



Course Syllabus

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| 1 | Course title | Principles of Geochemistry | |
| 2 | Course number | 0345351 | |
| 3 | Credit hours | 3 | |
| | Contact hours (theory, practical) | 3 | |
| 4 | Prerequisites/corequisites | 305231 Petrology | |
| 5 | Program title | Environmental and applied Geology | |
| 6 | Program code | | |
| 7 | Awarding institution | The University of Jordan | |
| 8 | School | School of science | |
| 9 | Department | Geology | |
| 10 | Course level | | |
| 11 | Year of study and semester (s) | 2023/2024 Fall | |
| 12 | Other department (s) involved in teaching the course | Non | |
| 13 | Main teaching language | English | |
| 14 | Delivery method | <input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online | |
| 15 | Online platforms(s) | <input checked="" type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others..... | |
| 16 | Issuing/Revision Date | 27/2/2024 | |

17 Course Coordinator:

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|---|---------------------|
| Name: Dr Najel Yaseen | Contact hours: |
| Office number: 202 | Phone number: 22275 |
| Email: nyaseen@ju.edu.jo | |



18 Other instructors: Non

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.

Overview of the formation of the solar system and the synthesis of chemical elements; chemical equilibrium; acids and bases; distribution and geochemical classification of elements; salts and aqueous geochemistry; chemical weathering and mineral equilibria; introduction to thermodynamics; oxidation-reduction reactions; isotope geochemistry: radioactive, radiogenic, and stable isotopes and their applications.

20 Course aims and outcomes:

Aims:

- 1- Help the students to apply mathematical and chemical principles on earth materials (i.e rocks, minerals, water, gases etc)
- 2- Help the students to understand the origin of the different spheres of the earth and their interaction
- 3- Help the students to understand the causes of the observed chemical composition of the terrestrial materials

- 4- Help students to use their understanding of thermodynamics and kinetics to predict mineral and fluid-rock reactions for a geochemical system and given environmental conditions
- 5- Introduce students to the basics of age determination

B- Students Learning Outcomes (SLOs):

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 define terms and concepts related to geochemistry | X | x | | | | | x | | |
| 2 describe and explain the origin of the universe, solar system and the synthesis and abundances of chemical elements | X | x | | | | | x | | |
| 3 explain the chemical differentiation of the Earth | X | x | | | | | x | | |
| 4- relate electronic structure of atoms to their physical and chemical properties | X | x | | | | | x | | |
| 5 predict ionic substitution in crystals (minerals) | X | x | | | | | x | | |
| 6 use basics of aqueous geochemistry and mineral stability diagrams | X | x | | | | | x | | |
| 7 use their understanding of thermodynamics and kinetics to predict mineral and fluid-rock reactions for a geochemical system and given environmental conditions | X | x | | | | | x | | |
| 8 explain Clay minerals as products of chemical weathering (self reading) | X | x | | | | | x | | |
| 9 construct Eh-ph diagrams | X | x | | | | | x | | |
| 10 use basic knowledge of stable and radiogenic isotopes and their application to geosciences | X | x | | | | | x | | |

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 | | Big Bang Nucleosynthesis | 1 | Face to face | | | Problem set | |
| | | | 2 | | | | | Faure, G. 1998 |
| | | | | | | | | |
| 2 | | Solar system Chemical differentiation of the earth (1) | 1 | Face to face | | | Problem set | |
| | | | 3 | | | | | Faure, G. 1998 |
| | | | | | | | | |
| 3 | | Chemical differentiation of the earth (2) Electronic structure Periodic table and atomic weights | 1 | Face to face | | | Problem set | |
| | | | 4 | | | | | Faure, G. 1998 |
| | | | | | | | | |
| 4 | | Chemical Bonds, ionic radii, and crystals Ionic substitution Acids and bases | 1 | Face to face | | | | |
| | | | 5 | | | | | Faure, G. 1998 |
| | | | | | | | | |
| | | Law of | | | | | Problem | |

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|---|--|---|---|--------------|--|--|----------------|-------------------|
| 5 | | mass action | 1 | Face to face | | | set | Faure, G. 1998 |
| | | pH Control of Dissociatio n equilibiria (2) | 5 | | | | | |
| 6 | | Salts solubility | 6 | | | | Problem set | Faure, G. 1998 |
| | | Salts replacemen t | | | | | | |
| 7 | | Activities and concentrati ons | 6 | | | | Problem set | Faure, G. 1998 |
| | | Thermodyn amics | 7 | | | | | |
| 8 | | Entropy & Gibbs free energy | 1 | | | | | Faure, G. 1998 |
| | | Gibbs free energy and law of mass action | 7 | | | | | |
| | | Van't hoff equation | | | | | | |
| | | | | | | | | |
| 9 | | Minerl stability diagram | 1 | Face to face | | | | Faure, G. 1998 |
| | | Oxidation and reduction deffinitions | 9 | | | | | |

| 10 | | Electromotive force Nernst equation Stability of water | 1 9 | Face to face | | | | Faure, G. 1998 |
|------|---------|--|--------------------------|---|----------|--------------------------------------|--------------------|-------------------|
| 11 | | Eh ph diagram iron oxide Eh ph diagram Fe^{2+} , Fe^{3+} geochronology | 1 9 | Face to face | | | | Faure, G. 1998 |
| Week | Lecture | Topic | Student Learning Outcome | Learning Methods (Face to Face/Blended/ Fully Online) | Platform | Synchronous / Asynchronous Lecturing | Evaluation Methods | Resources |
| 12 | | Decay methods Rb- Sr method crystallization Rb- Sr method metamorphism | 1 10 | Face to face | | | | Faure, G. 1998 |
| 13 | | U- pb method Stable isotope Oxygen and hydrogen isotopes | 1 10 | Face to face | | | | Faure, G. 1998 |



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 st exam | 15 | 1-5 | 1-5 | 4 | |
| 2 nd exam | 15 | 6-7 | 6-7 | 8 | |
| Proplem sets | 10 | 1-10 | 1-10 | Each 2 weeks | |
| Self-reading exam | 10 | weathering | | 12 | |
| Final exam | 50 | 5-13 | 5-13 | | |
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23 Course Requirements

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24 Course Policies:

A- Attendance policies: **university regulation**

B- Absences from exams and submitting assignments on time: **university regulation**

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior: **university regulation**

E- Grading policy: **May subjected to changes (depends on the overall results)**

0 - 39 F

40 - 44 D-

45 - 49 D

50 - 54 D+

55 - 59 C-

60 - 64 C

65 - 69 C+

70 - 74 B-

75 - 79 B



80 - 84 B+

85 - 89 A-

90- 100 A

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

25 References:

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

- **Faure, G. 1998. Principles and Applications of Geochemistry. 2nd edition. Prentice Hall, 600 pp.**

B- Recommended books, materials, and media:

- Misra, K. 2013: Introduction to Geochemistry: Principles and Applications

26 Additional information:

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|---|
| Name of Course Coordinator: -----Najel Yaseen-----Signature: ----- Date: - Spring-2023-2024-- |
| Head of Curriculum Committee/Department: ----- Signature: ----- --- |
| Head of Department: ----- Signature: ----- - |
| Head of Curriculum Committee/Faculty: ----- Signature: ----- - |



Dean: ----- Signature: -----
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