JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OFCIVIL ENGINEERING

III Year – I Semester		L	T	P	C
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WATER RESOURCES ENGINEERING - I					

Course Learning Objectives:

The course is designed to

- Understand the hydrologic cycle and its relevance to Civilengineering
- make the students understand physical processes in hydrology and, components of the hydrologiccycle
- appreciate concepts and theory of physical processes andinteractions
- learn measurement and estimation of the components hydrologiccycle.
- provide an overview and understanding of Unit Hydrograph theory and itsanalysis
- understand flood frequency analysis, design flood, floodrouting
- appreciate the concepts of groundwater movement and wellhydraulics

Course Outcomes

At the end of the course the students are expected to

- be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related designaspects
- develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulicstructures.
- ability to develop design storms and carry out frequencyanalysis
- be able to determine storage capacity and life ofreservoirs and develop unit hydrograph and synthetic hydrograph.
- be able to estimate flood magnitude and carry out flood routing.
- be able to determine aquifer parameters and yield ofwells.
- Ability to develop the hydrological models.

UNIT I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, raingauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II Abstractions from Precipitation: Initial abstractions.
Evaporation: factors affecting, measurement, reduction

Evapotranspiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices, inter flow

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UNIT-III Runoff: Catchment characteristics**,** Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.
Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

Hydrological models: Rainfall – Run off modeling, conceptual methods.

UNIT-IV Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.
Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT-V Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation-steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

Text Books:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), NewDelhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P)Ltd.
3. Sharma , S.K (2016) " Irrigation Engineering", S.chand publisher New Delhi.

References:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education PvtLtd, (2013),New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
3. Chow , V.T.Maidment,D.K and Mays L.W(2011). "Applied hydrology",Tata McGraw Hills Education Pvt ltd, New Delhi.
4. Mays L.W, Wiley India Pvt. Ltd,(2013). "Water Resources Engineering" Wiley India Pvt.Ltd.