College of Engineering

Department of Civil Engineering

CE 522 Groundwater Hydrology

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required
Course Description	Introduction to groundwater hydrology; occurrence, storage and supply of groundwater; basic differential equations for flow in confined and unconfined aquifers. Steady and unsteady groundwater wells and hydraulics problems; groundwater recharge; saline water intrusion; groundwater modeling.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to:

Course Learning Outcomes (CLOs)	*Related Student Outcomes (SO)*
CLO1. Explain and recognize characteristics of groundwater flow in porous and fractured aquifers. K1	**SO1**
CLO2. Explain and recognize physically based equations that describe flow in the saturated zone, groundwater flow under natural conditions, and around a pumping well under homogenous and heterogeneities of isotropic and anisotropic flow. K1	**SO1**
CLO3. Formulate groundwater modelling to simulate underground water real-life problems. S1	**SO2**
CLO4. Perform and demonstrate appropriate qualitative and quantitative methods commonly used in physical hydrogeology and in literature (e.g. piezometric maps, conceptual and numerical models of soils and aquifers, analytical solutions for groundwater flow, interpretation of pumping tests). V1	**SO6**

Student Outcomes related to this Course

SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.

SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.

SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.

Topics Covered

List of Topics	Related CLOs
1. Introduction	**CLO 1,2,3**
2. Movement of Groundwater	**CLO 2**
3. Well Hydraulics	**CLO 2,3**
4. Groundwater Modelling	**CLO 2,3,4**

Textbook(s) and Other Required Material	• Bear J., Hydraulics of Groundwater, McGrow-Hill International, 1979. • Todd D.K., Ground Water Hydrology, John Wiley and Sons, 2000. • Driscoll, F., Groundwater and Wells, St. Paul, Minnesota, IIEd.,1986. • Raghunath H.M., Ground Water Hydrology, Wiley Eastern Ltd., Second reprint, 2000. • Willis,R. and Yeh, W.W.G., Groundwater Systems Planning and Management, Prentice-Hall, 1987. • Bear J., Dynamics of fluids in porous media, American Elsevier publishing co., Inc., 1972. • Walton, C., Groundwater Resources Evaluation, McGraw Hill, 1970. • Strack, O.D.L., Groundwater Mechanics, PrenticeHall,1989. • Garg, S.P., Groundwater and Tube Wells, Oxford & IBH Publishing Co., 1993 • Examples of local and international quality standards for groundwater wells (i.e., Wells and MODFLOW)
Grading System	Assignments 20% Project work 20% Midterm Exams 20% Final Exams 40%
Instructors	Dr. Osama Saad A Al Gahtani
Date of Review	March, 2025