

## مواصفات مقرر: الجيوفيزياء الهندسية والبيئية

### Course Specification of: Engineering and Environmental Geophysics

المعلومات العامة عن المقرر					
1.	اسم المقرر Course Title	الجيوفيزياء الهندسية والبيئية Engineering and Environmental Geophysics			
2.	رمز المقرر ورقمه Course Code and Number	EG465			
3.	الساعات المعتمدة للمقرر Credit Hours	الساعات المعتمدة Credit Hours			الإجمالي Total
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	
		2	1		3
4.	المستوى والفصل الدراسي Study Level and Semester	المستوى الرابع - الفصل الأول			
5.	المتطلبات السابقة للمقرر (إن وجدت) Pre-requisites (if any)	GEOS334			
6.	المتطلبات المصاحبة (إن وجدت) Co-requisites (if any)	GEOS451			
7.	البرنامج الذي يدرس له المقرر Program(s) in which the course is offered	العلوم الجيولوجية			
8.	لغة تدريس المقرر Language of teaching the course	عربي - انجليزي			
9.	نظام الدراسة Study System	فصلي منتظم			
10.	مكان تدريس المقرر Location of teaching the course	الحرم الجامعي			
11.	اسم معد (و) مواصفات المقرر Prepared by	د. مروان أحمد البعداني			
12.	تاريخ اعتماد مجلس الجامعة Date of Approval				

### وصف المقرر Course Description

وصف المقرر بالإنجليزية	وصف المقرر بالعربية
<p>This course provides a description of the geophysical techniques or methods used in engineering and environmental applications, and the use of those technologies as an integrated exploration method, through the use of the logical methodology (physics, mathematics and geology, with engineering techniques, information engineering, and devices).</p> <p>This course will also discuss how to choose and estimate geophysical techniques appropriate for specific applications.</p>	<p>يقدم هذا المقرر وصفا للتقنيات أو الطرق الجيوفيزيائية المستخدمة في التطبيقات الهندسية والبيئية، واستخدام تلك التقنيات كطريقة استكشاف متكاملة، وذلك من خلال استخدام المنهجية المنطقية (الفيزياء والرياضيات والجيولوجيا، مع التقنيات الهندسية وهندسة المعلومات والأجهزة).</p>



كما سيناقش هذا المقرر كيف يتم اختيار وتقدير التقنيات الجيوفيزيائية المناسبة لتطبيقات معينة.

### مخرجات تعلم المقرر (CILOs) Course Intended Learning Outcomes

After completing the course, the student will be able to:		بعد الانتهاء من دراسة المقرر سوف يكون الطالب قادرا على أن:	
a1.	Demonstrate sufficient knowledge and understanding of the basic principles of geophysical methods, equipment, and field procedures, both for application and interpretation to be simple.	a1 -	يظهر المعرفة الكافية والفهم للمبادئ الأساسية للطرق الجيوفيزيائية والأجهزة والإجراءات الميدانية، وذلك لأجل أن يكون كل من التطبيق والتفسير بسيطا.
a2.	Explain concepts, principles, and techniques for designing a system, process, or application component of the geophysical method of an engineering and / or environmental problem and its procedural implementation.	a2 -	يشرح مفاهيم ومبادئ وتقنيات تصميم النظام أو العملية أو عنصر التطبيق للطريقة الجيوفيزيائية للمشكلة الهندسية و/أو البيئية وتنفيذها إجرائيًا.
a3.	Describe the various current trends in geophysical survey methods in engineering and environmental issues.	a3 -	يصف الاتجاهات الحالية المختلفة في أساليب المسح الجيوفيزيائي في القضايا الهندسية والبيئية.
b1.	Assess the problem (engineering or environmental) and determine the suitability of a geophysical method (s) to apply to solving this problem.	b1 -	يقيم المشكلة (هندسية أو بيئية) وتحديد مدى ملاءمة الطريقة (الطرق) الجيوفيزيائية لتطبيقها في حل هذه المشكلة.
b2.	Distinguishes between the various geophysical methods, and the ability to plan to conduct geophysical surveys, and cost estimation.	b2 -	يميز بين الوسائل الجيوفيزيائية المختلفة، والقدرة على التخطيط لإجراء مسوحات جيوفيزيائية وتقدير الكلفة.
c1.	Uses existing and modern technologies to study various engineering and environmental problems, taking into account international standards and approaches and taking into account the local population when undertaking any activity.	c1 -	يستخدم التقنيات القائمة والحديثة لدراسة المشاكل الهندسية والبيئية المختلفة، مع الأخذ في الاعتبار المقاييس والمقاربات العالمية ومراعاة السكان المحليين عند القيام بأي نشاط.
c2.	Collect and analyze field data, link them together, find a scientific and practical explanation, and prepare the necessary reports.	c2 -	يجمع ويحلل البيانات الحقلية والربط فيما بينها وإيجاد تفسير علمي وعملي واعداد التقارير اللازمة.
d1.	Adapts to new environments, working in different environments and cultures.	d1 -	يتأقلم مع البيئات الجديدة، والعمل في البيئات والثقافات المختلفة.
d2.	Exhibits specifications and general features intelligent and objective outside the scope of specialization.	d2 -	يبيد موصفات ومميزات ذكاء عامة وموضوعية خارج نطاق التخصص.

