



جغيات علوم الجيولوجية Geosciences

قسم/ برنامج Department:

مواصفات مقرر: جيولوجيا المياه

Course Specification of: Hydrogeology

المعلومات العامة عن المقرر General information about the course				
1.	اسم المقرر Course Title	جيولوجيا المياه Hydrogeology		
2.	رمز المقرر ورقمه Course Code and Number	GEOS 335		
3.	الساعات المعتمدة للمقرر Credit Hours	الساعات المعتمدة Credit Hours		
		محاضرات Lecture	عملي Practical	الإجمالي Total
		2	1	3
4.	المستوى والفصل الدراسي Study Level and Semester	3rd level, 1st semester		
5.	المتطلبات السابقة للمقرر (إن وجدت) Pre-requisites (if any)	PNR 111		
6.	المتطلبات المصاحبة (إن وجدت) Co-requisites (if any)	-		
7.	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	Bachelor of Geosciences -All Tracks BSc Environmental Science BSc Geological Engineering		
8.	لغة تدريس المقرر Language of teaching the course	English/Arabic		
9.	نظام الدراسة Study System	Academic year of two semesters		
10.	مكان تدريس المقرر Location of teaching the course	Faculty of Petroleum and Natural Resources		
11.	اسم معد (و) مواصفات المقرر Prepared by	Dr. AlKhateeb Alkebsi د/ الخطيب الكبسي		
12.	تاريخ اعتماد مجلس الجامعة Date of Approval	2020		

وصف المقرر Course Description	
وصف المقرر بالإنجليزية	وصف المقرر بالعربية
This course aims to acquire the student general knowledge about groundwater occurrences, origin and flow, interpretation of hydrogeologic conditions in different groundwater environs and identification of important processes in water-rock and surface water – groundwater interactions. It aims to give students a sound understanding of how water moves below the surface, including soil and groundwater flow. The teaching focuses on a physical	

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understanding of key processes in the hydrological cycle that control the state and movement of water in the subsurface. The knowledge that is the basis for addressing practical aspects such as: how to apply common and advanced techniques in hydrogeology, how to solve practical problems and which tools can be used in each case.

Course Intended Learning Outcomes (CILOs) مخرجات تعلم المقرر

After completing the course, the student will be able to:		بعد الانتهاء من دراسة المقرر سوف يكون الطالب قادرا على أن:	
a1.	Describe the water cycle and its driving processes		- a1
a2.	Illustrate the different scientific facts, fundamental hydrogeologic terms, principles and techniques related to groundwater exploration and management		- a2
a3.	Recognize in details the occurrences, origin and environmental problems associated with groundwater movements in aquifer systems		a3.
b1.	Assess the concepts, principles, procedures, theories and their interrelationships for interpreting hydrogeological data from different rock environs and deep sedimentary basins.		-b1
b2.	Recognize the significance of hydrogeology in solving different economic, environmental, constructional and water related problems.		- b2
c1.	Rate and solve problems related to groundwater aquifer evaluation and management		- c1
c2.	Handle laboratory equipment and field samples in appropriate manner, considering safety issues, scientific ethics and accuracy during reporting aquifer characteristics in different environs		- c2
d1.	Acquire the skills of working in groups according to responsibilities of each team member		- d1
d2.	Employ recent communication technology, internet and use of textbooks for collecting information and prepare short essays about groundwater flow regime and associated problems		- d2

مواعمة مخرجات تعلم المقرر مع مخرجات التعلم للبرنامج:

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Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)			
مخرجات التعلم المقصودة من المقرر (Course Intended Learning Outcomes)		مخرجات التعلم المقصودة من البرنامج (Program Intended Learning Outcomes) (تكتب جميع مخرجات البرنامج كما هي رمزا ونصا)	
a1	Describe the water cycle and its driving processes	A1	
a2	Illustrate the different scientific facts, fundamental hydrogeologic terms, principles and techniques related to groundwater exploration and management	A2	
a3.	Recognize in details the occurrences, origin and environmental problems associated with groundwater movements in aquifer systems	A3	
b1	Assess the concepts, principles, procedures, theories and their interrelationships for interpreting hydrogeological data from different rock environs and deep sedimentary basins.	B1	
b2	Recognize the significance of hydrogeology in solving different economic, environmental, constructional and water related problems.	B2	
c1	Rate and solve problems related to groundwater aquifer evaluation and management	C2	
c2	Handle laboratory equipment and field samples in appropriate manner, considering safety issues, scientific ethics and accuracy during reporting aquifer characteristics in different environs	C3	
d1	Acquire the skills of working in groups according to responsibilities of each team member	D1	
d2	Employ recent communication technology, internet and use of textbooks for collecting information and prepare short essays about groundwater flow regime and associated problems	D3	

