



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Post Graduate

Branch: Environmental Management,

Course/Subject Code: ME01018071

Course / Subject Name: Groundwater Hydrology and Contamination

w.e.f. Academic Year:	2024-25
Semester:	1 st Semester
Category of the Course:	PEC

Prerequisite:	Hydrological cycle, Source of Ground Water
Rationale:	To develop fundamentals of ground water hydrology, quality, pollution and conservation

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Understand the various sources and types of contamination of groundwater.
02	understand current groundwater issues and the technologies employed to deal with them.
03	Assess the ground water hydrology, quality, pollution and conservation.
04	understand the ground water quality parameters and its modeling.
05	Learn the different techniques of decontamination of polluted groundwater.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial/Practical	
			ESE (E)		PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of 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.	3	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.	4	7
8	Ground Water Conservation: Ground Water Budget, Seepage From Surface Water, Artificial Recharge.	4	7
	Total	45	100



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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
25	20	30	25	0	0

Where R:Remember; U:Understanding; A:Application, N:Analyze and E:Evaluate C:Create(as per R3evised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) 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.

(b) Open sources of software and website: MOEF&CC, NPTEL

Suggested Course Practical List/ Exercise :

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

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