The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Environmental Geochemistry

1	Course title	**Environmental Geochemistry**
2	Course number	**0365481**
3	Credit hours (theory, practical)	3 hrs. (Theory)
	Contact hours (theory, practical)	3 hrs. (Theory / week)
4	Prerequisites/corequisites	
5	Program title	B. Sc. In Geology
6	Program code	0305 2
7	Awarding institution	The University of Jordan
8	Faculty	Science
9	Department	Geology
10	Level of course	4th year B.Sc.
11	Year of study and semester (s)	
12	Final Qualification	B. Sc. In Geology
13	Other department (s) involved in teaching the course	None
14	Language of Instruction	English
15	Date of production/revision	

16. Course Coordinator:

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

Office number: ***Geo 307***
Phone number (Office): 009626 5355000 ext. 22254
Cell: :00962796906169
Office Hrs.: Sun, Tue, Thu , 10 - 11 am
: Mon , Wed , 9:30-11 pm
Email: mkuisi@ju.edu.jo

17. Other instructors:

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

18. Course Description:

Environmental geochemistry is the application of chemical and hydrochemical principles to predicting the fate of organic and inorganic pollutants at the earth's surface and in the atmosphere. The purpose of this course is to provide a practical background in basic geochemical principles that can be applied to environmental problems. The course will make use of computer programs to solve geochemical problems. Some simple chemical analyses will be done to illustrate important environmental chemical reactions, e.g., pH, Eh, dissolved O_2, alkalinity, hardness, nutrient concentrations.

19. Course aims and outcomes:

A- Aims:

By the end of the course you will be able to:

- Gaining factual knowledge (terminology, classifications, methods, trends) and Learning fundamental principles, generalizations, or theories.
    - Student should be able to define key terms used in geochemistry. Carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur hold special importance in the surface environment.
    - Student should be able to identify the important ionic forms of these elements, explain their significance in the environment, and explain how humans have modified the natural global cycles of these elements.
- Learning to apply course material (to improve thinking, problem solving, and decisions)
    - Given a geochemical dataset (from lake sediments, soils, or natural waters) you should be able to apply your knowledge to make reasonable inferences about past or current environmental conditions.
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course (I)
    - You should be able to carry out selected field and laboratory analyses that are routinely performed in environmental geochemical research. You should also be able to use Geographic Information Systems (GIS) software to explore geochemical problems.
- Developing skill in expressing oneself orally or in writing
    - You should be able to write a logical preliminary interpretation of geochemical data and report the results of a research project in a professional manner.

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

- Understanding the water quality parameters and how to interpretate any laboratory results by using the proper software package
- Understanding of the natural geochemical cycles of elements at the surface of the Earth, as well as the effects of human activities upon these cycles.
- Understanding of the processes involved in the distribution and transport of chemical substances between the atmospheric, continental and marine environments.
- Ability to reflect on the interactions among chemical, geological, physical and biological environmental processes.
- Ability to interpret environmental geochemical data sets.

20. Topic Outline and Schedule:

Week#	Chapter Number/Lecture Topic	Exams / Note
1 2 3 4	Chemistry of Groundwater Water Quality: Physical, Chemical, Microbiological and Radiological Characteristics of water Water Quality Standards Water Classification and Treatment Systems	Quiz 1 Quiz 2
5 6	Equilibrium thermodynamics and kinetics Acid-Base Equilibria	Quiz 3
7	Oxidation Reduction Reactions	Quiz 4
8	Carbon Chemistry	Quiz 5
9	Isotopes	Quiz 6
10 11	Atmospheric Chemistry and Pollution	Quiz 7
12	Hazard waste and Hazardous Material	Quiz 8
13	Environmental Mineralogy	Quiz 9
14 15	The continental Environment	Quiz 10

21. Teaching Methods and Assignments:

This course has an emphasis on data analysis and interpretation. Students are frequently challenged to analyze and interpret previously collected geochemical data or data they have collected themselves. In addition, students must use the necessary software packages to classify and make the thermodynamic calculations for the water parameters.

Software packages includes: PhreeqC, Aquachem, Minteq and Rockworks

This course includes lab work and analysis. The student need to learn the basic principles of analyzing the water samples and calculate the different parameter concentrations. Each student is responsible for collecting 3 water samples from different localities and do the analysis by himself.

The course also includes a number of hands-on field and laboratory activities designed for students to get practice carrying out environmental monitoring and analysis as practiced by professionals. Both are assessed as laboratory or in-class exercises and are most often scored using rubrics. Student mastery of data interpretation is also assessed using take-home exams and in-class quizzes.

A number of problem sets will be assigned. These will be collected and will constitute a portion of your grade. The Monday class of every two weeks will normally be a recitation section during which the problems will be discussed. The student will be expected to participate in these discussions. Similar problems can be expected on the quizzes and the final exam. Thus the student who waits until the last minute to do these problems, or simply copies down the instructor's or fellow student's solutions without attempting to do the problems, will have an excellent shot at an F.

22. Evaluation Methods and Course Requirements:

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

23. Course Policies:

- Attendance Policy: attendance is mandatory. Class non-attendance usually results in poor grades.
- All students are expected to follow the policies of the Student Code of Ethics as outlined in the Student Handbook.
- During class lectures, please make sure that all cell phones and pagers are silenced or are in vibrate mode. If you need to answer an urgent call (except during an exam), please leave the class to speak on the phone.
- Please make sure to arrive at class on time, as entering late is a distraction to the students and instructor. Students arriving after an exam has already been passed out (without legitimate excuse) will lose 10 points on that exam, and will have less amount of time to finish the exam compared with the rest of the class.
- Cheating may, at my discretion, result in an ***F*** for the course. \

Grading will not necessarily be "on a curve." There is no expectation of what the average grade should be, nor what the grade distribution should look like. If everyone were to demonstrate outstanding understanding of all the material, then everyone deserves a grade of A (and I would be very happy to give each one of them)! I therefore encourage you to discuss the course material with each other to get the most out of the class.

24. Required equipment:

25. References:

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

- Eby, G. N. (2004) Principles of Environmental Geochemistry. Brooks/Cole, 514 p.
  (It is highly recommended and mandatory to buy the textbook; in addition, slides will be provided and/or uploaded to Blackboard system)

B- Recommended books, materials, and media:

- Drever, J (2008): The geochemistry of natural waters. Prentice Hall Publisher, USA.
- Environmental Engineering (1998) Davis and Cronwell
- Fundamental of Environmental Engineering (1999) Danny D. Reible
- Environmental Engineers Handbook (1997) David and Lipta'k
- Basic Concepts of Environmental Chemistry (1997) Connell
- Environmental Chemistry (1996) Colin Baird
- Applied Chemical Hydrogeology (2001). Kehew, A.E
- Groundwater Geochemistry Fundamentals and Applications to Contamination (1997) William J. Deutsch
- Environmental Soil and Water Chemistry (1998) Evangelou V.P.
- Aqueous Environmental Geochemistry (2003) Donald Langmuir

26. Additional information:

Name of Course Coordinator: Mustafa Al Kuisi Signature: ---------- Date -20/08/2017

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

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

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

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

Copy to:

Head of Department
Assistant Dean for Quality Assurance
Course File