مواءمة مخرجات التعلم باستراتيجيات التعليم والتعلم والتقييم Alignment of CILOs to Teaching and Assessment Strategies			
أولاً: مواءمة مخرجات تعلم المقرر (المعارف والفهم) باستراتيجية التعليم والتعلم والتقييم: First: Alignment of Knowledge and Understanding CILOs			
مخرجات المقرر/ المعرفة والفهم Knowledge and Understanding CILOs	استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقييم Assessment Strategies	
a1 -	Describe the water cycle and its driving processes		Examinations,



a2 -	Illustrate the different scientific facts, fundamental hydrogeologic terms, principles and techniques related to groundwater exploration and management	Interactive Lectures Discussion Case study	Assignments, Oral presentations
a3 -	Recognize in details the occurrences, origin and environmental problems associated with groundwater movements in aquifer systems		

ثانياً: مواءمة مخرجات تعلم المقرر (المهارات الذهنية) باستراتيجية التدريس والتقويم:

Second: Alignment of Intellectual Skills CILOs

مخرجات المقرر/ المهارات الذهنية Intellectual Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
b1 -	Assess the concepts, principles, procedures, theories and their interrelationships for interpreting hydrogeological data from different rock environs and deep sedimentary basins.	Discussion Demonstration Brain storm Problem solving	Essay test, Assignments, Oral presentations.
b2 -	Recognize the significance of hydrogeology in solving different economic, environmental, constructional and water related problems.		

ثالثاً: مواءمة مخرجات تعلم المقرر (المهارات المهنية والعملية) باستراتيجية التدريس والتقويم:

Third: Alignment of Professional and Practical Skills CILOs

مخرجات المقرر/ المهارات المهنية والعملية Professional and Practical Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
c1-	Rate and solve problems related to groundwater aquifer evaluation and management	Self and independent learning Tutorials & practical classes, case study, Computer based teaching	Achievement tests Chart Drawing practical exams
c2-	Handle laboratory equipment and field samples in appropriate manner, considering safety issues, scientific ethics and accuracy during reporting aquifer characteristics in different environs		

رابعاً: مواءمة مخرجات تعلم المقرر (المهارات العامة) باستراتيجية التدريس والتقويم:

Fourth: Alignment of Transferable (General) Skills CILOs

مخرجات المقرر Transferable (General) Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
d1-	Acquire the skills of working in groups according to responsibilities of each team member	Small group working Student-led Seminars	Achievement tests



d2-	Employ recent communication technology, internet and use of textbooks for collecting information and prepare short essays about groundwater flow regime and associated problems	Case Study Method	Team working
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Course Content محتوى المقرر					
Theoretical Aspect الموضوعات الجانب النظري					
الرقم Order	الموضوعات الرئيسية/ الوحدات Topic List / Units	الموضوعات الفرعية Sub Topics List	عدد الأسابيع Number of Weeks	الساعات الفعالية Contact Hours	رموز مخرجات التعلم للمقرر (CILOs)
1	Introduction	Hydrological cycle and Water balance equation	2	4	a1 a2
2	Vadose/Unsaturated zone flow		2	4	a3 b1 c1
3	Types of Groundwater Aquifers and confining layers		1	2	a3 b1 c1
4	Groundwater geology and hydrogeological environments		1	2	a2 a3 b1 b2 c2 d1
5	Aquifer compressibility, and Dupuit equation		1	2	a2 a3 b1 b2 c2 d1
6	Water Table and Potentiometric Maps		1	2	a3 b2 c2 d1
7	Principles of groundwater flow & Radial groundwater flow to Wells		1	2	a3 b2 c2 d1 d2
8	Determination of Aquifer Parameters	Darcy law and its application	2	4	a3 b2 c1 c2 d1 d2
9	Groundwater/surface water interaction		1	2	a3 b2 c2 d1 d2
10	Groundwater quality(briefly) & Aquifers in Yemen		2	4	a3 b2 c2 d1 d2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			14	28	

