross command area, Culturable command area, Culturable cultivated and uncultivated area, Kor depth and Kor period, Consumptive use of water (Evapo – Transpiration), Irrigation efficiencies – Water conveyance efficiency, Water application efficiency, Water distribution efficiency and Consumptive use efficiency; Determination of irrigation requirements of crops, Assessment of irrigation water.

UNIT - 4**L-9, T-3**

IRRIGATION CHANNELS - SILT THEORIES & DESIGN PROCEDURE : Classification, Canal alignment, Cross section of an irrigation channel, Balancing depth, Borrow pit, Spoil bank, Land width, Silt theories–Kennedy's theory, Lacey's regime theory, Kennedy's method of channel design, Silt supporting capacity according to Kennedy's theory, Use of Garret's diagram in channel design; Lacey's theory applied to channel design, Use of Lacey's regime diagrams, Comparison of Kennedy's theory and Lacey's theory, Sediment transport.

WATER LOGGING: Water logging, Effects of water logging, Causes of water logging, Remedial measures, Losses in canal, Land drainage, Tile drains, Lining of irrigation channels necessity, advantages and disadvantages.

UNIT - 5**L-9, T-3**

DIVERSION HEAD WORKS: Component parts of a Diversion Head works, Types of weirs, Causes of failure of weirs and their remedies, Design of weirs–Bligh's creep theory, Lane's weighted creep theory and Khosla's theory, Silt control at head works.

CANAL OUTLETS AND REGULATION WORKS: Types of outlets, Non- modular outlets, Semi-module outlets, Rigid modules, Canal falls, Necessity and location of falls, Development of falls, Classification of falls, Canal regulators, Off-take alignment, Head regulators and cross-regulators, Canal escape

ACTIVITIES:

- *Construction of flood hydrograph resulting from rainfall of unit duration for a given area.*
- *Find out the parameters for Guntur aquifers using the data from Central Ground Water Board, Ministry Of Water Resources, Government Of India; Ground Water Brochure, Guntur District, Andhra Pradesh.*
- *Calculate water requirements of crops for Guntur.*
- *Design of an irrigation channel cross section using Kennedy's theorem and Lacey's theorem.*

TEXT BOOKS:

1. B. C. Punmia and P. B. B. Lal, "Irrigation and Water Power Engineering", 12th edition, New Delhi, Laxmi Publications Pvt. Ltd., 1992.
2. S. K. Garg, "Irrigation Engineering and Hydraulic Structures", 23rd edition, New Delhi, Khanna Publishers, 2009.

REFERENCE BOOKS:

1. P. N. Modi, "Irrigation, Water Resources and Water Power Engineering", 7th edition, New Delhi, Standard Book House, 2008.
2. K. Subramanya, "Engineering Hydrology", 3rd edition, New Delhi, Tata McGraw Hill, 2010.