مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	**Earth Resources and the Environment** **موارد الارض و البيئة**
2	**Course number**	0305381
3	**Credit hours**	3 hours (3,0)
	Contact hours (theory, practical)	3 hours (3,0)
4	**Prerequisites/corequisites**	0305231
5	**Program title**	**Environmental and Applied Geology**
6	**Program code**	
7	**Awarding institution**	الجامعة الاردنيةThe University of Jordan
8	**School**	Science
9	**Department**	Geology
10	**Course level**	Third – fourth year
11	**Year of study and semester (s)**	2023/2024 first, second
12	**Other department (s) involved in teaching the course**	None
13	**Main teaching language**	English
14	**Delivery method**	☐**Face to face learning** ☐Blended ☐Fully online
15	**Online platforms(s)**	☐**Moodle** ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	Second semester 2023/2024

17 Course Coordinator:

Name: Khitam Alzughoul	Contact hours: **1-2 (S, TUE, Wed)**
Office number G217:	Phone number: (962) 5355000- ext.: 22260
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18 Other instructors:

Name: Office number: Phone number: Email: Contact hours: Name: Office number: Phone number: Email: Contact hours:

19 Course Description:

As stated in the approved study plan. This course is an introductory presentation of physical and chemical characteristics of resources of the earth. Emphasis will be placed on the descriptive geology and origin of economic mineral concentrations: Minerals; the foundations of society. Energy from fossil fuels; energy for the future: nuclear energy; abundant metals; fertilizer and chemical minerals; water resources; soil resources: formation, types, distribution and uses; future resources; environmental impact assessment of resources exploitation and use; assessment of the environmental dangers of large projects.

20 Course aims and outcomes: A- Aims:

1. To acknowledge the basic geologic processes and concepts using the framework of Earth resources. And the geologic processes that are responsible for the formation and distribution of resources
2. To realize that everything we use comes from somewhere on Earth and when we are done with it, it ends up somewhere.
3. To Think about what resources we use daily, both intentionally and unintentionally, where those resources come from, and environmental consequences of exploitation, manufacturing, and use.
4. contribute to solving challenging problems related to earth resources and energy sectors together with graduates of other disciplines.
5. To consider the science behind politically-charged environmental issues so that informed, and intelligent decisions can be made.
6. To consider the reasons for and remedies to environmental problems, and to contribute to Environmental Impact Assessment of Natural Resources –Oriented Projects
7. To Show how every-day-decisions made by individuals like you and me affect the land we live on, the water we drink, and air the breath.
8. Contribute scientifically and ethically to the development of the society.

B- Students Learning Outcomes (SLOs):

1. To learn the basic geologic processes and concepts using the framework of Earth resources.
2. To realize that geologic processes are responsible for the formation and distribution of resources and they have impacts on the shape our present day economy, policy, and lifestyles.
3. Understand the geologic processes responsible for the formation and distribution of natural resources and how they shape our present day economy, policy, and lifestyles.
4. Acquire an understanding of scientific foundations of different types of Natural resources Be able to Categorize them based on their chemical characteristics, occurrences and/ or source or genesis.
5. Demonstrate knowledge of various exploration methods (geological, geochemical and geophysical) to conduct a prospecting survey for specific natural resources.
6. Develop good inter-personal and communication skills through writing and contributing to critical discussion in groups.

Objectives of the Environmental and Applied Geology program are:

- **PEO-1:** EAG program graduates are expected to be creative and responsible professionals leading a successful career in academia and/or industry.
- **PEO-2:** EAG program graduates are expected to communicate with peers and society to raise awareness and provide innovative solutions to contemporary problems and challenges.
- **PEO-3:** EAG program graduates are expected to adapt to new developments and technology and disseminate the concepts of continuous learning and modernization.