### موازنة 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.	Demonstrate sufficient knowledge and understanding of the basic principles of geophysical methods, equipment, and field procedures, both for application	A1	Express knowledge and understanding of geological-specific theories, paradigms, concepts and principles, in

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	and interpretation to be simple.		addition to general literature and basic science.
a2.	Explain concepts, principles, and techniques for designing a system, process, or application component of the geophysical method of an engineering and / or environmental problem and its procedural implementation.	A2	Explain fundamental geological principles and concepts in theoretical, practical and vocational situations and the possibility of applying them.
a3	Describe the various current trends in geophysical survey methods in engineering and environmental issues.	A4	Describe solutions for geological problems using logical scientific methods and creativity.
b1.	Assess the problem (engineering or environmental) and determine the suitability of a geophysical method (s) to apply to solving this problem.	B2	Explore knowledge and skills in solving geological and environmental problems logically and professionally.
b2.	Distinguishes between the various geophysical methods, and the ability to plan to conduct geophysical surveys, and cost estimation.	B4	Experiment independently skills of critical thinking and creative analysis to solve problem (s) that may encounter in the field or lab.
c1.	Uses existing and modern technologies to study various engineering and environmental problems, taking into account international standards and approaches and taking into account the local population when undertaking any activity.	C2	Apply new and established technologies with efficiency to collect and interpret geological data, recognizing their strengths and limitations.
c2.	Collect and analyze field data, link them together, find a scientific and practical explanation, and prepare the necessary reports.	C5	Administer various geological data, integrate, scientifically interpret, and report them.
d1.	Adapts to new environments, working in different environments and cultures.	D1	Adjust to new environment, and function in diverse learning and working environments.
d2.	Exhibits specifications and general features intelligent and objective outside the scope of specialization.	D3	Express general and impartial intellectual characteristics beyond the specialization.

مواصلة مخرجات التعلم باستراتيجيات التعليم والتعلم والتقييم Alignment of CILOs to Teaching and Assessment Strategies		
أولاً: مواصلة مخرجات تعلم المقرر (المعارف والفهم) باستراتيجيات 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 - Demonstrate sufficient knowledge and understanding of the basic principles of geophysical methods, equipment, and field procedures, both for application and interpretation to be simple.	Explanatory lectures using the data show.	Theoretical exams.
a2 - Explain concepts, principles, and techniques		

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	for designing a system, process, or application component of the geophysical method of an engineering and / or environmental problem and its procedural implementation.		
a3 -	Describe the various current trends in geophysical survey methods in engineering and environmental issues.		

ثانياً: موازنة مخرجات تعلم المقرر (المهارات الذهنية) باستراتيجية التدريس والتقييم:

Second: Alignment of Intellectual Skills CILOs

مخرجات المقرر/ المهارات الذهنية Intellectual Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقييم Assessment Strategies
b1 -	Assess the problem (engineering or environmental) and determine the suitability of a geophysical method (s) to apply to solving this problem.	Examples, exercises and brainstorming.	Oral examination and reports.
b2 -	Distinguishes between the various geophysical methods, and the ability to plan to conduct geophysical surveys, and cost estimation.		

ثالثاً: موازنة مخرجات تعلم المقرر (المهارات المهنية والعملية) باستراتيجية التدريس والتقييم:

Third: Alignment of Professional and Practical Skills CILOs

مخرجات المقرر/ المهارات المهنية والعملية Professional and Practical Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقييم Assessment Strategies
c1-	Uses existing and modern technologies to study various engineering and environmental problems, taking into account international standards and approaches and taking into account the local population when undertaking any activity.	Tasks and assignments.	Assessment of the tasks and assignments by direct questions.
c2-	Collect and analyze field data, link them together, find a scientific and practical explanation, and prepare the necessary reports.		

