



Jordan University of Science and Technology
Faculty of Engineering
Civil Engineering Department

CE756 Groundwater Hydrology - JNQF Level: 9

First Semester 2024-2025

Course Catalog

3 Credit Hours. Occurrence of groundwater; movement of groundwater; groundwater levels; quality of groundwater, hydrodynamic dispersion; modeling of groundwater; surface and subsurface investigation of groundwater; artificial recharge of groundwater; intrusion of saline water into coastal aquifers. Transport of contaminants; use of computer models for the simulation of flow and transport problems.

Teaching Method: On Campus

Text Book

Title	Ground- Water Hydrology and Hydraulics
Author(s)	McWhorter, D.B. and D.K. Sunada
Edition	13th Edition
Short Name	MS
Other Information	Water Resources Publication, Reprint 2010

Course References

Short name	Book name	Author(s)	Edition	Other Information
DS	Physical and Chemical Hydrogeology	Domenico, P.A. and F.W. Schwartz	1st Edition	John Wiley and sons, New York, 1990.
AW	Applied Groundwater Modeling: simulation of Flow and Advection Transport	Anderson, M. P. and Woessner, W.W.	1st Edition	Academic Press, 1992
B	Hydraulics of Groundwater	Bear, J.	1st Edition	McGraw-Hill, 1979
D	Groundwater and Wells	Driscoll, F.G.	2nd Edition	Johnson Div., 1986
FC	Groundwater	Freeze, R.A. and Cherry	1st Edition	Prentice Hall, 1979

HP	Computational Methods in Subsurface Flow	Huyakorn, P.S., and G.F. Pinder,	1st Edition	Academic Press, 1983
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Instructor	
Name	Prof. Wa'il Abu-El-Sha'r
Office Location	C5L1
Office Hours	Mon : 13:00 - 15:30 Tue : 11:00 - 12:00 Wed : 13:00 - 15:30 Thu : 11:00 - 12:00
Email	wail@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Mon, Wed : 11:30 - 13:00 Room: C5025

Tentative List of Topics Covered		
Weeks	Topic	References
Week 1	Introduction	1.1 - 1.2 From DS , 2.1 - 2.3 From B , Chapter 1 From FC
Week 2	Groundwater and the Hydrologic Cycle	1.4 From DS , Chapter 3 From B
Week 3	The Groundwater Environment	Chapter 2 From DS , Chapter 4 From FC
Week 4	Modeling Approaches	From AW
Week 5	Darcy's Law	3.1 - 3.3 From DS , 4.1 - 4.3 From B
Weeks 6, 7	Equations of Groundwater Flow	Chapter 3 From MS , 4.1 - 4.3 From DS
Week 7	Regional Groundwater Flow Characteristics	7.1, 7.2 From DS , 5.1, 6.1, 6.7 From FC
Weeks 8, 9	Generalized Groundwater Flow equations / Analytic Solutions	8.1 - 8.3 From B , 8.3 From FC
Week 10	Superposition / Saltwater Intrusion	5.4 From DS , 8.9, 8.10 From B , 8.13 From FC

Week 11	Numerical Modeling	From HP
Week 12	Aquifer Evaluation / Pump Test	5.1 - 5.3 From DS , Chapters 13 and 16 From D
Week 13	Transport Processes	10.1 - 10.4 From DS
Week 13	Transport Equations	Chapter 13 From DS , 9.1 - 9.2 From FC
Week 14	Analytic Solutions	17.1 - 17.3 From DS
Week 14	Groundwater Contamination: Overview and Characterization	16.1 From DS , 168 - 202 From D
Week 16	Groundwater Contamination and Remediation	Chapter 19 From DS

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
To be able to identify the different types of aquifers and geologic formation that form the groundwater environment. [1L9K1]	20%	
To be able to estimate groundwater flow using Darcy's law and apply groundwater flow equations for different natural scenarios [1L9S2]	20%	
To model groundwater flow at the basin using MODFLOW code and to manage groundwater pumping. [1L9C6]	20%	
To be able to estimate the aquifer properties base on field tests such as pump tests. [1L9S2]	20%	
To evaluate the transport of groundwater contaminants and identify available analytic solutions. [1L9S3]	20%	

Relationship to Program Student Outcomes (Out of 100%)											
PI-1a	PI-2a	PI-2b	PI-2c	PI-2d	PI-3a	PI-4a	PI-4b	PI-5a	PI-6a	PI-6b	PI-7a

Relationship to NQF Outcomes (Out of 100%)			
L9K1	L9S2	L9S3	L9C6
20	40	20	20

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