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	**Metamorphic rock Petrology**
2.	Course Number	0305935
3.	Credit Hours (Theory, Practical)	3, theory
	Contact Hours (Theory, Practical)	3, theory
4.	Prerequisites/ Corequisites	-
5.	Program Title	PH.D in Geology
6.	Program Code	-
7.	School/ Center	School of Science
8.	Department	Geology
9.	Course Level	PH D program
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	25/04/2025
16.	Revision Date	

17. Course Coordinator:

Name: Dr Najel Yaseen Contact hours: -

Office number: Geology 202 Phone number: ext: 22275

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18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
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Email:
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19. Course Description:

Chemical reactions and chemical kinetics in metamorphic rocks**.** Mineral thermodynamics and Phase equilibria in metamorphic rocks. Metamorphic crystallization mechanisms. Geothermometry and geobarometry in metamorphic rocks.

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)

(SO1) Students will be able to design and execute original research, employing advanced methodologies to generate new knowledge in their specialized area of geology

(SO2) Students will display the potential to seriously evaluate complex geological problems, the usage of analytical and problem-fixing capabilities to develop modern answers and interpretations of their studies.

(SO3) Students will benefit know-how in using cutting-edge gear, techniques, and technology applicable to their geological research, applying these abilities to research and cope with complicated geological phenomena.

(SO4) Students will effectively communicate their studies findings via academic guides, presentations, and conferences, making significant contributions to the scientific network and attractive technical and non-technical audiences.

(SO5) Students will showcase a sturdy dedication to ethical studies practices and apprehend the broader societal and environmental affects of their work, promoting sustainability and integrity within the subject.

(SO6) Students will demonstrate a determination to persistent mastering, actively enticing with rising studies, and professional improvement possibilities to maintain and amplify their know-how throughout their careers.

PILO's	***National Qualifications Framework Descriptors***		
	Competency (C)	**Skills (B)**	**Knowledge (A)**
1.		X	
2.		X	
3.			X
4.		X	
5.	X		
6.			X

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

CLO1. Differentiate among major metamorphic facies and facies series, interpreting their tectonometamorphic significance based on mineral assemblages and phase equilibria.

CLO2. Employ advanced thermodynamic modeling tools (e.g., THERMOCALC, Perple_X) to reconstruct pressure-temperature-time (P-T-t) paths of metamorphic rocks.

CLO3. Analyze mineral chemistry, trace element distributions, and isotopic systems in metamorphic minerals to unravel the metamorphic and tectonic evolution of orogenic belts.

CLO4. Construct comprehensive petrogenetic models by integrating field observations, petrographic analysis, geochemical data, and geochronological information to explain the evolution of metamorphic terranes.

CLO5. Effectively communicate research findings on metamorphic processes through well-structured scientific papers, oral presentations, and technical reports..

CLO6. Evaluate the broader geological, environmental, and societal implications of metamorphic processes, promoting ethical research practices and sustainability considerations..

Course CLOs	**The learning levels to be achieved**					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
CLO (1)	✔	✔				
CLO (2)	✔	✔	✔			
CLO (3)	✔	✔		✔		
CLO (4)	✔	✔	✔			✔
CLO (5)	✔	✔			✔	
CLO (6)	✔	✔			✔	

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)	Descriptors** A	B	C
CLO (1)		✔	✔				X		
CLO (2)	✔		✔					X	
CLO (3)	✔		✔				X		
CLO (4)	✔	✔		✔				X	X
CLO (5)				✔				X	
CLO (6)					✔				X

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		General introduction						
2	2	Introduction to Metamorphism: Concepts, Types, and Agents Classification of Metamorphic Rocks and Textures	1	Face to Face			Exams + assignments	Suggested readings + papers
3	2	Metamorphic Facies and Facies Series P-T Conditions and Tectonic Settings	1	Face to Face			Exams + assignments	Suggested readings + papers
4	2	Thermodynamics in Metamorphism: Basic Principles Phase Diagrams: Schreinemakers Rules and Applications	2	Face to Face			Exams + assignments	Suggested readings + papers
5	2	Thermodynamic Modeling: Introduction to THERMOCALC and Perple_X Building Simple Phase Diagrams	2	Face to Face			Exams + assignments	Suggested readings + papers
6	2	Mineral Chemistry in Metamorphic Rocks Geothermobarometry: Techniques and Applications	2	Face to Face			Exams + assignments	Suggested readings + papers
7	2	Isotope Geochemistry in Metamorphic Rocks (Rb-Sr, Sm-Nd systems)	3	Face to Face			Exams + assignments	Suggested readings + papers

		Applications of Isotopes in Metamorphic Petrology						
8	2	Case Study 1: P-T-t Paths in Regional Metamorphism **Midterm Exam**		Face to Face			Exams + assignments	Suggested readings + papers
9	2	High-Pressure and Ultra-High-Pressure Metamorphism Field and Analytical Techniques for UHP Terranes	4	Face to Face				
10	2	Metamorphic Processes: Dehydration, Melting, and Metasomatism Integration of Field, Petrographic, and Geochemical Data	4	Face to Face			Exams + assignments	Suggested readings + papers
11	2	Case Study 2: Tectonic Evolution of an Orogenic belt Writing a Scientific Research Report (Structure, Ethics, Citations)	5, 6	Face to Face			Exams + assignments	Suggested readings + papers
12	2	Economic Aspects of Metamorphism: Skarns, Ore Deposits Sustainability and Societal Implications in Metamorphic Studies	5, 6	Face to Face			Exams + assignments	Suggested readings + papers
13	2	Student Presentations on Selected Case Studies	6	Face to Face			Exams + assignments	Suggested readings + papers
14	2	Presentations **Final EXAM**		Face to Face			Exams + assignments	Suggested readings + papers

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	30	TBD	1,2,3	End of eighth week	
Home Assignments	10	TBD	1,2,3,4,5,6	Each two weeks	
Project and presentation	20	TBD	1,2,3,4,5,6	Term-long project due at the end of the semester	
Final Exam	40	TBD	3,4,5,6	End of semester	

25. Course Requirements:

students should have a computer, internet connection, account on a specific software/platform…(elearning)

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:

- Bucher, K. (2023). Petrogenesis of metamorphic rocks (9th ed.). Springer.
- Winter, J. D. (2010). *Principles of igneous and metamorphic petrology* (2nd ed.). Pearson Education.

B- Recommended books, materials, and media:

Yardley, B. W. D. (1989). An introduction to metamorphic petrology. Longman Scientific & Technical.

Powell, R., & Holland, T. (1994). Thermodynamics of rocks. Chapman and Hall.

Spear, F. S. (1993). Metamorphic phase equilibria and pressure-temperature-time paths. Mineralogical Society of America.

28. Additional information:

Signature: Date:

Name of the Instructor or the Course Coordinator: **Dr. Najel Yaseen**	……...……	**25/04/2025**……
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: ……..……