رابعاً: موازنة مخرجات تعلم المقرر (المهارات العامة) باستراتيجية التدريس والتقييم:

Fourth: Alignment of Transferable (General) Skills CILOs

مخرجات المقرر Transferable (General) Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقييم Assessment Strategies
d1-	Adapts to new environments, working in different environments and cultures.	Doing research and reports.	View and discuss research and reports.
d2-	Exhibits specifications and general features intelligent and objective outside the scope of specialization.		



## Course Content محتوى المقرر

### Theoretical Aspect الجوانب النظرية

الرقم Order	الموضوعات الرئيسية/ الوحدات Topic List / Units	الموضوعات الفرعية Sub Topics List	عدد الأسابيع Number of Weeks	الساعات الفعليّة Contact Hours	رموز مخرجات التعلم للمقرر (CILOs)
1	Introduction	<ul style="list-style-type: none"> <li>- Targets of engineering and environmental investigations</li> <li>- Near-surface geophysical methods</li> <li>- Grid interval</li> <li>- Combined various geophysical methods</li> <li>- Factors of cost estimation</li> <li>- Ambiguity of interpretation</li> </ul>	2	4	a1, a2 a3
2	Environmental Problems	<ul style="list-style-type: none"> <li>- Location and characterization of near-surface geological structures</li> <li>- Characterization of aquifers</li> <li>- Groundwater protection</li> <li>- Salinity of underground water</li> <li>- Landfill characterization</li> <li>- Safe disposal of nuclear and chemical waste</li> <li>- Landslides and ground subsidence</li> <li>- Archeological site delineation</li> <li>- Evaluation of earthquake hazards</li> <li>- Mining problems and safety</li> <li>- Environmental hygiene</li> <li>- Radioactivity surveys for indoor radon risk</li> <li>- Radiation from industrial and waste dumps</li> <li>- Delineation of radioactive fallouts</li> <li>- Detection of fracture zones (earthquake prediction)</li> </ul>	1	2	a1, a2, a3, b1, b2, c2, d1



3	Civil Engineering Problems	<ul style="list-style-type: none"> <li>- Testing of foundations</li> <li>- Survey of establishments and construction works</li> <li>- Geotechnical problems</li> <li>- Blast planning and analysis</li> <li>- Location of water</li> <li>- Location of older underground excavations</li> </ul>	1	2	a1, a2, a3, b1, b2, c2, d1
4	Gravity Surveying	<ul style="list-style-type: none"> <li>- Review</li> <li>- Applications to environmental and engineering studies</li> <li>- Delineation of structural trends, contacts, and faults</li> <li>- Mapping of salt structures</li> <li>- Estimating shape and depth of plutons</li> <li>- Mapping of alluvium/bedrock contact</li> <li>- Gravity investigations of landfill</li> <li>- Microgravity studies of rock bursts in mines</li> <li>- Microgravity detection of subsurface voids and cavities</li> </ul>	2	4	a1, a2, a3, b1, b2, c1, c2, d1, d2
5	Magnetic Surveying	<ul style="list-style-type: none"> <li>- Review</li> <li>- Environmental and engineering applications</li> <li>- Mapping of structural trends and basement features</li> <li>- Magnetic investigations over landfills</li> <li>- Detection of buried metal drums and casings</li> <li>- Mapping of cavities and voids</li> <li>- Mapping of dikes blocking groundwater flow</li> <li>- Detection of archaeological objects</li> </ul>	2	4	a1, a2, a3, b1, b2, c1, c2, d1, d2
6	Midterm Exam	-	1	2	a1, a2, a3, b1, b2, c1, c2, d1, d2
7	Seismic	- Review	2	4	a1, a2, a3,

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	<b>Surveys</b>	<ul style="list-style-type: none"> <li>- Reflection surveying</li> <li>- Applications to environmental and engineering problems</li> <li>- Mapping of fracture zones</li> <li>- Reflection profiling in groundwater studies</li> <li>- Delineation of bedrock valleys</li> <li>- Detection of shallow faults and cavities</li> </ul>			b1, b2, c1, c2, d1, d2
		<ul style="list-style-type: none"> <li>- Refraction surveying</li> <li>- Environmental and engineering applications</li> <li>- Velocity as a guide to rock strength</li> <li>- Detection of potential collapse features</li> <li>- Mapping of buried ancient ditch</li> <li>- Mapping of gravel and sand deposits</li> <li>- Dam site investigations</li> </ul>			
<b>8</b>	<b>Self-potential Surveying</b>	<ul style="list-style-type: none"> <li>- Review</li> <li>- Applications to environmental and engineering problems</li> <li>- Seepage flow in a landslide body</li> <li>- Seepage flow in dams and reservoir floors</li> <li>- Delineation of groundwater flow</li> <li>- Studies of geothermal fluid flow</li> </ul>	1	2	a1, a2, a3, b1, b2, c1, c2, d1, d2
<b>9</b>	<b>Resistivity and</b>	<ul style="list-style-type: none"> <li>- Review</li> </ul>	2	4	a1, a2, a3,





