

3/4 B.Tech. FIFTH SEMESTER

CE5T3

WATER RESOURCES ENGINEERING-I

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Pre-requisites: Environmental science, fluid mechanics, hydraulics and hydraulic machinery

Learning objectives:

- To become conversant with principles and practice of Irrigation engineering.
- To be aware of the occurrence, movement and augmentation of surface water and ground water.

Course outcomes:

At the end of the course the student will have:

1. Ability to determine and analyze various components of hydrologic cycle
2. Capability to apply hydrograph methods to estimate runoff and flood routing methods.
3. Ability to evaluate the groundwater yield.
4. Skill to apply the various irrigation methods to the fields and apply the irrigation management practices.
5. Capability to design irrigation canals in alluvial soils

UNIT I

HYDROLOGIC CYCLE

Engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, and computation of average rainfall over a basin, processing of rainfall data. Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-evapotranspiration-Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff-components of runoff, factors affecting runoff, stream gauging, effective rainfall.

UNIT-II

HYDROGRAPH

Hydrograph, separation of base flow. Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph, S-hydrograph, IUH, Synthetic Unit Hydrograph.

FLOOD ROUTING

Design Discharge, Computation of design discharge-rational formula, SCS method, flood frequency analysis-Gumbel's method, log Pearson III method, basic concepts of flood routing-hydraulic and hydrologic routing, channel and reservoir routing.

UNIT-III

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.

UNIT-VI

IRRIGATION

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, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies

UNIT-V

CANALS

Classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

Learning resources:

Text books:

1. A text book of Engineering Hydrology, (3rd edition) by Jayarami Reddy, Bangalore University Science Press, 2011.
2. Irrigation and water power engineering, (16th edition) by Punmia, B.C. Laxmi Publications pvt. Ltd., New Delhi, 2010.

Reference books:

1. Elementary hydrology by Singh V.P., PHI Publications, 2012.
2. Irrigation and Water Resources & Water Power, (7th edition) by Modi, P.N., Standard Book House, 2008.
3. Irrigation Water Management by Majundar, D.K., Prentice Hall of India, 2009.

e-learning resources:

NPTEL