Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	Course Title	Advance Hydrogeology
2.	Course Number	0305761
3.	Credit Hours (Theory, Practical)	3, theory
	Contact Hours (Theory, Practical)	3, theory
4.	Prerequisites/ Corequisites	-
5.	Program Title	Geology
6.	Program Code	-
7.	School/ Center	School of Science
8.	Department	Geology
9.	Course Level	Master
10.	Year of Study and Semester (s)	First/Second Semester – First or second Year
11.	Other Department(s) Involved in Teaching the Course	-
12.	Main Learning Language	English
13.	Learning Types	✔ Face to face learning ☐Blended ☐Fully online
14.	Online Platforms(s)	✔ Moodle ✔ Microsoft Teams
15.	Issuing Date	-
16.	Revision Date	Fall 2024

17. Course Coordinator:

Name: Prof. Dr. Mustafa Al Kuisi

Contact hours: -

Office number: Geology 307

Phone number: ext: 22254

Email: mkuisi@ju.edu.jo

18. Other Instructors:

Name: Prof. Dr. Mustafa Al Kuisi

Contact hours: -

Office number: Geology 307

Phone number: ext: 22254

Email: mkuisi@ju.edu.jo

19. Course Description:

The advanced hydrogeology course is designed to provide students with in-depth knowledge and advanced techniques in hydrogeological investigations, modeling, and water resource management. This course goes through key topics such as groundwater flow dynamics, aquifer characterization, contaminant transport, and the application of numerical models like MODFLOW. Participants will learn to interpret complex hydrogeological data, assess groundwater resources, and develop sustainable management strategies. Hands-on exercises using advanced hydrogeological software and case studies from real-world scenarios help bridge theory with practice. By the end of the course, attendees will be equipped with the expertise needed to tackle advanced challenges in groundwater science and resource management effectively.

20. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. **SO (1):** Students will demonstrate comprehensive knowledge of environmental principles, theories, and management practices, enabling them to analyze and address complex environmental challenges effectively.
2. **SO (2):** Students will develop the skills to design, conduct, and critically evaluate environmental research, using quantitative and qualitative methods to propose evidence-based solutions to environmental problems.
3. **SO (3):** Students will acquire hands-on experience in laboratory work, field investigations, and environmental monitoring, applying advanced tools and techniques to assess and manage natural resources and environmental risks.
4. **SO (4):** Students will effectively communicate complex environmental information through written, oral, and visual formats, catering to technical experts, policymakers, and the general public.
5. **SO (5):** Students will exhibit ethical responsibility and awareness of the social and environmental impacts of their work, integrating sustainable practices and principles in their decision-making processes.

21. Course Intended Learning Outcomes (CLO's): (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Master Advanced Hydrogeological Knowledge: Demonstrate expertise in hydrogeological concepts, theories, and analytical techniques.
2. Conduct and Evaluate Research: Design, perform, and critically assess hydrogeological studies using field and laboratory techniques.
3. Communicate and Apply Findings: Effectively communicate complex data and incorporate ethical, environmental considerations in decision-making.
4. Commit to Lifelong Learning: Continuously pursue professional development and adapt to advancements in hydrogeology.

Course CLOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
CLO (1)	✔	✔	✔	✔	✔	
CLO (2)	✔	✔	✔	✔	✔	✔
CLO (3)	✔	✔	✔	✔	✔	✔
CLO (4)		✔	✔	✔	✔	✔

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's / Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)
CLO (1)	✔	✔	✔	✔	✔
CLO (2)	✔	✔	✔	✔	✔
CLO (3)	✔	✔	✔	✔	✔
CLO (4)	✔	✔	✔	✔	✔

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1	Introduction to Hydrogeology: Advanced Concepts	1	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
2	2	Groundwater Flow Dynamics and Aquifer Systems	1	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
3	3	Advanced Groundwater Modeling: Concepts and Applications	1	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
4	4	Contaminant Transport in Groundwater Systems	2	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
5	5	Methods of Aquifer Testing and Analysis	2	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
6	6	Groundwater-Surface Water Interactions	2	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
7	7	Groundwater Recharge and Sustainability	2	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
8	8	**Midterm Exam**	3	Face to Face	MS	S		
9	9	Groundwater Resource Management and Policy	3	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
10	10	Groundwater Vulnerability and Risk Assessment	3	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
11	11	Advanced Tools in Hydrogeology: Remote Sensing and GIS	3	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
12	12	Case Studies: Hydrogeological Challenges in Jordan	4	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
13	13	Ethical and Environmental Considerations in Hydrogeology	4	Face to Face	MS	S	Exams + assignments	Suggested readings + papers
14	14	Final Exam		Face to Face	MS	S		

24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm Exam	30	TBD	1,2	End of eighth week	
Home Assignments	10	TBD	3,4	Weekly	
Project and presentation	20	TBD	1,2,3,4,5	Term-long project due at the end of the semester	
Final Exam	40	TBD	1,2,3,4,5	End of semester	

25. Course Requirements:

To complete this course, students need a reliable computer, a stable internet connection, a webcam for virtual sessions, and an account on the designated software platform for accessing materials and submitting assignments. These tools are essential for effective participation and engagement.

26. Course Policies:

A. Attendance policies: Students should attend at least 80% of the total number of lectures.
B. Absences from exams and submitting assignments on time: Students who miss an exam must submit and acceptable excuse and then a makeup exam will be appointed.
C. Health and safety procedures: Students should follow the university regulations.
D. Honesty policy regarding cheating, plagiarism, misbehavior: According to university regulations.
E. Grading policy:

1. Mid exam 30%
2. Homework/Seminar/Quiz 30%
3. Final exam: 40%.

The current university's letter grade scale is adopted.

F. Available university services that support achievement in the course: Central library, personal computer labs at different locations in the university, e-learning site, faculty member's website, etc.

27. References:

1. Fetter, C.W. (2001) Applied Hydrogeology. 4th Edition, Prentice Hall, Upper Saddle River.
2. Anderson, M.P., W.W. Woessner, and R.J. Hunt, 2015, Applied Groundwater Modeling—Simulation of Flow and Advective Transport, second edition. Elsevier, London, United Kingdom.
3. Bredehoeft, J.D., 2007, Determining sustainable groundwater development, in The Handbook of Groundwater Engineering, second edition, J.W. Delleur, editor. Chemical Rubber Company (CRC) Press, Boca Raton, Chapter 27.

28. Additional information:

Name of the Instructor or the Course Coordinator:	Signature:	Date:
Prof. Dr. Mustafa Al Kuisi	……...……	……..……
Name of the Head of Department	Signature:	Date:
Dr Bety Saqarat	……...……	……..……
Name of the Head of Graduate Studies/ School of Science	Signature:	Date:
Prof. Kamal Swaidan	……...……	……..……
Name of the Dean or the Director	Signature:	Date:
Prof. Mahmoud I. Jaghoub	……...……	……..……