	<b>Induced Polarization Surveys</b>	<ul style="list-style-type: none"> <li>- <b>Resistivity applications</b></li> <li>- Groundwater exploration</li> <li>- water quality</li> <li>- Mapping of chemical pollution plumes</li> <li>- delineation of water-saturated zones in landslide bodies</li> <li>- location of permafrost zones</li> <li>- location of archaeological objects</li> <li>- location of cavities and voids</li> <li>- Resistivity characteristics of geothermal fluids</li> <li>- <b>IP applications</b></li> <li>- Evaluation of aquifer potential</li> <li>- investigation of domestic waste dump</li> <li>- mapping of industrial contamination</li> </ul>			b1, b2, c1, c2, d1, d2
10	<b>Electromagnetic Surveys</b>	<ul style="list-style-type: none"> <li>- Review</li> <li>- Examples of applications to environmental problems</li> <li>- Delineation of contamination plume from waste dumps</li> <li>- mapping industrial groundwater contamination</li> <li>- mapping soil salinity in farmland</li> </ul>	1	2	a1, a2, a3, b1, b2, c1, c2, d1, d2
11	<b>Final Exam</b>	-	1	2	a1, a2, a3, b1, b2, c1, c2, d1, d2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			16	32	

الموضوعات العملية (إن وجدت) Practical Aspect (if any)				
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	Geophysical methods for solving environmental problems -Field survey -Data corrections	4	8	a1, a2, a3, b1, b2, c1, c2, d1, d2

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	-Processing -Presentation -Joint interpretation -Writing a report			
2	Geophysical methods for solving engineering problems -Field survey -Data corrections -Processing -Presentation -Joint interpretation -Writing a report	4	8	a1, a2, a3, b1, b2, c1, c2, d1, d2
3	Mid-term exam	1	3	a1, a2, a3, b1, b2, c1, c2, d1, d2
4	Geophysical methods for solving geotechnical problems -Field survey -Data corrections -Processing -Presentation -Joint interpretation -Writing a report	2	4	a1, a2, a3, b1, b2, c1, c2, d1, d2
5	Field work	2	4	a1, a2, a3, b1, b2, c1, c2, d1, d2
6	Final exam	1	3	a1, a2, a3, b1, b2, c1, c2, d1, d2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		14	30	

### استراتيجيات التعليم والتعلم Teaching Strategies

- Lectures.
- Exercises.
- Field applications.
- Brain storming.
- Tasks and activities.

### الأنشطة والتكليفات Tasks and Assignments

م No	التكليف/ الواجب Assignments/ Tasks	نوع التكليف (فردى / تعاونى) Mark	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due	خرجات التعلم CILOs (symbols)
1	Weekly reports	Individual	5	1 -11	a1 – a3, b1, ,b2, c1, c2, d1, d2

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2	Essay for geophysical applications at environmental and engineering site investigations.	Individual	10	10	a1 – a3, b1, ,b2, c1, c2, d1, d2
Total Score إجمالي الدرجة			15		

تقييم التعلم Learning Assessment					
الرقم No.	أنشطة التقييم Assessment Tasks	أسبوع التقييم Week due	الدرجة Mark	نسبة الدرجة إلى الدرجة النهائية Proportion of Final Assessment	مخرجات التعلم CILOs (symbols)
1	الأنشطة والتكليفات Tasks and Assignments		15	15%	a1 – a3, b1, ,b2, c1, c2, d1, d2
2	كوز (1) Quiz	W6	5	5%	a1- a3, b1, b2
3	اختبار نصف الفصل (نظري) Midterm Exam (Theo.)	W9	15	15%	a1 – a3, b1, ,b2, c1, c2, d1, d2
4	اختبار نصف الفصل (عملي) Midterm Exam (Pract.)	W9	5	5%	a1 – a3, b1, ,b2, c1, c2, d1, d2
5	اختبار نهاية الفصل (عملي) Final Exam (practical)	W14	20	20%	a1-a3, b1, b2, c1, c2, d1, d2
6	اختبار نهاية الفصل (نظري) Final Exam (theoretical)	W16	40	40%	a1 – a3, b1, ,b2, c1, c2, d1, d2
Total الإجمالي			100	%100	

