



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160610

Semester – VI

Subject Name: WATER RESOURCES ENGINEERING AND HYDROLOGY

Type of course: Professional Core Course of Civil Engineering

Prerequisite: Knowledge of hydrological cycle and its component, ground water hydrology, Basic ideas about floods, drought, hydropower plants and reservoir

Rationale:

1. To develop basic understanding about precipitation, infiltration, evapotranspiration, hydrograph, capacity of reservoir
2. To enable the students for estimation of runoff, infiltration, evaporation, floods and reservoir capacity
3. To create understanding about features of various types of dam

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	MODULE - I Hydrological Parameters: Hydrological cycle, Water balance concept, Climate and availability of water, types and forms of precipitation, Variability in rainfall, Measurement & Data analysis of precipitation, Evaporation and its measurement, Transpiration and its measurement, Measurement of Evapotranspiration, Potential and actual evapotranspiration, Penman Monteith method. Infiltration indices, Factors affecting infiltration, Horton's equation and Green Ampt method.	12
2	MODULE – II Runoff: Drainage basin and watershed characteristics, Types of runoff, Surface, subsurface flow, base flow. Hydrographic Analysis: Mass curve, Hyetograph, Hydrograph with types, assumptions, rationale and limitations of unit hydrograph, Derivation of unit hydrograph and its conversions, S- hydrograph and its uses, Snyder's Hydrograph, Flow duration curve and its uses.	15



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3	MODULE – III Groundwater Hydrology: Occurrence, Darcy’s law, Well hydraulics, Well losses, Yield, Pumping and recuperation test. Dams and Reservoirs: Types, Investigations, Site selection, Zones and levels of storage in reservoir, Safe and Design yield, Reservoir capacity, Reservoir sedimentation and control, Bed load, suspended load. Types of dams, Selection of type and site of dam, Information about major dams and reservoirs of India.	15
4	MODULE – IV Floods: Indian rivers and floods, Causes of floods, Alleviation and flood management, Levees and floodwalls, Floodways, Channel improvement works, Flood damage analysis. Flood Terminology and Hydrological Analysis: Design flood, Standard Project flood, Probable maximum flood, Flood estimation, Frequency analysis, Flood routing through reservoirs and open channels, Muskingham Routing. Hydel Power: Micro, Small, High generation plants, Low, Medium and High head plants, Power house components and Hydel schemes.	10
5	MODULE – V Drought Management and Water Harvesting: Definition of drought, Causes and types of drought, measures for water conservation and augmentation, drought contingency planning and execuion. Water harvesting: rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks, rooftop model of rainwater harvesting. Water Resources Planning and Management: Requirement of Water Resources schemes, Principles and objectives of Water resources planning. Levels in planning, Functional requirements of water resources projects, steps in water resources planning, Environmental aspects in water resources planning.	8

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15%	15%	15%	20%	20%	15%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. K. Subramanya, Engineering Hydrology, Tata McGraw Hill Pub. Co. New Delhi.



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2. C.S.P. Ojha, R. Berndtsson and P. Bhunya, Engineering Hydrology, Oxford University Press, New Delhi.
3. R.A. Wurbs and W.P. James, Water Resources Engineering, Prentice Hall of India, New Delhi.
4. R.K. Sharma and T.K. Sharma, Hydrology and Water Resources Engineering, Dhanpat Rai Publications, New Delhi.
5. H. M. Raghunath, Hydrology: Design, Principles and Analysis, New Age International Publishers.
6. R.K. Linsley, J.B. Franzini, D.L. Freyberg and G. Tchobanoglous, Water Resources Engineering, McGraw Hill Singapore.
7. V.P. Singh, Elementary Hydrology, Prentice Hall, Englewood Cliffs, New Jersey.
8. Ven Te Chow, D.R. Maidment and L.W Mays, Applied Hydrology, McGraw Hill International Edition, New York

Course Outcomes: At the end of the course, Student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Computation of mean precipitation from a catchment , infiltration rate and Infiltration Capacity	15
CO-2	Able to calculate runoff from a catchment and Compute peak flood flow	20
CO-3	Able to compute reservoir capacity using mass curve and dependable flow using flow duration curve for the requirement of irrigation, power generation etc.	15
CO-4	Develop basic idea about reservoir sedimentation, its control and Computing the capacity of well	20
CO-5	Estimation of design flood for the design of hydraulic structure and Measures of water conservation to battle drought	15
CO-6	Understanding the concepts of Water resources planning and its environmental aspects.	15

List of Experiments:

1. To determine rate of infiltration and infiltration capacity using double ring infiltrometer.
2. Measurement of rainfall



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3. Estimation of flood using unit hydrograph
4. Computation of rate of infiltration using infiltrometer
5. Computation of live and dead storage capacity of reservoir
6. Flood routing of reservoir and channel
7. Calculation of dependable flow.
8. Determination of capacity of well.
9. Calculation of power of a hydro-power plant

Major Equipment:

Double ring infiltrometer, rainfall simulator, rain gauges, models of various dams

List of Open Source Software/learning website:

1. <http://www.nptel.iitm.ac.in/courses/Hydrology>