Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	**Course Title**	Clay Minerals
2.	**Course Number**	0305722
3.	**Credit Hours (Theory, Practical)**	3, theory
	Contact Hours (Theory, Practical)	3, theory
4.	**Prerequisites/ Corequisites**	-
5.	**Program Title**	M.Sc. in Geology
6.	**Program Code**	-
7.	**School/ Center**	School of Science
8.	**Department**	Geology
9.	**Course Level**	-
10.	**Year of Study and Semester (s)**	-
11.	**Other Department(s) Involved in Teaching the Course**	-
12.	**Main Learning Language**	English
13.	**Learning Types**	✔ Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	✔ Moodle ✔ Microsoft Teams
15.	**Issuing Date**	-
16.	**Revision Date**	Fall 2024

17. Course Coordinator:

Name: Hind Ghanem Contact hours: -

Office number: Phone number: ext: 22281

Email: h.ghanem@ju.edu.jo

18. Other Instructors:

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

19. Course Description:

The aim of this course is to introduce the student to the world of Clay Minerals. The identification and characterization of minerals present in clay using different techniques and the interpretation of clay mineralogical data in combination with chemical analyses. The physical and chemical properties of clay minerals that are important with regard to clay minerals applications in environmental and industrial applications and the interaction of clays and human health.

20. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Students will show advanced expertise of geological standards, theories, and analytical techniques, equipping them to clear up complicated geological problems.

2. Students will develop the capability to design, conduct, and critically examine geological research, using quantitative and qualitative information evaluation to draw significant conclusions applicable to enterprise and academia.

3. Students will gain arms-on enjoy in fieldwork and laboratory settings, applying advanced geological techniques and tools to investigate geological phenomena and conduct resource assessments.

21. Course Intended Learning Outcomes (CLO's): (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. To demonstrate understanding of the structure, nomenclature, and occurrences of clay minerals.
2. To understand and characterize the transformation processes in clay minerals and reactions on clay mineral surfaces.
3. To be familiar with sample preparation techniques for clay minerals.
4. To understand the clay minerals applications in environmental and industrial applications and the interaction of clays and human health.

Course CLOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
1	✔	✔	✔			
2		✔	✔	✔		
3		✔	✔	✔	✔	
4		✔	✔	✔	✔	

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)
CLO (1)	✔					
CLO (2)	✔		✔			
CLO (3)	✔	✔	✔			
CLO (4)	✔	✔	✔			

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Introductory Meeting	1	Face to Face			Exams + assignments	Suggested readings + papers
	1.2	Introduction: Clay Minerals and their significance	1	Face to Face			Exams + assignments	Suggested readings + papers
	1.3							
2	2.1	Structures of sheet silicates: review	1	Face to Face			Exams + assignments	Suggested readings + papers
	2.2	Structures of sheet silicates: review	1	Face to Face			Exams + assignments	Suggested readings + papers
	2.3							
3	3.1	Chemistry and Mineralogy of Kaolinite, Illite and Smectite Minerals	1	Face to Face			Exams + assignments	Suggested readings + papers
	3.2	Chemistry and Mineralogy of Kaolinite, Illite and Smectite Minerals	1	Face to Face			Exams + assignments	Suggested readings + papers
	3.3							
4	4.1	Chemistry and Mineralogy of Chlorite and Mixed Layer Minerals	1	Face to Face			Exams + assignments	Suggested readings + papers
	4.2	Chemistry and Mineralogy of Chlorite and Mixed Layer Minerals	1	Face to Face			Exams + assignments	Suggested readings + papers
	4.3							
5	5.1	Geology of Clays	1	Face to Face			Exams + assignments	Suggested readings + papers
	5.2	Geology of Clays	1	Face to Face			Exams + assignments	Suggested readings + papers

