

Groundwater Exploration

Code CE-885	Credit Hours 3-0
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Course Description

The objectives of this course are to:

1. Review the occurrence and movement of groundwater within a geological formation
2. Review some geological terms that are related to groundwater exploration and development
3. Review the theory of most geophysical methods that are applicable to groundwater exploration and development in basement and sedimentary terrain.
4. Provide students with opportunities to solve groundwater exploration and development related problem using geophysical method.

Textbook:

1. Technical Engineering and Design Guides as Adapted from the US Army Corps of Engineers, No. 23, Geophysical Exploration for Engineering and Environmental Investigations, ASCE Press, 1998
2. D. Chapellier, Well Logging in Hydrogeology, A.A. Balkema, Rotterdam, 1992.

Reference Book:

3. Simmers et al, Recharge of Phreatic Aquifers in (Semi-) Arid Areas, A. A. Balkema, 1997
4. S. Nazarian and J. Diehl J., Use of Geophysical Methods in Constructions, Proc. of Sessions of Geo-Denver 2000, Geotechnical Special Publications No. 108, ASCE, 2000
5. H. P. Patra and S. K. Nath, Schlumberger Geoelectric Sounding in Groundwater (Principles, Interpretation and Application), A. A. Balkema, Rotterdam, 1999
6. J. M. Reynolds, An Introduction to Applied and Environmental Geophysics, John Wiley & Sons, 1997
7. J. L. Mari, G. Arens, D. Chapellier and P. Gaudiani, Geophysics of Reservoir and Civil Engineering, Institutes Francais du Petrole Publication, T-Edition Technip, 1999

Prerequisites

NIL

Assessment System for Theory

Quizzes	10-15%
Assignments	5-10%
Mid Terms	25-30%
Project	0-10%
ESE	45-50%

Teaching Plan

Week No	Topics	Learning outcomes
1	Introduction	Course Outline, objectives, teaching plan, assessment method, concepts review

2-6	Geotechnical Problems associated with Groundwater	Common geotechnical problems associated with groundwater: investigation of seepage at the dam site; mapping of interface between fresh and saline water/groundwater; mapping of contaminated aquifers, groundwater over pumping, land subsidence, ground improvement.
7-8		Problems encountered: exploration of groundwater resources in sedimentary and fractured rocks; water well design, piezometer design and installation, artificial recharge, dewatering,
9	MID TERM EXAM	
10-11	Groundwater exploration methods	Reconnaissance survey, surface investigation methods Subsurface investigations including test drilling, resistivity logging, temperature logging, velocity measurement and other methods Electromagnetic (EM) and Electrical Resistivity (ER) methods in solving groundwater related problems Well design, construction and development Groundwater monitoring: observation network, watertable fluctuation Deterioration of wells; its causes and remedial measures
13-17	Groundwater Observation	Selection of sites for the observation network Installation of observation wells and piezometers Conjunctive use of surface and groundwater
18	End Semester Exams	