Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCEC523	Hydrogeology and Well Hydraulics	3	1	0	4

Course Objective
This course is introduced to familiarize the students with the fundamental concepts in hydrogeology and well hydraulics
Learning Outcomes
Upon successful completion of this course, the students should be able to: ● Understand the fundamentals of hydrogeology and groundwater occurrence ● Understand the basics of groundwater exploration and well hydraulics ● Know the fundamental aspects of groundwater management

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1.	**Introduction to Hydrogeology** Importance of Groundwater in Hydrologic cycle; Groundwater budget; Occurrence and Distribution of Groundwater, Water bearing properties of geological media, Vertical distribution of water, Concept of water table, Environmental factors affecting water table level	7 L + 1 T	Understand the Fundamentals of hydrogeology and groundwater occurrence
2.	**Hydrogeological processes:** Groundwater movement and Darcy's law; Concept of Permeability, Determination of permeability in laboratory and field; Heterogeneity and Anisotropy; General flow equations in confined and unconfined aquifers; Steady and Unsteady flow conditions; Evaluation of aquifer parameters	8 L + 3T	Know the basics of groundwater movement
3.	**Groundwater Exploration and Well Hydraulics:** Surface and Subsurface investigation of groundwater, Geologic and Geophysical exploration methods Types of water wells and method of construction, Well design, completion, protection and rehabilitation, Yield characteristics of wells, Pumping tests, Special well flow conditions	9 L + 3 T	Understand the concepts of groundwater exploration and well hydraulics
4.	**Groundwater Quality and Contamination:** Groundwater chemistry, Geochemical Processes, Contaminant Transport Mechansims, Remediation Techniques.	6 L + 2 T	Understanding various hydrogeochemical processes affecting groundwater quality

4	**Groundwater Modeling and Management:** Case studies on Groundwater Quantity and Quality Management, Management Strategies, and Policies, Conceptual and numerical models of Groundwater flow, Predictive modeling of flow and solute transport, Algorithm Development, Modeling Software	9 L + 4 T	Knowledge on groundwater management strategies
5	**Advanced Topics:** Hydrogeology of Fractured aquifers, Multiphase flow scenarios in earth systems	3 L + 1 T	Get introduced to the advanced topics in hydrogeology
	Total Contact Hours	**42 L + 14 T**	

Text Books:

1. Todd D.K., Mays L.W. (2011) Groundwater Hydrology, Wiley Publishers, Third Edition.
2. Raghunath H.M. (2007) Groundwater, New Age International Pvt Ltd Publishers, Third edition.

Reference Books:

1. Dassargues A. (2018) Hydrogeology: Groundwater Science and Engineering, CRC Press Publishers, First Edition.
2. Jacob B. (2013) Hydraulics of Ground Water, Dover Publications.