GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering Syllabus

Subject Code : 3716501

Subject Name : Advanced Hydrology & Water Resources Engineering

WEF Academic Year :	2023 - 24
Semester :	1
Category of the Course :	Core I

Teaching and Examination Scheme :

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

Objective : To make the knowledge base of the student in Hydrology stronger and broader so that they can handle the design and analysis of the environmental systems with confidence.

Sr. No.	Topic	Teaching Hours
1	**MODULE 1 :** Rainfall data and its processing- frequency analysis-probability distribution and its application hydrology.-IDF Curves and DAD curves and its derivation and uses. Water losses-Infiltration-Hortans' and Green Ampt model runoff-Indices. Hydrograph-components- base flow separation- unit hydrograph- S and synthetic hydrograph. Case studies relating to water shed management.	14
2	**MODULE 2 :** Ground water flow and well hydraulics-Aquifer parameters-land subsidence due to over pumping- steady radial flow in to a well-well in uniform flow-steady flow with uniform charge-and steady flow in to a well confined, unconfined and leaky aquifers-well near aquifer boundaries-multiple well systems-partially penetrating wells --pumping tests. Non equilibrium for pumping test-Theis method.-Jacob's method-Chow's method. Salt water intrusion, ground water basin development, and Artificial recharge.	14

3	**MODULE 3 :** Open wells — Design of open well —yield test.- Methods of construction-dug wells. Tube wells, Design Screened wells , Selection of screen size yield of well, well lose, determination of well loss, by step pumping method, Test holes, well logs, shallow tube wells, drilling on rocks, screen installation well completion , well development, testing wells for yield, failure of tube wells, collector of radial wells, cavity wells and infiltration galleries.	14
4	**MODULE 4 :** Yield estimation: flow duration curve and mass curve —reservoir capacity and design. Hydrologic equation and water balance studies- flood routing studies. Floods-estimation: Empirical -Rational formula- hydrograph method- flood frequency analysis- Gumbel's and Log-pearson type III. Regression — Linear and non-linear - correlation- Methods of assessing error in hydrologic data and hydrologic computation. Modelling — Classification of models based various criteria — Physically based models —Classification of PDEs- Methods for solution — FDM —Explicit and Implicit equation -solution procedure for Laplace and Unsteady ground water flow equation- and FEM (Basic concepts only).	14

References :

1. Singh, V.P. *Elementary Hydrology.* Prentice Hall of India, New Delhi, 1994.
2. Chow , V.T., D.R. Maidment and L.W. Mays, *Applied Hydrology,* McGraw Hill Book company, Singapore, 1988.
3. McCuen, R. H. *Hydrologic analysis and design,* Prentice Hall, Eaglewood Cliffs, New Jersey, 1989.
4. Subramanya, K. Engineering Hydrology, Tata Mcgraw Hill, Newdelhi,1994.
5. Raghunath H.M..-Hydrology H.M Wiley Eastern Ltd Newdelhi,1985.
6. Raghunath H.M..- Groundwater , New Age International, 2007.
7. Ciriani T.A -Mathematical models for surface water hydrology.
8. Tood D. K.-Ground water hydrology, Wiley Eastern.
9. Viessman,L and Knapp.-Introduction to hydrology.
10. Duggal and Soni, Elements of Water Resources Engineering, New Age International, 1996.
11. Garg S.P, Ground water and tube wells, Oxford &IBH Newdelhi, 1982.
12. Mutreja K. N. ": Applied Hydrology ", Mcgraw hill Education India Pvt. Ltd.

Course Outcomes :

After completion of this course , student will be able to

Sr. No.	CO Statement
CO-1	Computation of mean precipitation from a catchment , infiltration rate and Infiltration Capacity.
CO-2	Calculate various aquifer properties and safe yield.
CO-3	Design tube wells of different types and open wells.
CO-4	Calculate required reservoir capacity and carry out flood routing.
CO-5	Carry out the modeling for surface and ground water flow phenomena.

List of Analysis Practicals :

1. Rainfall Data Analysis
2. Infiltration analysis Hortons Equation Single and double wall Infiltrometer
3. Rainfall simulator
4. Artificial Recharge Techniques
5. Well testing for yields
6. Gumbels Flood frequency Analysis
7. Groundwater flow Physical model

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