مصادر التعلم Learning Resources	
توثق المراجع حسب نظام APA (اسم المؤلف، سنة النشر، اسم الكتاب، دار النشر، بلد النشر).	
المراجع الرئيسية (لا تزيد عن مرجعين) Required Textbook(s)	
1. Sharma P. V., 1997: " <i>Environmental and engineering geophysics</i> ". Cambridge University Press, 475 p. 2. Telford, W.M., Geldart, L.P., Sheriff, R.E. and Lceys, D.A., (1990): " <i>Applied Geophysics</i> " 2nd edition; Cambridge Univ. Press, 121p.	
المراجع المساندة Essential References	
1. Dobrin, M.B. and Savit, C. H., (1988): " <i>Introduction to geophysical prospecting</i> ", the 4th Edition. McGraw-Hill Book Co. New York, 867p. 2. Sharma, P.V., (1976): " <i>Geophysical methods in geology</i> ", Elsevier Scientific Publishing Company, Amsterdam, The Nether land. 3. Lillie, R., (1999): " <i>Whole Earth Geophysics: An Introductory Textbook for Geologists and Geophysicists</i> ". Upper Saddle River, NJ: Prentice Hall. 361 p.	
المصادر الإلكترونية ومواقع الإنترنت Electronic Materials and Web Sites etc.	
1. usgs.gov website analytics usgs.gov 2. <a href="http://trustmyscience.com">trustmyscience.com</a> 3. Suggested Journals: <i>Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)</i> <i>Geophysical Journal of the Royal Astronomical Society</i> <i>Journal of Geophysical Research</i>	

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*Geophysics*  
*Pure and Applied Geophysics*  
*Geotechnical and Environmental Geophysics*  
*Geophysical Prospecting*  
*Journal of Applied Geophysics*  
*Journal of Environmental and Engineering Geophysics*

## Course Policies:

<b>1</b>	<b>Class Attendance:</b> <ul style="list-style-type: none"> <li>- Students are expected to attend classes regularly and promptly.</li> <li>- The attendance should not be less than 80%.</li> <li>- 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.</li> </ul>
<b>2</b>	<b>Tardy:</b> <ul style="list-style-type: none"> <li>- Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.</li> </ul>
<b>3</b>	<b>Exam Attendance/Punctuality:</b> <ul style="list-style-type: none"> <li>- According to the rules the student gets absent in the exam of the course.</li> </ul>
<b>4</b>	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"> <li>- Papers survey or projects should be submitted by the time detriment by the professor.</li> </ul>
<b>5</b>	<b>Cheating:</b> <ul style="list-style-type: none"> <li>- 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.</li> </ul>
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<b>7</b>	<b>Other policies:</b> <ul style="list-style-type: none"> <li>- The student should by a commitment by the rules inside class and university. Therefore, he is expected to show respect for his classmate, instructors &amp; others.</li> </ul>



قسم/ برنامج: العلوم الجيولوجية  
العام الجامعي: 2020-2019م

## خطة مقرر: الجيوفيزياء الهندسية والبيئية

### Course Plan (Syllabus): Engineering and Environmental Geophysics

معلومات عن أستاذ المقرر							
Information about Faculty Member Responsible for the Course							
الاسم Name		الساعات المكتبية (أسبوعياً) Office Hours					
المكان ورقم الهاتف Location & Telephone No.		السبت SAT	الأحد SUN	الاثنين MON	الثلاثاء TUE	الأربعاء WED	الخميس THU
البريد الإلكتروني E-mail							

معلومات عامة عن المقرر					
General information about the course					
1.	اسم المقرر Course Title	الجيوفيزياء الهندسية والبيئية Engineering and Environmental Geophysics			
2.	رمز المقرر ورقمه Course Code and Number	EG465			
3.	الساعات المعتمدة للمقرر Credit Hours	الساعات المعتمدة			الإجمالي Total
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	
		2	1		3
4.	المستوى والفصل الدراسي Study Level and Semester	المستوى الرابع - الفصل الأول			
5.	المتطلبات السابقة للمقرر Pre-requisites	GEOS334			
6.	المتطلبات المصاحبة (إن وجدت) Co-requisite	GEOS451			
7.	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	العلوم الجيولوجية			
8.	لغة تدريس المقرر Language of teaching the course	عربي - انجليزي			
9.	مكان تدريس المقرر Location of teaching the course	الحرم الجامعي			

