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 for a MSCE degree
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; groundwater in Saudi Arabia.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to

Course Learning Outcomes	***Related Program Outcomes***
CLO1: Explain and recognize characteristics of groundwater flow in porous and fractured aquifers.	**K1**
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**
CLO3: Use groundwater modelling to simulate underground water real-life problems	**S1**
CLO4: Discuss and evaluate 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).	**C1**

Student Outcomes related to this Course	**K1**. Recognize advanced engineering knowledge, concepts and techniques to identify, interpret and analyze complex and real-life engineering problems.

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<tr><td></td><td>S1. Provide solution for complex and real-life engineering problems through critical thinking and using modern engineering tools and identify its impact on social and ethical issues.
C1. Criticize and discuss scientific research reports /papers related to Civil Engineering issues with high level of ethics and proficiency, independently, or as a team work.</td></tr>
<tr><td>Topics Covered</td><td>
<table>
<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Introduction</td><td>CLO1</td></tr>
<tr><td>2. Movement of Groundwater</td><td>CLO2</td></tr>
<tr><td>3. Well Hydraulics</td><td>CLO3</td></tr>
<tr><td>4. Groundwater Modelling and applications</td><td>CLO4</td></tr>
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<tr><td>Textbook(s) and Other Required Material</td><td>

Bear J., Hydraulics of Groundwater, McGrow-HillInternational, 1979.
Todd D.K., Ground Water Hydrology, John Wiley and Sons, 2000.
Driscoll,F.,GroundwaterandWells,St.Paul,Minnesota,IIEd.,1986.
RaghunathH.M.,GroundWaterHydrology,WileyEasternLtd.,Second reprint, 2000.
Willis,R.andW.W.G.Yeh,Groundwater Systems Planning and Management, Prentice-Hall, 1987.
BearJ., Dynamics of fluids in porous media, American Elsevier publishing co., inc, 1972.
C.Walton, Groundwate rResources Evaluation, McGrawHill, 1970.
O.D.L. Strack, Groundwater Mechanics, PrenticeHall,1989.
S.P. Garg, Groundwater and Tube Wells, Oxford & IBH Publishing Co., 1993

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<tr><td>Grading System</td><td>Assignments 20%
Project Work 20 %
Midterm Exam 20%
Final Exam 40%</td></tr>
<tr><td>Instructors</td><td>Dr. Osama Saad A Al Gahtani
E-mail: oalgahtani@ksu.edu.sa Office 2A61</td></tr>
<tr><td>Date of Review</td><td>February, 2021</td></tr>
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