

## Groundwater Hydrology

<b>Course Code</b> <b>CE-848</b>	<b>Credit Hours</b> <b>3+0</b>
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### Course Description

To introduce the concept of ground water flow in hydrology and contamination as an extension of the mandatory fluid mechanics and hydraulics taught in the junior year of the civil engineering curriculum.

### Textbook:

1. Dixon, W. J. and Massey, F. J. Introduction to Statistical Analysis, 4th ed. New York: McGraw-Hill, 1983.
2. Everitt, B. Chance Rules: An Informal Guide to Probability, Risk, and Statistics. Copernicus, 1999.
3. Feller, W. An Introduction to Probability Theory and Its Applications, Vol. 1, 3rd ed. New York: Wiley, 1968.
4. Fisher, N. I.; Lewis, T.; and Embleton, B. J. J. Statistical Analysis of Spherical Data. Cambridge, England: Cambridge University Press, 1987.

### Reference Book:

1. Fisher, R. A. and Prance, G. T. The Design of Experiments, 9th ed. rev. New York: Hafner, 1974.
2. Keeping, E. S. Introduction to Statistical Inference. New York: Dover, 1995.
3. Mises, R. von Probability, Statistics, and Truth, 2nd rev. English ed. New York: Dover, 1981.
4. O'Hagan, A. Kendall's Advanced Theory of Statistics, Vol. 2B: Bayesian Inference, 6th ed. New York: Oxford University Press, 1998.

**Prerequisites.** Nil

### ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
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Assignments	10%
Mid Terms	30%
End Semester Exam	50%

### Teaching Plan

Week No	Topics/Learning Outcomes
1-3	Equations for steady and unsteady flow in confined and unconfined aquifers.
4-5	Application of Groundwater flow equations to some practical problems on seepage.
6	Well hydraulics for all types of flow and boundary conditions.
7	Analysis and evaluation of pumping test data by analytical methods. Theoretical analysis and application to some practical problems.
8	Types of models: Physical models, Resistance Network; flow net, Conductive sheet and liquid analogues, Sand models, Hele-Shaw models.
9	<b>Mid Semester Exam</b>
10-13	Design of analogues and models to solve some specific groundwater problems.
14	Groundwater balance studies.
15-16	Groundwater Development: Collector wells, infiltration gallery, conjunctive use, artificial recharge, safe yield, yield test, geophysical methods, selection of pumps

<b>17-18</b>	<b>End Semester Exam</b>