وصف المقرر	
Course Description	
This course provides a description of the geophysical techniques or methods used in engineering and environmental applications, and the use of those technologies as an integrated exploration method, through the use of the logical methodology (physics, mathematics and geology, with engineering techniques, information engineering, and devices).	يقدم هذا المقرر وصفا للتقنيات أو الطرق الجيوفيزيائية المستخدمة في التطبيقات الهندسية والبيئية، واستخدام تلك التقنيات كطريقة استكشاف متكاملة، وذلك من خلال

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This course will also discuss how to choose and estimate geophysical techniques appropriate for specific applications.

استخدام المنهجية المنطقية (الفيزياء والرياضيات والجيولوجيا، مع التقنيات الهندسية وهندسة المعلومات والأجهزة).  
كما سيناقش هذا المقرر كيف يتم اختيار وتقدير التقنيات الجيوفيزيائية المناسبة لتطبيقات معينة.

### مخرجات تعلم المقرر (CILOs) Course Intended Learning Outcomes

After completing the course, the student will be able to:		بعد الانتهاء من دراسة المقرر سوف يكون الطالب قادرا على أن:
a1.	Demonstrate sufficient knowledge and understanding of the basic principles of geophysical methods, equipment, and field procedures, both for application and interpretation to be simple.	a1 - يظهر المعرفة الكافية والفهم للمبادئ الأساسية للطرق الجيوفيزيائية والأجهزة والإجراءات الميدانية، وذلك لأجل أن يكون كل من التطبيق والتفسير بسيطاً.
a2.	Explain concepts, principles, and techniques for designing a system, process, or application component of the geophysical method of an engineering and / or environmental problem and its procedural implementation.	a2 - يشرح مفاهيم ومبادئ وتقنيات تصميم النظام أو العملية أو عنصر التطبيق للطريقة الجيوفيزيائية للمشكلة الهندسية و/أو البيئية وتنفيذها إجرائياً.
a3.	Describe the various current trends in geophysical survey methods in engineering and environmental issues.	a3 - يصف الاتجاهات الحالية المختلفة في أساليب المسح الجيوفيزيائي في القضايا الهندسية والبيئية.
b1.	Assess the problem (engineering or environmental) and determine the suitability of a geophysical method (s) to apply to solving this problem.	b1 - يقيم المشكلة (هندسية أو بيئية) وتحديد مدى ملاءمة الطريقة (الطرق) الجيوفيزيائية لتطبيقها في حل هذه المشكلة.
b2.	Distinguishes between the various geophysical methods, and the ability to plan to conduct geophysical surveys, and cost estimation.	b2 - يميز بين الوسائل الجيوفيزيائية المختلفة، والقدرة على التخطيط لإجراء مسوحات جيوفيزيائية وتقدير الكلفة.
c1.	Uses existing and modern technologies to study various engineering and environmental problems, taking into account international standards and approaches and taking into account the local population when undertaking any activity.	c1 - يستخدم التقنيات القائمة والحديثة لدراسة المشاكل الهندسية والبيئية المختلفة، مع الأخذ في الاعتبار المقاييس والمقاربات العالمية ومراعاة السكان المحليين عند القيام بأي نشاط.
c2.	Collect and analyze field data, link them together, find a scientific and practical explanation, and prepare the necessary reports.	c2 - يجمع ويحلل البيانات الحقلية والربط فيما بينها وإيجاد تفسير علمي وعملي واعداد التقارير اللازمة.
d1.	Adapts to new environments, working in different environments and cultures.	d1 - يتأقلم مع البيئات الجديدة، والعمل في البيئات والثقافات المختلفة.
d2.	Exhibits specifications and general features intelligent and objective outside the scope of specialization.	d2 - يبدي مواصفات ومميزات ذكاء عامة وموضوعية خارج نطاق التخصص.



