

**The University of Jordan**  
**Accreditation & Quality Assurance Center**

**COURSE Syllabus**  
**Principles of**  
**Geochemistry**

1	Course title	Principles of Geochemistry
2	Course number	0345351
3	Credit hours (theory, practical)	3 hours theory; 9:30-11:00 Monday and Wednesday
	Contact hours (theory, practical)	3 hours theory
4	Prerequisites/corequisites	Petrology 0305231, mineralogy, first year math, physics, and chemistry
5	Program title	Environmental and Applied Geology
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Faculty of Science
9	Department	Geology
10	Level of course	undergraduate
11	Year of study and semester (s)	2016-2017 Fall
12	Final Qualification	
13	Other department (s) involved in teaching the course	
14	Language of Instruction	English
15	Date of production/revision	October 2016

#### 16. Course Coordinator: Dr. Ghaleb H Jarrar

Office numbers, office hours, phone numbers, and email addresses should be listed.

Monday, Tuesday, and Thursday 12:00-13:00  
jarrargh@ju.edu.jo  
0096277746161617

#### 17. Other instructors:

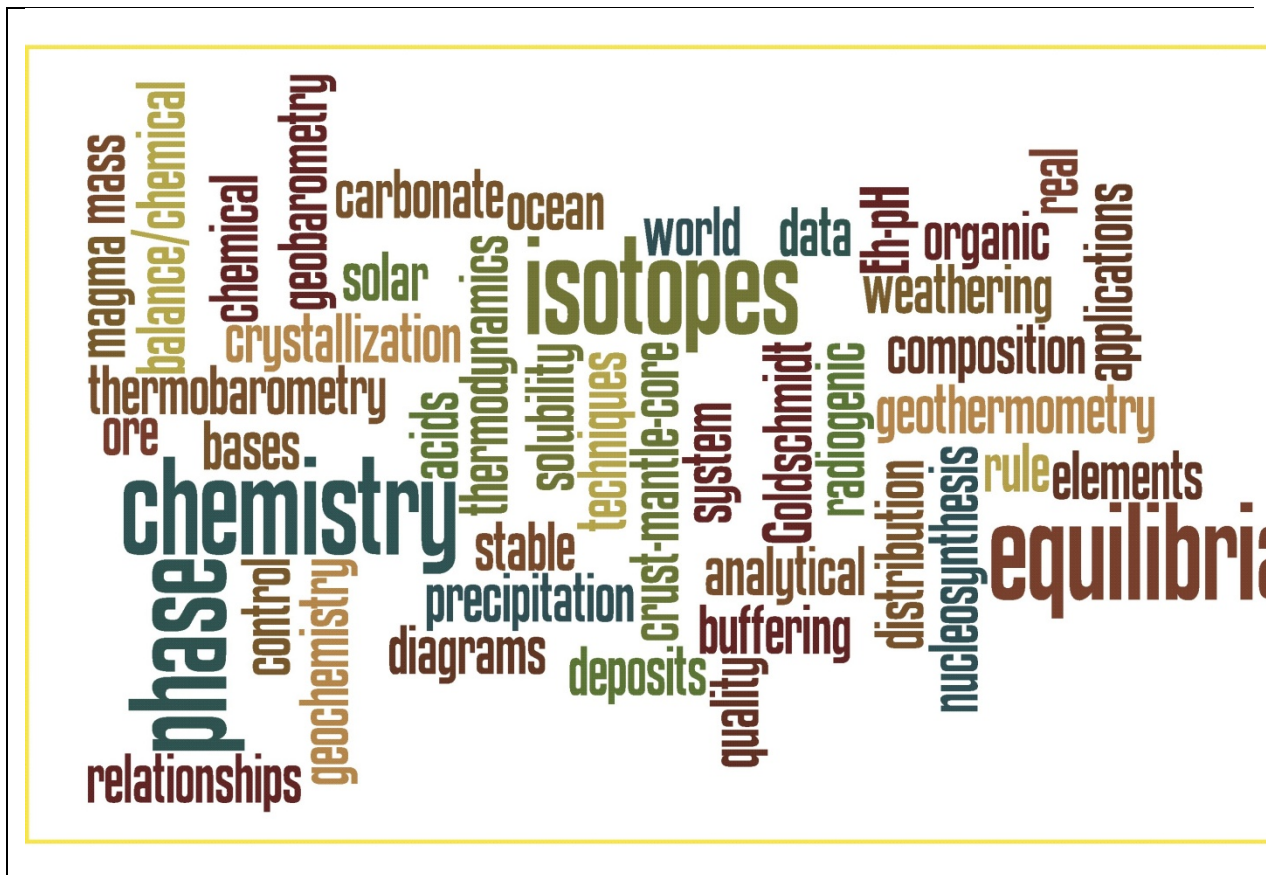
*Office numbers, office hours, phone numbers, and email addresses should be listed.*

#### 18. 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.

The image below (from the workshop teaching geochemistry 2010, see link below demonstrates the wide range of topics dealt with in Geochemistry.