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Upon successful completion of this course, students will be able to:

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1: To learn the basic geologic processes and concepts using the framework of Earth resources	√√√	√√√							
2: To realize that geologic processes are responsible for the formation and distribution of resources and they have impacts on the shape our present day economy, policy, and lifestyles	√√√	√√√							√√√
3: Acquire an understanding of scientific foundations of different types of Natural resources Be able to Categorize them based on their chemical characteristics, occurrences and/ or source or genesis	√√√	√√√	√√√						
4: Demonstrate knowledge of various exploration methods (geological, geochemical and geophysical) to apply and conduct a prospecting survey for specific natural resources	√√√	√√√					√√√		
5: Develop good inter-personal and communication skills through writing and contributing to critical discussion in groups.	√√√	√√√					√√√	√√√	
6: Contribute scientifically and ethically to the development of the society	√√√	√√√							√√√

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21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	**Introduction,**	1,2,3	**Face to Face**			- Assignment -Quiz -First Exam	Introduction Ch. 1
	1.2	- Definitions: resources, mineral deposits, Ore, Economic Geology	1,2,3	Face to Face			- Assignment -Quiz -First Exam	Introduction Ch. 1
	1.3	- Minerals: The foundations of society.	1,2,3	Face to Face			- Assignment -Quiz -First Exam	Introduction Ch. 1
2	2.1 2.2 2.3	**. Principles,** **Grade, mineral deposits** Classification, • Earth resources through history **- Introduction to Non Metallic Resources:** Building materials and other	1,2,3, 7,9	Face			- Assignment -Quiz - First Exam	**Ch 1, 2** **Class notes** Ch 20

		industrial resources - Factors affecting economic evaluation of the ores		Face to Face ,	Moodle JU/ E-learning			
3	3.1 3.2 3.3	**Exploration, Analytical methods** Mineral Explorations: geology, geochemical, geophysical, Drilling	1,2,3, 4,7	Face to Face			- Assignment -Quiz - First Exam	Class Notes
4	4.1 4.2 4.3	**Sources** **- What necessary to form Ore deposits** - Ore forming fluids; - sources, - means of transport, p. 62 - means of precipitations	1, 2,3	Face to Face			Assignment 3 -Quiz - First Exam	**Ch 4** Class notes

5	5.1	- means of precipitations/ Phase diagrams	1,2,3,	Face to Face			Assignment 3 -Quiz - First Exam	**Ch 4** Class notes
	5.2	First Exam						
	5.3	-Mode of Occurrence, morphology of the principal types of Ore Deposits	1, 2, 3, 4, 7	Face to Face			Assignment 5 Quiz hand samples, Groups -Second Exam	Ch 2 Ch 5, Class Notes
6	6.1	Textures, Paragenetic Sequence,	1, 2, 3, 4, 7	Face to Face				
	6.2	Zoning		Face to Face				
	6.3	Examples Wall rock alterations	1, 2, 3, 4, 7	Face to Face				
7	7.1	**Geochemical Alterations 1**	1, 2, 3, 4,6	Face to face			Assignment 6 -Quiz -Hand Samples - second Exam	Ch 3 Class notes
	7.2							
	7.3	Geochemical Alterations 2						
8	8.1			Face to Face				Class Notes Videos
	8.2							

	8.3	Evaluation, Extraction and Mining methods Mineral Processing Environmental Impacts	2, 3, 4, 5,9	On-line	JU-Moodle E learning		- Assignment -Quiz - Second Exam	Animation of mining methods and processing
9	9.1	Second Exam						
	9.2	Energy Resources - fossil fuels Energy, Geology: Sources, fundamental parameters, migration, Traps Coal,	1,2, 3, 4,6,9	Face to Face			Assignment -Quiz - Second Exam	Bjørlykke Knut, Ch 1, Class notes -selected videos
	9.3							
10	10.1	- Conventional Resources Petroleum Oil,						
	10.2	Unconventional Resources -Tar Sands -Oil Shale in Jordan						
	10.3	Energy for the future- Renewable & Nuclear Power						
Week	**Lecture**	**Topic**	**Student Learning Outcome**	**Learning Methods (Face to Face/Blended/ Fully Online)**	**Platform**	**Synchronous / Asynchronous Lecturing**	**Evaluation Methods**	**Resources**

11	11.1	Magmatic Ore deposits =types, factors, cases	1–4,7,9	Face to Face			Assignment -Quiz - Final Exam	Ch. 10 Class Notes Videos
	11.2	Orthomagmatic deposits Cr, PGEs, Iron (Bushveld)						
	11.3							Ch. 7
12	12.1	Diamond Deposits Diamond Deposits						Class Notes
	12.2	Introduction to porphyry Ore deposits: Cu	1-4,7	Face to Face			Quiz Hand samples Final Exam	Ch. 14 Ch. 15, Class notes
	12.3	porphyry Cu ore deposits: alteration / Exploration						
13	13.1	Supergene Cu Enrichment	1-4	Face to Face			Quiz Hand samples Final Exam	Ch. 15, **19** Class notes
	13.2		1-4,9				Quiz Hand samples Final Exam	
	13.3	Uranium Ore deposits		Face to Face				Ch 17 Ch 18

