



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163515

Semester – VI

Subject Name: Groundwater Contamination

Type of course: Professional Elective Course

Prerequisite: Fundamentals of different sources of groundwater

Rationale: To learn the principles and theories regarding ground water contamination

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
4	0	0	4	70	30	0	0	100

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.	04	10
2	Ground water hydraulics: Darcy's law, its range of validity, Dupuit's 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	14	33
3	Ground water quality: Indian and international standards	02	04
4	Ground water pollution: Sources, remedial and preventive measures	04	10
5	Ground water conservation: Ground water budget, seepage from surface water, artificial recharge	04	10
6	Models for ground water flow: Sampling and monitoring methods , transport mechanisms, modelling Advective-Dispersive transport, Adsorption and chemical reaction, biodegradation kinetics, numerical flow and transport modelling, waste site characterization/investigation, ground water remediation, legal issues in ground water contamination.	14	33



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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	15	15	10	0

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. 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

Course Outcome:

After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Apply the laws of ground water hydraulics and solve the differential equations for different types of aquifers	20
CO-2	Identify the sources of ground water contamination and suggest the remedial and preventive measures to overcome ground water contamination	15
CO-3	Decide the mechanisms for ground water conservation	15
CO-4	Use the models for ground water flow and apply them for minimization/prevention of ground water contamination and its transport	15