GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL MANAGEMENT (18)

GROUND WATER HYDROLOGY & CONTAMINATION

SUBJECT CODE: 2711805

SEMESTER: I

Type of course: Engineering and Technology

Prerequisite: Hydrological cycle
Source of Ground Water
Modeling of Ground Water

Rationale: To develop fundamentals of ground water hydrology, quality, pollution and conservation

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2	2	5	70	30	20	10	20	0	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction:** Definition of Ground Water, Aquifers, Vertical Distribution of Subsurface Water, Hydrological Properties of Water Bearing Strata, Ground Water in Hydrologic Cycle.	6	15
2	**Ground Water Hydraulics:** Darcy's Law, Its Range of Validity, Dupuit Forchheimer Assumptions, Applications of Darcy's Law for Simple Flow Systems, Governing Differential Equations for Confined and Unconfined Aquifers, Steady and Unsteady Flow Solutions for Fully Penetrating Wells, Partially Penetrating Wells, Interference of Wells, Test Pumping Analysis With Steady and Unsteady Flows, Delayed Yield, Method of Images	10	24
3	**Ground Water Quality:** Indian and International Standards	4	9
4	**Ground Water Pollution:** Sources, Remedial and Preventive Measures	6	14
5	**Ground Water Conservation:** Ground Water Budget, Seepage From Surface Water, Artificial Recharge	6	14
6	Models for Groundwater Flow, Sampling and Monitoring Methods, Transport Mechanisms, Modeling Advective-Dispersive Transport, Adsorption and Chemical Reaction, Biodegradation Kinetics, Numerical Flow and Transport Modeling, Waste Site Characterization/Investigation, Ground Water Remediation, Legal Issues in Groundwater Contamination Appendices.	10	24

Reference Books:

1. Ground Water : by Raghunath
2. Ground Water Hydrology: By D K Todd
3. Groundwater Resources Education by W C Walton
4. Numerical Ground Water Hydrology by Roger Diewest.

5. Ground water hydrology and contamination by Nicholas Cheremenisoff
6. Ground Water Hydraulics and Pollutant Transport by Randall J. Charbeneau, 2000.
7. Ground Water Assessment, Development and Management" by K. Karanth,, McGraw Hill Companies.
8. Groundwater Hydrology by K.R. Rushton, John Wiley & Sons, Ltd.

Course Outcome: On completion of the course, the student is expected to be able to:

- understand current groundwater issues and the technologies employed to deal with them
- Assess the ground water hydrology, quality, pollution and conservation
- understand the ground water quality parameters and its modeling

List of Exercises: Term work will comprise of assignments on the questions related to definition of terms used in ground water hydrology, ground water contamination, methods of treatment of contaminated ground water

Design based Problems (DP)/Open Ended Problem: Numericals based on Darcy's law, Dupuit law for yield.

List of Open Source Software/learning website: http://nptel.ac.in/