مواصفات مقرر: الادارة المتكاملة لمصادر المياه

Course Specification of: Integrated Water Resources Management

General information about the course المعلومات العامة عن المقرر						
.1	اسم المقرر Course Title	الادارة المتكاملة لمصادر المياه Integrated Water Resources Management				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 465				
.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	4th level, 2nd semester				
.5	المتطلبات السابقة المقرر (إن وجدت) Pre-requisites (if any)	GEOS 335, GEOS 462, GEOS 463				
.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 -Hydrogeology Track				
.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
IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital eco-systems	الإدارة المتكاملة لموارد الماء هي عملية رفع مستوى التنمية المنسقة وإدارة المياه والأرض والموارد ذات الصلة لتعظيم محصلة الرفاهية الاقتصادية والاجتماعية بطريقة عادلة دون التفريط في إستدامة النظم البيئية الأساسية للحياة.

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.	understand the principles of the hydrological cycle and flow of water in natural and constructed		- a1

	environments, including quantitative estimates of the water fluxes		
a2.	describe how components of the water cycle are influenced by human activity		**– a2**
a3.	explain how flooding, catchment runoff and water storages are managed**.**		**a3.**
b1.	apply the water-balance equation to various hydrological problems in time and space		**–b1**
b2.	apply key technical methods (e.g. modelling, statistics, GIS) related to water and environmental.		**- b2**
c1.	analyses hydrological data and municipal planning in order to evaluate water resource management in an area		**- c1**
c2.	measure important components of the water cycle, especially flow measurements in streams		**- c2**
d1.	conduct and write a report on the results obtained from an individual project		**- d1**
d2.	deal with the uncertainty and different orders of magnitude related to the measurements, data analysis and modeling**.**		**- 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	understand the principles of the hydrological cycle and flow of water in natural and constructed environments, including quantitative estimates of the water fluxes	**A1**	
a2	describe how components of the water cycle are influenced by human activity	**A2**	
a3.	explain how flooding, catchment runoff and water storages are managed**.**	**A3**	
b1	apply the water-balance equation to various hydrological problems in time and space	**B1**	
b2	apply key technical methods (e.g. modelling, statistics, GIS) related to water and environmental.	**B2**	
c1	analyses hydrological data and municipal planning in order to evaluate water resource management in an area	**C2**	
c2	measure important components of the water cycle, especially flow measurements in streams	**C3**	
d1	conduct and write a report on the results obtained from an individual project	**D1**	
d2	deal with the uncertainty and different orders of magnitude related to the measurements, data analysis	**D3**	

	and modeling.		

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 -	understand the principles of the hydrological cycle and flow of water in natural and constructed environments, including quantitative estimates of the water fluxes	Interactive Lectures Discussion Case study	Examinations, Assignments, Oral presentations
a2 -	describe how components of the water cycle are influenced by human activity		
a3 -	explain how flooding, catchment runoff and water storages are managed.		

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 -	apply the water-balance equation to various hydrological problems in time and space	Discussion Demonstration Brain storm Problem solving	Essay test, Assignments, Oral presentations.
b2 -	apply key technical methods (e.g. modelling, statistics, GIS) related to water and environmental.		

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-	analyses hydrological data and municipal planning in order to evaluate water resource management in an area	Computer based teaching Tutorials & practical classes, case study,	Achievement tests Chart Drawing practical exams
c2-	measure important components of the water cycle, especially flow measurements in streams		

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-	conduct and write a report on the results obtained from an individual project	Small group working Student-led Seminars Case Study Method	Achievement tests Team working
d2-	deal with the uncertainty and different orders of magnitude related to the measurements, data analysis and modeling.		

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	**the basic processes of the water cycle**	such as precipitation, evaporation	1	2	a1 a2
2	**the presence of soil water and groundwater, and runoff.**		2	4	a3 b1 c1
3	**Processes at the catchment scale**	including the presence of recharge and discharge areas, the influence of topography on runoff formation, and flooding.	2	4	a3 b1 c1
4	**Influence of forestry, agriculture, cities and dams on runoff and the water cycle.**		2	4	a2 a3 b1 b2 c2 d1
5	**Water balance calculations for river basins and lakes.**		2	4	a2 a3 b1 b2 c2 d1
6	**Chemical and physical processes in lakes.**		1	2	a3 b2 c2 d1
7	**Water planning in society**		1	2	a3 b2 c2 d1 d2
8	**municipal plans for water supply and treatment**		2	4	a3 b2 c1 c2 d1 d2
9	**water resource management in Yemen**		1	2	a3 b2 c2 d1 d2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			**14**	**28**	

Prepared by
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Quality Assurance Unit
Assoc.Prof. Adel Al-Matary