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الموضوعات العملية (إن وجدت) Practical Aspect (if any)				
الرقم Order	التجارب العملية/ التمارين / تدريبات Practical / Exercises/ Tutorials topics	عدد الأسابيع Number of Weeks	الساعات الفعالية Contact Hours	رموز مخرجات التعلم Course ILOs
1	عناصر الدورة المائيه	2	4	a1
2	اشكال وانواع الطبقت الخازنه الجوفيه	2	4	b1 c1
3	تمارين حل المعاملات الهيدروجيولوجيه	2	4	b2 c1 c2 d1 d2
4	انواع المساميه	2	4	b2 c2 d1 d2
5	انواع العوامل الهيدرولكييه	1	2	b2 c2 d1 d2
6	تجارب عن التوصيلة المائيه	2	4	b2 c2 d1 d2
7	تجارب حقلية وتجارب معملية	2	4	b1 b2 c1 c2 d1 d2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		13	26	

استراتيجيات التعليم والتعلم Teaching Strategies	
<ul style="list-style-type: none"> Interactive Lectures Discussion Problem solving Case study, Computer based teaching Student-led Seminars 	

الأنشطة والتكليفات Tasks and Assignments					
م No	التكليف/ الواجب Assignments/ Tasks	نوع التكليف (فردى / تعاونى)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due	مخرجات التعلم CILOs (symbols)
1					
إجمالي الدرجة Total Score					

تقييم التعلم Learning Assessment					
الرق م No.	أنشطة التقييم Assessment Tasks	أسوع التقييم Week due	الدرجة Mark	نسبة الدرجة إلى الدرجة النهائية Proportion of Final Assessment	مخرجات التعلم CILOs (symbols)
1	Lab Exercises	Weekly	20	13.4%	b1, b2, c1,c2
2	Participation	Weekly	10	6.7%	a1,a2,a3,c1,c2
3	Quizzes	End of a topic	10	6.7%	a1,a2 a3,c1,c2,d1
4	Mid-Term written exam	Week 7	20	13.3%	a1,a2, a3 b1,b2,

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5	Final lab Exam	Week 14	20	13.3%	,b1,b2, c1 c2
6	Final Exam (theoretical)	Week 16	70	46.6%	all
Total الإجمالي			150	100.00%	

Learning Resources مصادر التعلم	
Required Textbook(s) (لا تزيد عن مرجعين)	
1. Todd D.K., 2005, Groundwater Hydrology, Wiley, USA. 2. Applied Hydrogeology by C. W. Fetter, Merrill (3ed) (1994)	
References	
1. Fetter, 1990, Applied Hydrogeology, CBS, India. 2. Groundwater Hydrology by Herman Bouwer (1978). 3. Chow Maidmen Mays, 1998, Applied Hydrology, Mac Graw Hill, Usa. 4. الشبلاق م.م. عماد ع., 1988, الهيدروجيولوجيا التطبيقية, جامعة عمر المختار البيضاء ليبيا.	
Electronic Materials and Web Sites etc. المصادر الإلكترونية ومواقع الإنترنت	
Journal of hydrology, Elsevier	

Course Policies:	
1	Class Attendance: - Students are expected to attend classes regularly and promptly. - The attendance should not be less than 80%. - If the student has been absent, he is responsible for finding out any missed material by consulting other students or going to the professor's office hours.
2	Tardy: - Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.
3	Exam Attendance/Punctuality: - According to the rules the student gets absent in the exam of the course.
4	Assignments & Projects: - Papers survey or projects should be submitted by the time detriment by the professor.
5	Cheating: - According to the rules, cheating is a serious offense and will always result in an imposition of a penalty. The penalties that can be started from the range of canceling the result of the course to canceling the student's admission.
6	Plagiarism: -Plagiarism is a serious offense and will always result in an imposition of a penalty. The penalties that can be started by making a zero mark for the work.
7	Other policies: -The student should by a commitment by the rules inside class and university. Therefore, he is expected to show respect for his classmate, instructors & others.

