WATER RESOURCES ENGINEERING- I

Course Code: 13CE1119

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Course Educational Objectives:

- To provide necessary background for understanding the occurrence and movement of water in hydrosphere and able to estimate and analyze the rain fall data.
- To enable the student to understand the water requirement for different crops and design suitable channel for conveying water to the fields.

Course Outcomes:

- Student will demonstrate the ability to measure various hydrology components and develop unit hydrographs for different catchments to estimate the flood discharges.
- Student will have the confidence in using modern water application methods to the irrigation fields.

UNIT-I (10 Lectures)

HYDROLOGY:

Introduction to Engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data and estimation of missing precipitation data.

Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation – evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT-II (12 Lectures)

DESCRIPTIVE HYDROLOGY AND HYDROGRAPH ANALYSIS:

Runoff-components of runoff, factors affecting runoff, computation of runoff- Infiltration method and rational method, Stream gauging: Necessity, selection of gauging sites, methods of measurement of depth, velocity and discharge. Hydrograph analysis - base flow separation, effective rain fall, Unit Hydrograph- definition, limitations and applications, derivation of Unit Hydrograph, S-hydrograph, IUH, Synthetic Unit Hydrograph (concept only).

UNIT-III (12 Lectures)

GROUND WATER:

Ground water - Occurrence, types of aquifers, aquifer parameters-porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, radial flow to wells in confined and unconfined aquifers, Determination of hydraulic properties of aquifers, Yield of an open well- constant level pumping test, recuperation test.

UNIT-IV (14 Lectures)

IRRIGATION AND WATER REQUIREMENT OF CROPS:

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, Crop seasons in India, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies, determination of irrigation requirements of crops.

UNIT-V (12 Lectures)

DESIGN OF CHANNELS:

Classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, Lining of irrigation channels-necessity, advantages and disadvantages, Types of lining, design of lined canal.

TEXT BOOKS:

1. Jayaram Reddy, *"Engineering Hydrology"*, 2nd Edition, Laxmi publications Pvt. Ltd., New Delhi reprint 2008.
2. B.C.Punmia, B.B.L. Pande, Ashok K.R. Jain, Arun K.R. Jain, *"Irrigation & Water Power Engineering"*, 16th Edition, Laxmi Publications (P) Ltd., New Delhi, 2009.
3. R.K.Sharma & T.K. Sharma, *"Hydrology and Water Resource Engineering"*, 5th Edition, Dhanapati Rai Publications, 2000.
4. K Subramanya, *"Engineering Hydrology"*, Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2008.

REFERENCES:

1. V.P.Singh, *"Elementary Hydrology"*, 2nd Edition, PHI Publications, Prentice Hall, 1992.
2. P.N.Modi, *"Irrigation, Water Resources & Water Power Engineering"*, 2nd Edition, Standard Book House, Rajsons Publications Pvt. Ltd., 2008.
3. D.K.Majumdar, *"Irrigation Water Management"*, 3rd Printing, Prentice Hall of India, 2004.
4. S.K Garg, *"Irrigation engineering and hydraulic structures"*, 24th Edition, Khanna publishers, 2012.