Dean of the Faculty
Assoc.Prof. Bassim AlKhirbash

Dean of the Development & Quality Assurance Center
Assoc.Prof. Huda Al-Emad

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

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	▪ Describe and predict for a given water resources system the main hydrological, hydraulic chemical and biological processes and how these processes are dynamically linked with aquatic ecosystems as well as with human activities such as land and water use and pollution.	3	6	a1
2	▪ Describe and explain the main concepts and instruments for analyzing and influencing formal and informal arrangements for water quality management, including policies, laws and institutions, and by adopting a historical perspective	3	6	b1 c1
3	▪ Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches;	3	6	b2 c1 c2 d1 d2
4	▪ Describe concepts to determine the value of water for various uses and users in (amongst others) economic and ecological terms and explain how these concepts can be used in water resources planning at various spatial and temporal scales	3	6	b2 c2 d1 d2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		**12**	**24**	

Teaching Strategies استراتيجيات التعليم والتعلم

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

Tasks and Assignments الأنشطة والتكليفات

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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 8	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. Karanth,K.R., 1993, Groundwater Assessment Development and Management, TATA McGraw Hill, New Delhi, India
2. Todd D.K., 2005, Groundwater Hydrology, Wiley, USA.

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 الإلكترونيه 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.

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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: الادارة المتكاملة لمصادر المياه

Course Plan (Syllabus): Integrated Water Resources Management

General information about the course معلومات عامة عن المقرر						
.1	اسم المقرر Course Title	الادارة المتكاملة لمصادر المياه Integrated Water Resources Management				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 465				
.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	4th level, 2nd semester				
.5	المتطلبات السابقة للمقرر Pre-requisites	GEOS 335, GEOS 462, GEOS 463				
.6	المتطلبات المصاحبة (إن وجدت) Co –requisite	-				
.7	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	Bachelor of Geosciences -Hydrogeology Track				
.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

IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital eco-systems	الإدارة المتكاملة لموارد الماء هي عملية رفع مستوى التنمية المنسقة وإدارة المياه والأرض والموارد ذات الصلة لتعظيم محصلة الرفاهية الاقتصادية والاجتماعية بطريقة عادلة دون التفريط في إستدامة النظم البيئية الأساسية للحياة.

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:
understand the principles of the hydrological cycle and flow of water in natural and constructed environments, including quantitative estimates of the water fluxes	- a1
describe how components of the water cycle are influenced by human activity	– a2
explain how flooding, catchment runoff and water storages are managed.	-a3
apply the water-balance equation to various hydrological problems	–b1

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in time and space	
apply key technical methods (e.g. modelling, statistics, GIS) related to water and environmental.	**- b2**
analyses hydrological data and municipal planning in order to evaluate water resource management in an area	**- c1**
measure important components of the water cycle, especially flow measurements in streams	**- c2**
conduct and write a report on the results obtained from an individual project	**- d1**
deal with the uncertainty and different orders of magnitude related to the measurements, data analysis and modeling.	**- 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	**the basic processes of the water cycle**	such as precipitation, evaporation	Week 1	2
2	**the presence of soil water and groundwater, and runoff.**		Week 2-3	4
3	**Processes at the catchment scale**	including the presence of recharge and discharge areas, the influence of topography on runoff formation, and flooding.	Week 4-5	4
4	**Influence of forestry, agriculture, cities and dams on runoff and the water cycle.**		Week 6-7	4
5	**Mid term exam**		Week 8	2
6	**Water balance calculations for river basins and lakes.**		Week 9-10	4
7	**Chemical and physical processes in lakes.**		Week 11	2
8	**Water planning in society**		Week 12	2
9	**municipal plans for water supply and treatment**		Week 13-14	4
10	**water resource management in Yemen**		Week 15	2
12	**Final exam**		Week 16	2

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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	▪ Describe and predict for a given water resources system the main hydrological, hydraulic chemical and biological processes and how these processes are dynamically linked with aquatic ecosystems as well as with human activities such as land and water use and pollution.	Week 1-3	6
2	Describe and explain the main concepts and instruments for analyzing and influencing formal and informal arrangements for water quality management, including policies, laws and institutions, and by adopting a historical perspective	Week 4-6	6
3	Mid lab exam	Week 7	2
4	Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches;	Week 8-10	6
5	Describe concepts to determine the value of water for various uses and users in (amongst others) economic and ecological terms and explain how these concepts can be used in water resources planning at various spatial and temporal scales	Week 11-13	6
11	Final lab exam	Week 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				

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	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 8	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. Karanth,K.R., 1993, Groundwater Assessment Development and Management, TATA McGraw Hill, New Delhi, India
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Electronic Materials and Web Sites *etc.* المصادر الإلكترونيه 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.