## Course Content محتوى المقرر

### Theoretical Aspect خطة تنفيذ الموضوعات النظرية

الرقم Order	الموضوعات الرئيسية/ الوحدات Topic List / Units	الموضوعات الفرعية Sub Topics List	الأسابيع Weeks due to	الساعات الفعلية Contact Hours
1	Introduction	<ul style="list-style-type: none"> <li>- Targets of engineering and environmental investigations</li> <li>- Near-surface geophysical methods</li> <li>- Grid interval</li> <li>- Combined various geophysical methods</li> <li>- Factors of cost estimation</li> <li>- Ambiguity of interpretation</li> </ul>	W1, W2	4
2	Environmental Problems	<ul style="list-style-type: none"> <li>- Location and characterization of near-surface geological structures</li> <li>- Characterization of aquifers</li> <li>- Groundwater protection</li> <li>- Salinity of underground water</li> <li>- Landfill characterization</li> <li>- Safe disposal of nuclear and chemical waste</li> <li>- Landslides and ground subsidence</li> <li>- Archeological site delineation</li> <li>- Evaluation of earthquake hazards</li> <li>- Mining problems and safety</li> <li>- Environmental hygiene</li> <li>- Radioactivity surveys for indoor radon risk</li> <li>- Radiation from industrial and waste dumps</li> <li>- Delineation of radioactive fallouts</li> <li>- Detection of fracture zones (earthquake prediction)</li> </ul>	W3	2
3	Civil Engineering Problems	<ul style="list-style-type: none"> <li>- Testing of foundations</li> <li>- Survey of establishments and construction works</li> <li>- Geotechnical problems</li> <li>- Blast planning and analysis</li> <li>- Location of water</li> <li>- Location of older underground excavations</li> </ul>	W4	2

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4	Gravity Surveying	- Review	W5, W6	4
		<ul style="list-style-type: none"> <li>- Applications to environmental and engineering studies</li> <li>- Delineation of structural trends, contacts, and faults</li> <li>- Mapping of salt structures</li> <li>- Estimating shape and depth of plutons</li> <li>- Mapping of alluvium/bedrock contact</li> <li>- Gravity investigations of landfill</li> <li>- Microgravity studies of rock bursts in mines</li> <li>- Microgravity detection of subsurface voids and cavities</li> </ul>		
5	Magnetic Surveying	- Review	W7, W8	4
		<ul style="list-style-type: none"> <li>- Environmental and engineering applications</li> <li>- Mapping of structural trends and basement features</li> <li>- Magnetic investigations over landfills</li> <li>- Detection of buried metal drums and casings</li> <li>- Mapping of cavities and voids</li> <li>- Mapping of dikes blocking groundwater flow</li> <li>- Detection of archaeological objects</li> </ul>		
6	Midterm Exam	-	W9	2
7	Seismic Surveys	- Review	W10, W11	4
		<ul style="list-style-type: none"> <li>- Reflection surveying</li> <li>- Applications to environmental and engineering problems</li> <li>- Mapping of fracture zones</li> <li>- Reflection profiling in groundwater studies</li> <li>- Delineation of bedrock valleys</li> <li>- Detection of shallow faults and cavities</li> </ul>		
		<ul style="list-style-type: none"> <li>- Refraction surveying</li> <li>- Environmental and engineering applications</li> <li>- Velocity as a guide to rock strength</li> <li>- Detection of potential collapse</li> </ul>		

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		<ul style="list-style-type: none"> <li>features</li> <li>- Mapping of buried ancient ditch</li> <li>- Mapping of gravel and sand deposits</li> <li>- Dam site investigations</li> </ul>		
8	Self-potential Surveying	<ul style="list-style-type: none"> <li>- Review</li> <li>- Applications to environmental and engineering problems</li> <li>- Seepage flow in a landslide body</li> <li>- Seepage flow in dams and reservoir floors</li> <li>- Delineation of groundwater flow</li> <li>- Studies of geothermal fluid flow</li> </ul>	W12	2
9	Resistivity and Induced Polarization Surveys	<ul style="list-style-type: none"> <li>- Review</li> <li>- <b>Resistivity applications</b> <ul style="list-style-type: none"> <li>- Groundwater exploration</li> <li>- water quality</li> <li>- Mapping of chemical pollution plumes</li> <li>- delineation of water-saturated zones in landslide bodies</li> <li>- location of permafrost zones</li> <li>- location of archaeological objects</li> <li>- location of cavities and voids</li> </ul> </li> <li>- <b>IP applications</b> <ul style="list-style-type: none"> <li>- Evaluation of aquifer potential</li> <li>- investigation of domestic waste dump</li> <li>- mapping of industrial contamination</li> </ul> </li> </ul>	W13, W14	4
10	Electromagnetic Surveys	<ul style="list-style-type: none"> <li>- Review</li> <li>- Examples of applications to environmental problems</li> <li>- Delineation of contamination plume from waste dumps</li> <li>- mapping industrial groundwater contamination</li> <li>- mapping soil salinity in farmland</li> </ul>	W15	2



