

B. Tech. Civil Engineering				
Course code: Course Title	Course Structure			Pre-Requisite
CE336: Groundwater Hydrology	L	T	P	Nil
	3	1	0	
Course Objectives: The objective of this course is to provide students with a comprehensive understanding of the principles and practices of groundwater hydrology. The course aims to equip students with the skills necessary to analyse, model, and manage groundwater systems, addressing issues related to groundwater flow, contamination, and sustainable use.				

S. No	Course Outcomes (CO)
CO1	Develop a thorough understanding of the physical principles governing groundwater flow, including aquifer properties, Darcy's law, and the groundwater flow equations.
CO2	Proficiency in constructing and utilizing groundwater flow models using tools such as MODFLOW, enabling them to simulate and analyse groundwater flow under various conditions.
CO3	Learn to model contaminant transport in groundwater, understanding the processes of advection, dispersion, and chemical reactions, and develop strategies for groundwater contamination remediation.
CO4	Ability to design and implement sustainable groundwater management practices.
CO5	Enhance their research skills by investigating contemporary issues in groundwater hydrology.

S. No.	Contents	Contact Hours
UNIT 1	Introduction: Definition of groundwater, role of groundwater in the hydrological cycle, groundwater bearing formations, classification of aquifers, flow and storage characteristics of aquifers, Darcy's law, anisotropy, and heterogeneity.	8
UNIT 2	Wells and Well Hydraulics: Different types of wells, construction of wells, steady and unsteady state solutions for confined, unconfined, and leaky aquifers, effect of boundaries, Multiple Well Systems, Partially Penetrating Wells, Well for special Conditions, Characteristics of Well Losses, Specific Capacity.	10
UNIT 3	Surface investigation of groundwater: Geologic methods, Remote sensing, geophysical exploration, Electric resistivity Method, Seismic Refraction Method, Gravity and Magnetic Methods, Water Witching.	8

UNIT 4	Concept of Artificial Recharge of Groundwater, recharge methods, research on water spreading, Wastewater recharge for reuse, Recharge Mounds. Artificial Recharge on Long Island, New York, includes recharge, artificial Recharge for Energy purposes.	8
UNIT 5	Groundwater Flow Modelling: Porous media models, Analog models, Electric Analog Models, and Digital computer models.	8
	Total	42

REFERENCES		
S. No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Todd, D.K., "Groundwater Hydrology", John Wiley.	1959
2	Bear, J., "Hydraulics of Groundwater", McGraw-Hill.	1979
3	Bouwer, H., "Groundwater Hydrology", McGraw-Hill.	1978
4	Walton, W.C., "Groundwater Resources Evaluation", McGraw-Hill.	1970