مواصفات مقرر: الاستكشاف السيزمي

Course Specification of: Seismic Exploration

General information about the course المعلومات العامة عن المقرر						
.1	اسم المقرر Course Title	الاستكشاف السيزمي Seismic Exploration				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 453				
.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 334				
.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 (Geophysics 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	Assoc.Prof. Ahmed Alaydrous				
.12	تاريخ اعتماد مجلس الجامعة Date of Approval	2020				

Course Description وصف المقرر

وصف المقرر ر بالإنجليزية

This course is intended to provide students with the concepts of geophysical seismic methods. It covers the seismic exploration methods. The basic field procedures which are followed during the acquisition of seismic data and their processing sequence will be covered in the course. Special attention will also be given to the various interpretation techniques of the seismic methods. The specific advantages, limitations, applications and case histories of these methods will be considered. Also this course gives the students an introduction to the interpretation of seismic reflection data.

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:

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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

a1.	Discuss the concept and limitations of basic theory for seismic wave propagation.		**- a1**
a2.	Describe the basic concepts of the seismic methods and their role in the exploration of natural resources especially petroleum.		**– a2**
a3.	Know basic principles and practical experience in 2D/3D seismic interpretation.		**a3.**
b1.	use principles of seismological instrumentation to select suitable equipment for various applications.		**–b1**
b2.	account for how the inner structure of Earth can be derived from seismological data and discuss the uncertainty and resolution limitations of various methods.		**- b2**
c1.	Conduct simple seismic refraction experiments.		**- c1**
c2.	Derive basic mathematical formulae applied in the two seismic methods and solve related problems.		**- c2**
d1.	Collaborate effectively within a multidisciplinary team.		**- d1**
d2.	How to present project work and results in a written report.		**- 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	Discuss the concept and limitations of basic theory for seismic wave propagation.	**A1**	
a2	Describe the basic concepts of the seismic methods and their role in the exploration of natural resources especially petroleum.	**A2**	
a3.	Know basic principles and practical experience in 2D/3D seismic interpretation.	**A3**	
b1	use principles of seismological instrumentation to select suitable equipment for various applications.	**B1**	
b2	account for how the inner structure of Earth can be derived from seismological data and discuss the uncertainty and resolution limitations of various methods.	**B2**	
c1	Conduct simple seismic refraction experiments.	**C2**	
c2	Derive basic mathematical formulae applied in the two seismic methods and solve related problems.	**C3**	

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d1	Collaborate effectively within a multidisciplinary team.	**D1**	
d2	How to present project work and results in a written report.	**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 -	Discuss the concept and limitations of basic theory for seismic wave propagation.	Interactive Lectures Discussion Case study	Examinations, Assignments, Oral presentations
a2 -	Describe the basic concepts of the seismic methods and their role in the exploration of natural resources especially petroleum.		
a3 -	Know basic principles and practical experience in 2D/3D seismic interpretation.		

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 -	use principles of seismological instrumentation to select suitable equipment for various applications.	Discussion Demonstration Brain storm Problem solving	Essay test, Assignments, Oral presentations.
b2 -	account for how the inner structure of Earth can be derived from seismological data and discuss the uncertainty and resolution limitations of various methods.		

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-	Conduct simple seismic refraction experiments.	Self and independent learning Tutorials & practical	Achievement tests Chart Drawing
c2-	Derive basic mathematical formulae applied		

	in the two seismic methods and solve related problems.	classes, case study, Computer based teaching	practical exams

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-	Collaborate effectively within a multidisciplinary team.	Small group working Student-led Seminars Case Study Method	Achievement tests Team working
d2-	How to present project work and results in a written report.		

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; Seismic Waves**	Raypath Geometry; Loss of Seismic Energy; Seismic Sources, Recording of Seismic Waves	1	2	a1 a2
2	**Seismic Refraction Surveying**	General Principles; Geometry of Refracted Raypaths; Interpretation; Applications and Case Histories	3	6	a1 a2 b1 c1 d1
3	**Seismic Reflection Surveying**	Reflection Surveys; Data Processing; Interpretation; Applications	3	6	a1 a2 a3 b1 c2
4	**Recognition of hydrocarbon signatures**	2D/3D seismic interpretation, interpretive "rules-of-thumb"	2	4	a3 b2 c2 d2
5	**AVO inversion for rock-properties**	impedances and reflectivity	1	2	a3 b2 c2
6	**Time structure**	gridding, and fault interpretation	2	4	a3 b2 c2 d2
7	**Synthetic seismogram**	Correlating Seismic data with Borehole Logs; horizon tracking	1	2	a3 b2 c2 d1
8	**Introduction to Seismic Stratigraphy**	attributes, horizon contouring, and amplitude anomalies	1	2	a1 a2 a3 b2 c2 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	Seismic/Digital Signals	1	2	a1 c2
2	Seismic Refraction Field Lab	1	2	c1
3	Seismic Refraction Interpretation	2	4	a2 b2 c1 c2 d2
4	Seismic Reflection	1	2	a3 b2 c2 d2
5	Seismic Reflection Processing	1	2	a3 b2 c2 d1 d2
6	Seismic Reflection Interpretation	3	6	a3 b2 c2 d1 d2
7	Recognition of hydrocarbon signatures and interpretive "rules-of-thumb"	1	2	a3 b2 c2 d1 d2
8	Stratigraphy, attributes, horizon contouring, and amplitude anomalies	2	4	a2 a3 b2 c2 d1 d2
9	Synthetic seismogram	1	2	a3 b2 c2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		13	26	

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

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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 15**	**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. Introduction to Applied Geophysics; H. Robert Burger, Anne F. Sheehan, and Craig H. Jones; W. W. Norton & Company, 2006.