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قسم/ برنامج: العلوم الجيولوجية Geosciences (مسار جيولوجيا المياه Hydrogeology)
العام الجامعي: 2020-2021م

خطة مقرر: جيولوجيا المياه

Course Plan (Syllabus): Hydrogeology

معلومات عن أستاذ المقرر Information about Faculty Member Responsible for the Course						
الاسم Name	الدكتور: الخطيب يحيى الكبسي	الساعات المكتبية (أسبوعياً) Office Hours				
المكان ورقم الهاتف Location & Telephone No.	جامعة صنعاء 770828128	السبت SAT	الأحد SUN	الاثنين MON	الثلاثاء TUE	الأربعاء WED
البريد الإلكتروني E-mail	aalkebsi@yahoo.com					

معلومات عامة عن المقرر General information about the course					
1.	اسم المقرر Course Title	جيولوجيا المياه Hydrogeology			
2.	رمز المقرر ورقمه Course Code and Number	GEOS 335			
3.	الساعات المعتمدة للمقرر Credit Hours	الساعات المعتمدة Credit Hours			
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	تدريب Training
		2	1	-	-
4.	المستوى والفصل الدراسي Study Level and Semester	3rd level, 1st semester			
5.	المتطلبات السابقة للمقرر Pre-requisites	PNR 111			
6.	المتطلبات المصاحبة (إن وجدت) Co-requisite	-			
7.	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	Bachelor of Geosciences -All Tracks BSc Environmental Science BSc Geological Engineering			
8.	لغة تدريس المقرر Language of teaching the course	English/Arabic			
9.	مكان تدريس المقرر Location of teaching the course	Faculty of Petroleum and Natural Resources			

وصف المقرر Course Description

This course aims to acquire the student general knowledge about groundwater occurrences, origin and flow, interpretation of hydrogeologic conditions in different groundwater environs and identification of important processes in water-rock and surface water – groundwater interactions.

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It aims to give students a sound understanding of how water moves below the surface, including soil and groundwater flow. The teaching focuses on a physical understanding of key processes in the hydrological cycle that control the state and movement of water in the subsurface. The knowledge that is the basis for addressing practical aspects such as: how to apply common and advanced techniques in hydrogeology, how to solve practical problems and which tools can be used in each case.

Course Intended Learning Outcomes (CILOs) مخرجات تعلم المقرر

After completing the course, the student will be able to:	بعد الانتهاء من دراسة المقرر سوف يكون الطالب قادرا على أن:
Describe the water cycle and its driving processes	- a1
Illustrate the different scientific facts, fundamental hydrogeologic terms, principles and techniques related to groundwater exploration and management	- a2
Recognize in details the occurrences, origin and environmental problems associated with groundwater movements in aquifer systems	-a3
Assess the concepts, principles, procedures, theories and their interrelationships for interpreting hydrogeological data from different rock environs and deep sedimentary basins.	-b1
Recognize the significance of hydrogeology in solving different economic, environmental, constructional and water related problems.	- b2
Rate and solve problems related to groundwater aquifer evaluation and management	- c1
Handle laboratory equipment and field samples in appropriate manner, considering safety issues, scientific ethics and accuracy during reporting aquifer characteristics in different environs	- c2
Acquire the skills of working in groups according to responsibilities of each team member	- d1
Employ recent communication technology, internet and use of textbooks for collecting information and prepare short essays about groundwater flow regime and associated problems	- d2

Course Content محتوى المقرر

Theoretical Aspect خطة تنفيذ الموضوعات النظرية

الرقم Order	الوحدات (الموضوعات الرئيسية) Units	الموضوعات التفصيلية Sub Topics	الأسبوع Week Due	الساعات الفعالية Con. H
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1	Introduction	Hydrological cycle and Water balance equation	Week 1-2	4
2	Vadose/Unsaturated zone flow		Week 3-4	4
3	Types of Groundwater Aquifers and confining layers		Week 5	2
4	Groundwater geology and hydrogeological environments		Week 6	2
5	Mid term exam		Week 7	2
6	Aquifer compressibility, and Dupuit equation		Week 8	2
7	Water Table and Potentiometric Maps		Week 9	2
8	Principles of groundwater flow & Radial groundwater flow to Wells		Week 10	2
9	Determination of Aquifer Parameters	Darcy law and its application	Week 11-12	4
10	Groundwater/surface water interaction		Week 13	2
11	Groundwater quality(briefly) & Aquifers in Yemen		Week 14-15	4
12	Final exam		Week 16	2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			16	32

