GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Environmental Management (18)
SUBJECT NAME: GROUND WATER HYDROLOGY & CONTAMINATION
SUBJECT CODE: 3711805
M.E. 1st SEMESTER

Type of course: Engineering and Technology

Prerequisite: Hydrological cycle
Source 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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction:** Definition of ground water, aquifers, vertical distribution of sub surface water, hydrological properties of water bearing strata, ground water in hydrologic cycle.	4	11
2	**Ground Water Hydraulics:** Darcy's law, its range of validity, Dupuit's & 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	12	28
3	**Ground Water Quality:** Indian and international standards	2	5
4	**Ground Water Pollution:** Sources, remedial and preventive measures	3	7
5	**Transport of Ground Water Contamination:** Transport Mechanisms, Dispersion and diffusion, Retardation, Numerical Flow and Transport Modeling	3	7
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.	12	28
7	**Ground Water Restoration and Treatment:** Source control strategies, Treatment technologies, In situ treatment methods, Pump and treat method, Bioremediation	3	7
8	**Ground Water Conservation:** Ground Water Budget, Seepage From Surface Water, Artificial Recharge	3	7

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 the various sources and types of contamination of groundwater
- 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
- Learn the different techniques of decontamination of polluted groundwater.
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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