14	14.1	Ores of Jordan	1-6	Face to face			Critical thinking Report	Selected articles
	14.2				Ju- E learning			
	14.3							
15	15.1	Final Examinations						
	15.2							
	15.3							

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
1. Delivering Assignments Videos with pub up questions (Part of the assignment)	5	Price of commodity Mining methods Mining processes Largest Oil Fields of the world Energy Resources/ Jordan		1-13	Face to face Moodle and/or microsoft Teams
2. Quizzes	0	All topics		All weeks	Moodle and face to face

3. Reports	0-5	Energy Resources/ Jordan Field trip			Moodle
4. Exams First Exam Second Exam Final Exam	 20 25 50	 First, second , final		 4 8-9 Last week 0f school	 Paper
5. Seminars	0				

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

1. Online platform
2. The Library
3. Computer and Data Show
4. Internet and electronic services
5. Transmitted Polarizing Microscope (regular and Reflected), Specified samples (metallic and non metallic), Lenses, magnets, scales, Maps, Movies of mining and exploration methods and Environmental Impacts.

24 Course Policies:

A- All students are expected to attend all classes and should arrive on time. **Attendance** is essential to learning, be there. Students should maintain discipline and respect one another in both words and action. They are expected to come prepared and participate actively in class discussion. **Be on time**. Active participation is essential to learning.

According to University regulations, the maximum absence allowed is 15% of classes. Makeup exams r be given for accepted excuses.

B- Absences from exams and handing in assignments on time:

-Following the University rules in this regard: if the student provide a legitimate excuse, then another compensation exam will be given.

A quiz will be given during most lectures (unless an exam is scheduled). Each quiz will be 2-4 questions and based on the previous week's lecture. Quizzes cannot be made up. The lowest quiz grade will be dropped.

Late Assignments

It is essential that papers and other assignments be completed and submitted on time. Once the due date without notice and justification, the submission is not accepted.

C- Health and safety procedures:

Following The University regulations

D- Honesty policy regarding cheating, plagiarism, misbehavior:

* If the cheating have been proven or if student cause any disturbance during the exam; then the legislations and violation approved by the University of Jordan will be followed.

(If cheating is proven, then student/s, will be showed up upon investigation committee and university's regulation rules. In this regards will be followed.)

* اذا ثبت غش الطالب في الامتحان او ساهم في تعكير النظام الصفي فيتم تطبيق العقوبات المعمول بها في كلية العلوم و الجامعة الاردنية و حسب الأصول

E- Grading policy:

* First exam 20%, Second Exam 30%, Assignments + midterm project (10%) and Final Exam (40%)

__ Grades will be calculated based on points accumulated during the semester (50% for the first & second exams and activities). At the end of the semester there will be a comprehensive final exam. This exam will constitute 40% of your final semester grade.

Attendance, Quizzes, Participations & Assignments 10%

F- Available university services that support achievement in the course:

* The Library, Computer Center, and Hard rocks and Minerals Labs.

25 References:

A- Required book(s), assigned reading and audio-visuals:

- Evans, A.: 2018: Ore Geology and Industrial Minerals ; An Introduction; Blackwell Science, USA

- Bjørlykke Knut, 2015; Petroleum Geoscience From Sedimentary Environments to Rock Physics; Second Edition, Springer Heidelberg New York Dordrecht London, 666p.
- Craig, J. R.,Vanghan, D., and Skinner, B., 2010: Resources of the Earth, **4th** Ed. Prentice Hall, USA.

A- Recommended books, materials, and media:

Guilbert, J.M., and Park, C.F., Jr., 2008, The Geology of Ore Deposits, , Freeman, USA

Misra, K, 2001, Understanding Mineral Deposits, Wiley New York

Kesler, S.E., 1994, Mineral Resources, economics and the environment (Kesler 1994)

Economic Geology and Mineral industry Journals

Economic Geology, Mineralium Deposita, Ore Geology Reviews

Journal of Geochemical Exploration

Industrial Minerals , AAPG Bulletin (Explorer)

26 Additional information:

Name of Course Coordinator: --Dr. Khitam Alzughoul---Signature: -K. Alzughoul--Date: June 2024
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: --Dr. Mustafa Al Qaisi - Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------