M.Sc. GEOLOGY
SEMESTER - IV
COURSE - I - HYDROGEOLOGY AND ENVIRONMENTAL GEOLOGY

Course Name	Teaching hours for week	Credits	Internal Assessment marks	SEM-END Assessment marks	Total marks
HYDROGEOLOGY AND ENVIRONMENTAL GEOLOGY	**4**	**4**	**25**	**75**	**100**

Course Outcomes: The student will:

- Understand and gain knowledge on hydrological cycle, hydrological properties of rocks, occurrence of groundwater, drilling methods for wells, quality standards of groundwater, geo- environmental hazards
- Be able to assess the determine the hydraulic head and gradients, groundwater flow directions, major ions concentrations in water and classify its suitability for various purposes.
- Analyze and interpret the geo-electrical resistivity data for identification of suitable potential zone for groundwater extraction.
- Identify the groundwater pollution areas and its sources of pollution

After completion of this course the student can be able to works as hydrologist in ground water development and management department.

UNIT-I: Origin of Water - Hydrologic cycle; Hydrological properties of rocks, Porosity, Specific yield, Specific Retention, Hydraulic Conductivity, Storativity, and Transmissivity; Vertical Distribution of Ground Water - Types of Aquifers, Unconfined, Confined, Semi - Confined & Perched Springs; Hydrothermal phenomena; Water Table Contour maps; Water Table fluctuations and causative factors;

UNIT-II: Darcy's law and its Application; Determination of Permeability in laboratory and in field; Steady State, Unsteady State and Radial Flow equations; Tracer Studies; Pumping Tests- Methods, Estimation of T & S by Theis, Jacob and Theis Recovery Methods, Specific Capacity Method by Slither's Method; Groundwater exploration methods.

UNIT-III: Types of wells - Drilling Methods -Pumping equipment; Physical and Chemical properties of groundwater - Graphical presentation of Water quality data; Quality criteria for domestic, irrigation and industrial uses; Sources of pollution; Sea water intrusion and its controls; Problems of Arsenic, Fluoride and Nitrate; Radioisotopes for Ground Water Studies. Overexploitation and Ground Water Mining; Rain water Harvesting and artificial recharge methods; Groundwater provinces of India, Watershed Basin Management.

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UNIT-IV: Geo-environmental hazards, volcanoes, earthquakes, floods and coastal hazards; land desertification, degradation and management; soil erosion causes and management; impact of mining activities on the environment; global warming; water contamination- waste disposal and management.

Suggested Books:

1. Todd. (2006). *Groundwater hydrology*, 2nd ed. John Wiley & Sons.
2. Karanth, K. R. (1989). *Hydrogeology*. Tata McGraw-Hill Publ Co New Delhi.
3. Karanth, K. R. (1987). *Groundwater assessment: Development and management*. Tata McGraw- Hill Education.
4. Keller, E.a. (1978). *Environmental Geology.* Bell and Howell, USA.
5. Submanian, V. (2001). *Textbook in environmental Science*. Narosa Publication.

Reference books

1. Davis, S.N. and De Weist, R.J.M. (1966) *Hydrogeology*. John Wiley and Sons, New York.
2. Raghunath, H. M. (1987). Groundwater: *Hydrogeology, groundwater survey and pumping tests, rural water supply and irrigation systems.* New Age International.
3. Walton. W.C. (1970). *Groundwater Resources evaluation*. Mc Graw Hill Publ. Co.
4. Bouwer, H. (1978). *Groundwater hydrology*. McGraw-Hill College.

M.Sc. GEOLOGY
SEMESTER - IV
COURSE - II - WELLSITE GEOLOGY

Course Name	Teaching hours for week	Credits	Internal Assessment marks	SEM-END Assessment marks	Total marks
WELLSITE GEOLOGY	**4**	**4**	**25**	**75**	**100**

Course Outcomes: The student will:

- Gain knowledge on exploration strategies, role of wellsite geologist and preparation of geo- technical order, on-shore and off-shoe drilling technologies for hydrocarbon exploration and development, analysis of core and well cutting samples and interpretation of lithology of the area
- Gain knowledge on casing and cementing techniques
- Be able to prepare the geotechnical order, prepare the lithologs from drilling time
- Analyze the well cutting samples or side wall or core samples
- Identify the pay horizons through well-site geological analysis
- Evaluate the formation characteristics like., the water saturation, HC saturation, water salinity, pay zone thickness

After completion of this course the student can be able to works as geologist in oil industries like ONGC, GAIL, Reliance etc.

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