



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 602 WATER RESOURCES ENGINEERING					

Course Learning Objectives:

The course is designed to make the students,

1. Estimate irrigation water requirements.
2. Design irrigation canals
3. Understand hydrologic cycle and its relevance to Civil engineering.
4. Learn physical processes and their interactions in hydrology.
5. Learn measurement and estimation of the components of hydrologic cycle.
6. Have an overview and understanding of Hydrographs.

Course Outcomes:

At the end of the course the students are expected to

- a. Have a thorough understanding of the theories and principles governing the hydrologic processes.
- b. Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
- c. Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
- d. Develop design storms and carry out frequency analysis.
- e. Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
- f. Develop unit hydrograph and synthetic hydrograph.

Course Articulation Matrix:

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	1	2	-	-	-	-	1	2	-	3
CO2	2	3	1	2	2	-	-	-	-	-	-	1	3	-	1
CO3	3	3	3	1	2	1	1	-	-	-	-	1	2	-	3
CO4	2	3	1	2	2	-	-	-	-	-	-	1	3	-	1
CO5	3	2	3	2	2	1	2	-	-	-	-	1	1	-	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT – I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT-II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head



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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-III

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, rain gauge 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-IV

Abstractions: Initial abstractions, Evaporation: factors affecting, measurement, estimation, reduction, Evapotranspiration: factors affecting, measurement, estimation, control, Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

Runoff: Factors affecting runoff, components, empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

UNIT-V

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.

TEXTBOOKS:

1. 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2. 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi
3. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
4. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
5. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
6. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

REFERENCES:

1. 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T. K (2012), S. Chand & Co Publishers.
3. 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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