References

1. Introduction to Applied and Environmental Geophysics; 2nd Ed.; John M. Reynolds; 2011, John Wiley & Sons Ltd., 696 pp.
2. Looking into the Earth: An introduction to geological geophysics; Alan E. Mussett, M. Aftab Khan. Cambridge University Press, 2000.
3. Whole Earth Geophysics, Robert J. Lillie, Prentice-Hall Inc., 361 pp.

Electronic Materials and Web Sites *etc.* المصادر الإلكترونية ومواقع الإنترنت

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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.

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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 الجيوفيزياء Geophysics)

العام الجامعي: 2020-2021م

خطة مقرر: الاستكشاف السيزمي

Course Plan (Syllabus): Seismic Exploration

General information about the course معلومات عامة عن المقرر						
.1	اسم المقرر Course Title	الاستكشاف السيزمي Seismic Exploration				
.2	رمز المقرر ورقمه Course Code and Number	GEOS 453				
.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 334				
.6	المتطلبات المصاحبة (إن وجدت) Co–requisite	-				
.7	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	Bachelor of Geosciences (Geophysics 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

This course is intended to provide students with the concepts of geophysical seismic methods. It covers the seismic exploration methods. The basic field procedures which are followed during the acquisition of seismic data and their processing sequence will be covered in the course. Special attention will also be given to the various interpretation techniques of the seismic methods. The specific advantages, limitations, applications and case histories of these methods will be considered. Also this course gives the students an introduction to the interpretation of seismic reflection data.

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 Discuss the concept and limitations of basic theory for seismic wave propagation.	**- a1**
a2 Describe the basic concepts of the seismic methods and their role in the exploration of natural resources especially petroleum.	**– a2**
a3 Know basic principles and practical experience in 2D/3D seismic interpretation.	**-a3**
b1 use principles of seismological instrumentation to select suitable equipment for various applications.	**–b1**
b2 account for how the inner structure of Earth can be derived from seismological data and discuss the uncertainty and resolution limitations of various methods.	**- b2**
c1 Conduct simple seismic refraction experiments.	**- c1**
c2 Derive basic mathematical formulae applied in the two seismic methods and solve related problems.	**- c2**
d1 Collaborate effectively within a multidisciplinary team.	**- d1**
d2 How to present project work and results in a written report.	**- 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; Seismic Waves**	Raypath Geometry; Loss of Seismic Energy; Seismic Sources, Recording of Seismic Waves	Week 1	2
2	**Seismic Refraction Surveying**	General Principles; Geometry of Refracted Raypaths; Interpretation; Applications and Case Histories	Week 2-4	6
3	**Seismic Reflection Surveying**	Reflection Surveys; Data Processing; Interpretation; Applications	Week 5-7	6
4	**Mid-term exam**		Week 8	2
5	**Recognition of hydrocarbon signatures**	2D/3D seismic interpretation, interpretive "rules-of-thumb"	Week 9-10	4
6	**AVO inversion for rock-properties**	impedances and reflectivity	Week 11	2
7	**Time structure**	gridding, and fault interpretation	Week 12-13	4

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8	**Synthetic seismogram**	Correlating Seismic data with Borehole Logs; horizon tracking	**Week** 14	2
9	**Introduction to Seismic Stratigraphy**	attributes, horizon contouring, and amplitude anomalies	**Week** 15	2
10	**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	Seismic/Digital Signals	**Week** 1	2
2	Seismic Refraction Field Lab	**Week** 2	2
3	Seismic Refraction Interpretation	**Week** 3-4	4
4	Seismic Reflection	**Week** 5	2
5	Seismic Reflection Processing	**Week** 6	2
6	Mid lab exam	**Week** 7	2
7	Seismic Reflection Interpretation	**Week** 10-8	6
8	Recognition of hydrocarbon signatures and interpretive "rules-of-thumb"	**Week** 11	2
9	Stratigraphy, attributes, horizon contouring, and amplitude anomalies	**Week** 12-13	4
10	Synthetic seismogram	**Week** 14	2
11	Final lab exam	**Week** 15	2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		**15**	**30**

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

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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 15	20	13.3%
6	Final Exam (theoretical)	Week 16	70	46.6%
	Total المجموع		150	100.00%

Learning Resources مصادر التعلم

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