III Year-II Semester
(20CE6760) Hydrology & Irrigation Structures

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre- Requisites: Fundamentals of Engineering Hydrology

Course Objectives:
The course is designed to make the students;
- Understand hydrologic cycle and its relevance to Civil engineering
- Learn physical processes and their interactions in hydrology
- Learn measurement and estimation of the components of hydrologic cycle
- Have an overview and understanding of Hydrographs
- Know the principles of design of weirs on permeable foundations
- Know the concepts for analysis and design of storage head works

UNIT-I:
Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.
Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, 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: Initial abstractions, Evaporation: factors affecting, measurement, estimation, reduction, Evapotranspiration: factors affecting, measurement, estimation, control, Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT-III:
Runoff: Factors affecting runoff, components, 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, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

UNIT-IV:
Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components, causes and failures of weirs on permeable foundations, Bligh's creep theory,Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT- V:
Dams: Types of dams, selection of type of dam, selection of site for a dam.
Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis.
Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates.

Course Outcomes:

S.No	Course Outcomes	BTL
1	Have a thorough understanding of the theories and principles governing the hydrologic processes and develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures	L2
2	Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects	L3
3	Develop design storms and carry out frequency analysis and Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects	L5
4	Plan and design diversion head works	L4
5	Analyse stability of gravity and earth dams and Design hydraulic ogee spillways	L4

Text Books:

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. 'Applied hydrology' by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt. Ltd, (2011), New Delhi.
4. 'Engineering Hydrology' by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).
5. Irrigation and Water Resources Engineering' by Asawa G L (2013), New Age International Publishers
6. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.
7. 'Irrigation Water Resources and Water Power Engineering' by Modi P N (2011), Standard Book House, New Delhi

Reference Books:

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology' by Raghunath. H.M., New Age International Publishers, (2010)
3. 'Engineering Hydrology – Principles and Practice' by Ponce V.M., Prentice Hall International, (1994)
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).