CENTRAL UNIVERSITY OF KERALA
DEPARTMENT OF GEOLOGY
M.Sc. GEOLOGY

Course Code	EGE 5302	Semester	III
Course Title	Hydrogeology		
Credits	3	Type	Core

This is a participatory, experimental and employability based skill development course essential for ground water exploration.

Course Description

Hydrogeology is the study ofthe occurrence, distribution, and movement of groundwater below the Earth's surface. The course deals withvarious hydrogeologic processes, hydrological properties of rocks and principles of groundwater flow. It gives an overview of different groundwater exploration methods and water quality standards. The basic skills to apply pumping-test data to determine aquifer properties and an understanding of the chemical constituents in groundwater and surface waters is also provided by the course. The course will provide the theoretical knowledge required for the role of a professional hydrogeologist.

Course Outcome

By the end of the course, students are expected to be able to:

- **Define hydrogeological terms, properties, methods of measurement and examine the significance of hydrogeological results.**
- **Explain the principles of groundwater flow and groundwater chemistry.**
- **Appraise the different types of aquifers, their composition, flow patterns, chemistry and vulnerability to pollution.**
- **Demonstrate an understanding of the laws governing groundwater flow in porous media.**
- **Apply basic quantitative analysis techniques to solve practical hydrogeology problems.**
- Analyse of pumping test data to understand aquifer properties

Course Structure

Module - 1

Hydrological cycle and origin of ground water. Classification of rocks with respect to their water bearing properties- aquifers, aquicludes, aquitards, aquifuges. Types of aquifers. Hydrological properties of rocks: Porosity, permeability, void ratio, specific yield and specific retention, hydraulic conductivity, storativity, transmissivity.Barometric efficiency and tidal efficiency.

Module – 2

Groundwater flow: Darcy's law and its experimental verification, flow nets, fluid potentials.Well hydraulics: Pumping tests and data analysis. Steady radial flow to a well in confined and unconfined aquifers-Theim's equation, Dupuit-Forhemeir equation. Unsteady radial flow to a well in confined and unconfined aquifers-Theis, Chow's and Jacob's methods.Application of isotope studies and tracer techniques in ground water flow.

Module – 3

Ground water exploration: Geological methods- lithological and structural mapping. Geophysical methods-Electrical Resistivity methods, Wenner and Schlumberger arrays,
Profiling and VES methods. Seismic Refraction methods. Well logging: Spontaneous Potential Logging, Radiation logging, Gamma-gamma ray logging. Use of Aerial photos

and satellite imageries in ground water prospecting. Well design criteria: Types, construction, maintenance and development of wells. Physical, chemical and bacterial measures of water quality. Water quality standard for different purposes – Drinking, Domestic, Irrigation and Industrial. Saline water intrusion in coastal aquifers and its prevention – Ghyben-Herzberg relationship. Artificial recharge and rain water harvesting methods.

Evaluation &Grading

Skill development (Analytical, Writing and Presentation) – 20%
Class Test – 20%

End Semester Assessment – 60%

References

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- Davis,S.N. and Dewiest, R.J.N. (1966). Hydrogeology, John Wiley and Sons Inc. New York, 463p.
- Karanth, K.R.(1987). Groundwater Assessment Development and Management, Tata McGraw Hill, 720p.
- Linsley, R.K, Kohler, M.A. and Taulhus, J.L.H. (1975) Applied Hydrology, Tata McGraw Hill, 689p.
- Todd, D.K. (1980) Groundwater Hydrology, John Wiley and Sons, 552p.
- Walton,W.C. (1970) Groundwater Resource Evaluation, McGraw Hill Inc, 664p.
- Reghunath, H.M. (1992) Groundwater. 2nd Edn.Wiley Eastern Limited, 456p.
- Fetter, C.W. (2007) Applied Hydrogeology.Pearson, 624p.