19. Course aims and outcomes:

A- Aims:

After finishing this course the students should be able:

- to apply chemical principles on earth materials (i.e rocks, minerals, water, gases etc);
- to understand the origin of the different spheres (lithosphere, hydrosphere, and atmosphere) of the earth and their interaction;
- to understand the causes of the observed chemical composition of the terrestrial materials, rocks, mineral, and hydrosphere
- to understand the interaction between the geochemical cycles;
- to understand the basics of age determination in particular and the use of isotopes in general.

**B- Intended Learning Outcomes (ILOs):** Upon successful completion of this course students will be able to ...

- Understand the general features of atomic structure and its importance in shaping the physical and chemical properties of minerals
- Appreciate the role of chemical bonding and ionic substitution in the diversity of chemical composition of Earth materials
- Apply the basic principles of thermodynamics to understand mineral reactions, predict reversible and irreversible geological processes
- Apply principles of aquatic chemistry to compute concentrations of dissolved species in aqueous solutions under specific conditions
- Predict dissolution/precipitation of carbonates and silicates in the course of chemical weathering

Apply the principles of redox reactions in all geological processes e.g chemical weathering and ore deposits formation
Appreciate the usefulness of radioactive and stable isotopes in constraining the age of Earth's materials
Use the geochemical data of minerals and rocks to put constraints on the formation of magmatic rocks.
Explain the circulation of chemical elements
Explain the circulation and interaction of chemical elements between the geosphere, biosphere, hydrosphere, and the atmosphere.

## 20. Topic Outline and Schedule:

1.					
Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Atomic structure, chemical bonding, and ionic substitution	2	Dr, Ghaleb Jarrar		Quizzes Problem sets 1 <sup>st</sup> , 2 <sup>nd</sup> and final exam	Misra Chapters 1, 2,3
Basic thermodynamics	1				Chapter 4
Reactions in aqueous solutions and water chemistry	3				Chapter 7
Chemical weathering, mineral stability diagrams and geochemistry of sediments					Other resources Walther 2009
Oxidation reductions reactions	1				Chapter 8
Isotope: stable and radiogenic isotopes and principles of geochronology	1				Chapters 10 and 11
Chemistry of igneous rocks	1				Chapter 12
The hydrosphere	1				Chapter 13
The atmosphere					

## 21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

This course emphasizes the quantitative problem solving to gain a better understanding of geological processes.

Therefore, the student will be trained on that through independent and guided solution of problem sets that cover the various and most important aspects covered in the lecture.

## 22. Evaluation Methods and Course Requirements:

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

Discussion in the class, quizzes, quantitative problem solving and two midterm and a final exam

## 23. Course Policies:

A- Attendance policies:

The rules of the University apply

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

Assignments must be handed in on time.

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehaviour:

The regulations of the University of Jordan are applicable

E- Grading policy: The final grade is based on the overall performance of the student to be deduced from

Interest in class through interaction; participation in quizzes, problem set solving and exams:

Below is a tentative grading scale

A: 90-100

A-: 85-89

B+: 80-84

B: 75-79

B-: 70-74

C+: 65-69

C: 60-64

C-: 55-59

D+: 50-54

D: 49-45

D-: 40-44

F: 0-39

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

**24. Required equipment:**

Laptop; data show and white board and whiteboard marker

**25. References:**

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

This course is based on chapters selected from the textbook:  
Introduction to Geochemistry, principles and applications by  
Kula C. Misra, 1<sup>st</sup> edition 2012, Wiley-Blackwell, 438 pp

B- Recommended books, materials, and media:

Additional references include

Faure, G. 1998. Principles and applications of geochemistry, 2<sup>nd</sup> edition, Prentice Hall, 600 pp.  
Walther, V. J. 2009. Essentials of Geochemistry, 2<sup>nd</sup> edition, John and Bartlett, 797 pp.

**26. Additional information:**

The following link contains numerous resources for teaching materials and geochemical data:

Teaching geochemistry in the 21<sup>st</sup> Century:

<http://serc.carleton.edu/NAGTWorkshops/geochemistry/index.html>

Name of Course Coordinator: -----Signature: ----- Date: -----

----- Head of curriculum committee/Department: ----- Signature: -----

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Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

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

Assurance

Copy to:  
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Assistant Dean for Quality  
  
Course File