11	Final Exam	-	W16	2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			16	32

خطة تنفيذ موضوعات الجانب العملي Practical / Training/ Tutorials/ Exercises Aspects			
الرقم Order	التجارب العملية/ التمارين / تدريبات Practical / Exercises/ Tutorials topics	عدد الأسابيع Number of Weeks	الساعات الفعلية Contact Hours
1	Geophysical methods for solving environmental problems -Field survey -Data corrections -Processing -Presentation -Joint interpretation -Writing a report	W1-4	8
2	Geophysical methods for solving engineering problems -Field survey -Data corrections -Processing -Presentation -Joint interpretation -Writing a report	W5-8	8
3	Mid-term exam	W9	3
4	Geophysical methods for solving geotechnical problems -Field survey -Data corrections -Processing -Presentation -Joint interpretation -Writing a report	W10, W11	4
5	Field work	W12, W13	4
6	Final exam	W14	3
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		14	30

استراتيجيات التعليم والتعلم Teaching Strategies
<ul style="list-style-type: none"> <li>▪ Lectures.</li> <li>▪ Exercises.</li> <li>▪ Field applications.</li> <li>▪ Brain storming.</li> </ul>



Tasks and activities.

Tasks and Assignments والأنشطة والتكليفات

م No	التكليف/ الواجب Assignments/ Tasks	نوع التكليف (فردى/ تعاوني)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due
1	Weekly reports	Individual	5	1 -11
2	Essay for geophysical applications at environmental and engineering site investigations.	Individual	10	10
Total Score إجمالي الدرجة			15	

تقييم التعلم Learning Assessment

الرقم No.	أنشطة التقييم Assessment Tasks	أسبوع التقييم Week due	الدرجة Mark	نسبة الدرجة إلى الدرجة النهائية Proportion of Final Assessment
1	الأنشطة والتكليفات Tasks and Assignments		15	15%
2	كوز (1) Quiz	W6	5	5%
3	اختبار نصف الفصل (نظري) Midterm Exam (Theo.)	W9	15	15%
4	اختبار نصف الفصل (عملي) Midterm Exam (Pract.)	W9	5	5%
5	اختبار نهاية الفصل (عملي) Final Exam (practical)	W14	20	20%
6	اختبار نهاية الفصل (نظري) Final Exam (theoretical)	W16	40	40%
Total الإجمالي			100	%100

Learning Resources مصادر التعلم

توثق المراجع حسب نظام APA (اسم المؤلف، سنة النشر، اسم الكتاب، دار النشر، بلد النشر).

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

- Sharma P. V., 1997: "*Environmental and engineering geophysics*". Cambridge University Press, 475 p.
- Telford, W.M., Geldart, L.P., Sheriff, R.E. and Lceys, D.A., (1990): "*Applied Geophysics*" 2nd edition; Cambridge Univ. Press, 121p.

Essential References المراجع المساندة

- Dobrin, M.B. and Savit, C. H., (1988): "*Introduction to geophysical prospecting*", the 4th Edition. McGraw-Hill Book Co. New York, 867p.
- Sharma, P.V., (1976): "*Geophysical methods in geology*", Elsevier Scientific Publishing Company, Amsterdam, The Nether land.
- Lillie, R., (1999): "*Whole Earth Geophysics: An Introductory Textbook for Geologists and*

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*Geophysicists*". Upper Saddle River, NJ: Prentice Hall. 361 p.

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

1. usgs.gov website analytics usgs.gov
2. [trustmyscience.com](http://trustmyscience.com)
3. **Suggested Journals:**  
*Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)*  
*Geophysical Journal of the Royal Astronomical Society*  
*Journal of Geophysical Research*  
*Geophysics*  
*Pure and Applied Geophysics*  
*Geotechnical and Environmental Geophysics*  
*Geophysical Prospecting*  
*Journal of Applied Geophysics*  
*Journal of Environmental and Engineering Geophysics*

## Course Policies:

<b>1</b>	<b>Class Attendance:</b> <ul style="list-style-type: none"> <li>- Students are expected to attend classes regularly and promptly.</li> <li>- The attendance should not be less than 80%.</li> <li>- 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.</li> </ul>
<b>2</b>	<b>Tardy:</b> <ul style="list-style-type: none"> <li>- Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.</li> </ul>
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