GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL ENGINEERING
HYDROLOGY AND WATER RESOURCES ENGINEERING
SUBJECT CODE: 2150602
B.E. 5TH SEMESTER

Type of course: Water resources 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	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	MODULE – I Introduction, Hydrologic cycle, Climate and water availability, Water balances, Precipitation: Forms, Classification, Variability, Measurement, Data analysis, Evaporation and its measurement, Evapotranspiration and its measurement, Penman Monteith method. Infiltration: Factors affecting infiltration, Horton's equation and Green Ampt method.	**8**	20
2	MODULE – II Hyetograph and Hydrograph Analysis: Hyetograph, Runoff: drainage basin characteristics, Hydrograph concepts, assumptions and limitations of unit hydrograph, Derivation of unit hydrograph, S- hydrograph, Flow duration curve Groundwater: Occurrence, Darcy's law, Well hydraulics, Well losses, Yield, Pumping and recuperation test	**10**	20
3	MODULE – III Reservoir: Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control. Introduction to Dams	**12**	30

	Introduction and types of dams, spillways and ancillary works, Site assessment and selection of type of dam, Information about major dams and reservoirs of India Hydroelectric Power: Low, Medium and High head plants, Power house components, Hydel schemes.		
4	MODULE – IV Flood Management: Indian rivers and floods, Causes of floods, Alleviation, Leeves and floodwalls, Floodways, Channel improvement, Flood damage analysis. Hydrologic Analysis: Design flood, Flood estimation, Frequency analysis, Flood routing through reservoirs and open channels.	**8**	20
5	MODULE – V Drought Management and Water Harvesting: Definition of drought, Causes of drought, measures for water conservation and augmentation, drought contingency planning. Water harvesting: rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks.	**4**	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**20**	**15**	**20**	**15**	**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.
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. R.K. Linsley, J.B. Franzini, D.L. Freyberg and G. Tchobanoglous, Water Resources Engineering, McGraw Hill Singapore.
6. V.P. Singh, Elementary Hydrology, Prentice Hall, Englewood Cliffs, New Jersey.
7. Ven Te Chow, D.R. Maidment and L.W Mays, Applied Hydrology, McGraw Hill International Edition, New York

Course Outcome:

After learning the course the students should be able to:

1. Compute mean precipitation from a catchment
2. Compute infiltration rate and capacity
3. Calculate runoff from a catchment
4. Compute peak flood flow
5. Compute reservoir capacity using mass curve
6. Compute dependable flow using flow duration curve for the requirement of irrigation, power generation etc.
7. Basic idea about reservoir sedimentation and its control
8. Compute the capacity of well
9. Estimation of design flood for the design of hydraulic structure
10. Measures of water conservation to battle drought

List of Tutorials:

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

http://en.wikipedia.org/wiki/Hydrology

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.