Practical / Training/ Tutorials/ Exercises Aspects الجانب العملي خطة تنفيذ موضوعات الجانب العملي			
الرقم Order	موضوعات العملي/ المهام / التمارين Practical/ Tutorials/ Exercises Aspects	الأسبوع Week Due	الساعات الفعلية Cont. H
1	عناصر الدورة المائية	1,2	4
2	اشكال وانواع الطبقت الخازنه الجوفيه	3,4	4
3	تمارين حل المعاملات الهيدروجيولوجيه	5,6	4
4	Mid lab exam	7	2
5	انواع المساميه	8	2
6	انواع العوامل الهيدرولكيه	9	2
7	تجارب عن التوصيلة المائية	10,11	4
8	تجارب حقليه وتجارب معملية	12,13	4
11	Final lab exam	14	2
اجمالي الأسابيع والساعات الفعلية		14	28

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Number of Weeks /and Contact Hours Per Semester

Teaching Strategies استراتيجيات التعليم والتعلم

- Interactive Lectures
- Discussion
- Problem solving
- Case study,
- Computer based teaching
- Student-led Seminars

Tasks and Assignments الأنشطة والتكليفات

م No	التكليف / الواجب Assignments	نوع التكليف (فردى / تعاونى)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due
1				
Total Score إجمالي الدرجة			15/150 10/ 100	

Learning Assessment تقويم التعلم

م No	أساليب التقويم Assessment Method	موعد (أسبوع) التقويم Week Due	الدرجة Mark	الوزن النسبي % Proportion of Final Assessment
1	Lab Exercises	Weekly	20	13.4%
2	Participation	Weekly	10	6.7%
3	Quizzes	End of a topic	10	6.7%
4	Mid-Term written exam	Week 7	20	13.3%
5	Final lab Exam	Week 14	20	13.3%
6	Final Exam (theoretical)	Week 16	70	46.6%
Total المجموع			150	100.00%

Learning Resources مصادر التعلم

Required Textbook(s) المراجع الرئيسية (لا تزيد عن مرجعين)

- Todd D.K., 2005, Groundwater Hydrology, Wiley, USA.
- Applied Hydrogeology by C. W. Fetter, Merrill (3ed) (1994)

References

- Fetter, 1990, Applied Hydrogeology, CBS, India.
- Groundwater Hydrology by Herman Bouwer (1978).

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7. Chow Maidmen Mays, 1998, Applied Hydrology, Mac Graw Hill, Usa.

8. الشبلاق م.م. عماد ع. 1988, الهيدروجيولوجيا التطبيقية, جامعة عمر المختار البيضاء ليبيا.

Electronic Materials and Web Sites etc. المصادر الإلكترونية ومواقع الإنترنت

Journal of hydrology, Elsevier

Course Policies:

1	Class Attendance: <ul style="list-style-type: none"> - Students are expected to attend classes regularly and promptly. - The attendance should not be less than 80%. - If the student has been absent, he is responsible for finding out any missed material by consulting other students or going to the professor's office hours.
2	Tardy: <ul style="list-style-type: none"> - Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.
3	Exam Attendance/Punctuality: <ul style="list-style-type: none"> - According to the rules the student gets absent in the exam of the course.
4	Assignments & Projects: <ul style="list-style-type: none"> - Papers survey or projects should be submitted by the time detriment by the professor.
5	Cheating: <ul style="list-style-type: none"> - According to the rules, cheating is a serious offense and will always result in an imposition of a penalty. The penalties that can be started from the range of canceling the result of the course to canceling the student's admission.
6	Plagiarism: <ul style="list-style-type: none"> -Plagiarism is a serious offense and will always result in an imposition of a penalty. The penalties that can be started by making a zero mark for the work.
7	Other policies: <ul style="list-style-type: none"> -The student should by a commitment by the rules inside class and university. Therefore, he is expected to show respect for his classmate, instructors & others.