	5.3							
6	6.1	Analytical techniques in studying clay minerals: X-ray diffraction	3	Face to Face			Exams + assignments	Suggested readings + papers
	6.2	Analytical techniques in studying clay minerals: X-ray diffraction	3	Face to Face			Exams + assignments	Suggested readings + papers
	6.3							
7	7.1	Separation and Preparation of Clays for XRD Analysis; Practical	3	Face to Face			Exams + assignments	Suggested readings + papers
	7.2	Quantitative Analysis of Clay Materials by XRD; Practical	3	Face to Face			Exams + assignments	Suggested readings + papers
	7.3							
8	8.1	Analytical techniques in studying clay minerals: scanning electron microscopy	3	Face to Face			Exams + assignments	Suggested readings + papers
	8.2	Particle Size, Surface Area and Morphology of Clays	2	Face to Face			Exams + assignments	Suggested readings + papers
	8.3							
9	9.1	Physicochemical properties of Clays	1, 2	Face to Face			Exams + assignments	Suggested readings + papers
	9.2	Clay Interactions with Water and Organics	4	Face to Face			Exams + assignments	Suggested readings + papers
	9.3							
10	10.1	Clay Minerals and Drilling Fluids	4	Face to Face			Exams + assignments	Suggested readings + papers
	10.2	The Importance of Clays in the Oil Industry	4	Face to Face			Exams + assignments	Suggested readings + papers
	10.3							
11	11.1	Industrial applications of clay minerals	4	Face to Face			Exams + assignments	Suggested readings + papers
	11.2	Industrial applications of clay minerals	4	Face to Face			Exams + assignments	Suggested readings + papers
	11.3							

12	12.1	Clay Minerals in Engineering Geology	4	Face to Face			Exams + assignments	Suggested readings + papers
	12.2	Clay Minerals in Engineering Geology	4	Face to Face			Exams + assignments	Suggested readings + papers
	12.3							
13	13.1	Clay Minerals in Jordan	1	Face to Face			Exams + assignments	Suggested readings + papers
	13.2	Clay Minerals in Jordan	1	Face to Face			Exams + assignments	Suggested readings + papers
	13.3							
14	14.1	Presentations by students	4	Face to Face				
	14.2	Presentations by students	4	Face to Face				
	14.3							
15	15.1	Presentations by students	4	Face to Face				
	15.2	Presentations by students	4	Face to Face				
	15.3							

24. Evaluation Methods:

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

Evaluation Activity	Mark	Topic (s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm Exam	25	TBD		End of eighth week	
Home Assignments	15	TBD		Weekly	
Project and presentation	20	TBD		Term-long project due at the end of the semester	

Final Exam	40	TBD		End of semester	

25. Course Requirements:

Students should have a computer, internet connection, webcam, active account on Microsoft-teams. Students should have access to XRD laboratory and SEM laboratory.

26. Course Policies:

A- Attendance policies: following the school regulations. B- Absences from exams and submitting assignments on time: following the school regulations. C- Health and safety procedures: following the school regulations. D- Honesty policy regarding cheating, plagiarism, misbehavior: following the school regulations. E- Grading policy: following the school regulations. F- Available university services that support achievement in the course: NA.

27. References:

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

no specific required textbook.

B- Recommended books, materials, and media:

- Crystal structures of clay minerals and their X-ray identification", G.W. Brindley & G.Brown, 1980
- Chemistry of clays and clay minerals", A.C.D. Newman, 1987
- Clays, A. Meunier, 2005
- Assigned readings for different topics. See available resources on E-learning
- Any other textbook in Mineralogy and Clay Minerals topics is recommended.

28. Additional information:

Name of the Instructor or the Course Coordinator: **Hind Ghanem**	Signature: ……...……	Date: ……..……
Name of the Head of Quality Assurance Committee/ Department …….	Signature: ……...……	Date: ……..……
Name of the Head of Department ……**Dr Bety Saqarat**……	Signature: ……...……	Date: ……..……
Name of the Head of Quality Assurance Committee/ School of Science **Prof. Emad A. Abuosba**	Signature: ……...……	Date: ……..……
Name of the Dean or the Director **Prof. Mahmoud I. Jaghoub**	Signature: ……...……	Date: ……..……