مواصفات مقرر: جيولوجيا المياه

Course Specification of: Hydrogeology

General information about the course المعلومات العامة عن المقرر						
.1	اسم المقرر Course Title	جيولوجيا المياه Hydrogeology				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 335				
.3	الساعات المعتمدة للمقرر Credit Hours	Credit Hours الساعات المعتمدة				الإجمالي Total
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	تدريب Training	
		2	1	-	-	3
.4	المستوى والفصل الدراسي Study Level and Semester	3rd level, 1st semester				
.5	المتطلبات السابقة المقرر (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				

Course Description وصف المقرر

وصف المقرر ر بالإنجليزية	وصف المقرر ر 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 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.	Handel 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

مواءمة مخرجات تعلم المقرر مع مخرجات التعلم للبرنامج:

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	

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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	Handel 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 والتقويم
Alignment of CILOs to Teaching and Assessment Strategies

أولا: مواءمة مخرجات تعلم المقرر (المعارف والفهم) باستراتيجية التعليم والتعلم والتقويم:
First: Alignment of Knowledge and Understanding CILOs

مخرجات المقرر/ المعرفة والفهم Knowledge and Understanding CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
a1 -	Describe the water cycle and its driving processes	Interactive Lectures Discussion Case study	Examinations, Assignments, Oral presentations
a2 -	Illustrate the different scientific facts, fundamental hydrogeologic terms, principles and techniques related to groundwater exploration and management		
a3 -	Recognize in details the occurrences, origin and environmental problems associated with groundwater movements in aquifer systems		

ثانيا: 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.		

ثالثا: 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-	Handel laboratory equipment and field samples in appropriate manner, considering safety issues, scientific ethics and accuracy during reporting aquifer characteristics in different environs		

رابعا: 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 Case Study Method	Achievement tests Team working
d2-	Employ recent communication technology, internet and use of textbooks for collecting information and prepare short essays about groundwater flow regime and associated problems		

Course Content محتوى المقرر

Theoretical Aspect موضوعات الجانب النظري

الرقم Order	الموضوعات الرئيسة/ الوحدات Topic List / Units	الموضوعات الفرعية Sub Topics List	عدد الأسابيع Number of Weeks	الساعات الفعلية 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**	

Practical Aspect (if any) الموضوعات العملية (إن وجدت)

الرقم Order	التجارب العملية/ التمارين / تدريبات Practical / Exercises/ Tutorials topics	عدد الأسابيع Number of Weeks	الساعات الفعلية 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 المسامية	2	4	b2 c2 d1 d2
5	▪ انواع العوامل الهيدرولوكيه	1	2	b2 c2 d1 d2
6	▪ تجارب عن التوصيلة المائيه	2	4	b2 c2 d1 d2
7	▪ تجارب حقليه وتجارب معملية	2	4	b1 b2 c1 c2 d1 d2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		**13**	**26**	

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Assoc.Prof. Huda Al-Emad

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Prof. Dr. Al Qaseem Mohammed Abas

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/ Tasks	نوع التكليف (فردي/ تعاوني)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due	خرجات التعلم CILOs (symbols)
1					
	إجمالي الدرجة Total Score				

Learning Assessment تقييم التعلم

الرقم 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,
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) المراجع الرئيسة (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.

قسم/ برنامج: العلوم الجيولوجية Geosciences (مسار جيولوجيا المياه Hydrogeology)

العام الجامعي: 2020-2021م

خطة مقرر: جيولوجيا المياه

Course Plan (Syllabus): Hydrogeology

Information about Faculty Member Responsible for the Course معلومات عن أستاذ المقرر

الاسم Name	الدكتور: الخطيب يحيى الكبسي	الساعات المكتبية (أسبوعيا) Office Hours					
المكان ورقم الهاتف Location &Telephone No.	جامعة صنعاء 770828128	السبت SAT	الأحد SUN	الاثنين MON	الثلاثاء TUE	الأربعاء WED	الخميس THU
البريد الإلكتروني E-mail	aalkebsi@yahoo.com						

General information about the course معلومات عامة عن المقرر

Prepared by	Quality Assurance Unit	Dean of the Faculty	Dean of the Development & Quality Assurance Center
Assoc.Prof. Adel Al-Matary	Assoc.Prof. Adel Al-Matary	Assoc.Prof. Bassim AlKhirbash	Assoc.Prof. Huda Al-Emad

Rector of Sana'a University
Prof. Dr. Al Qaseem Mohammed Abas

.1	اسم المقرر Course Title	جيولوجيا المياه Hydrogeology				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 335				
.3	الساعات المعتمدة للمقرر Credit Hours	Credit Hours الساعات المعتمدة				الإجمالي Total
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	تدريب Training	
		2	1	-	-	3
.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				

Course Description وصف المقرر

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 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

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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**
Handel 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 الرئيسة) Units	الموضوعات التفصيلية Sub Topics	الأسبوع Week Due	الساعات الفعلية Con. H
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) &**		Week 14-15	4

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	Aquifers in Yemen			
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 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 المائيه	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 الهيدرولوكيه	9	2
7	▪ تجارب عن التوصيلة المائيه	10,11	4
8	▪ تجارب حقليه وتجارب معملية	12,13	4
11	Final lab exam	14	2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		**14**	**28**

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 (فردي/ تعاوني)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due
1				
	Total Score إجمالي الدرجة		**15/150** **10/ 100**	

Learning Assessment تقويم التعلم

م	أساليب التقويم	موعد(أسبوع) التقويم	الدرجة	الوزن النسبي%

No	Assessment Method	Week Due	Mark	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 الرئيسة (لا تزيد عن مرجعين)

3. Todd D.K., 2005, Groundwater Hydrology, Wiley, USA.
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References

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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.