Syllabus*: Environmental Analytical Chemistry (110103412)

Second Semester 2021 /2022

COURSE INFORMATION	
Course Name: Environmental Analytical Chemistry **Semester:** Second Semester 2021 /2022 **Department:** Department of chemistry **Faculty:** Science	**Course Code:** 110103412 **Section:** 1 and 2 **Core Curriculum**: mandatory
Day(s) and Time(s): Sun, Tue, Thr : 11:00-12:00 **Classroom:** H.B 202	**Credit Hours:** 3 **Prerequisites**: 2001031311

COURSE DESCRIPTION

The course provides an introduction to the basics of environmental chemistry. The topics cover biogeochemical cycles of sulfur, nitrogen, oxygen, carbon, and trace metals. Also includes selected environmental problems of global concern such as acid rain, greenhouse effect, depletion of stratospheric ozone, and nuclear winter. Recent analytical methods for the determination of pollutants in water and atmosphere will be described.

DELIVERY METHODS

The course will be delivered through a combination of active learning strategies. These will include:

- PowerPoint lectures and active classroom based discussion
- Collaborative learning through small groups acting in an interdisciplinary context.
- Relevant films and documentaries
- Video lectures
- E-learning resources: e-reading assignments and practice quizzes through Model and Microsoft Team

FACULTY INFORMATION

Name	
Academic Title:	**Associate Professor**
Office Location:	**Chem 215**
Telephone Number:	**5113**
Email Address:	**j.abdelghani@hu.edu.jo**
Office Hours:	**Monday** 10.00-11.00 **Wednesday** 10.00-11.00 *Please send an e-mail (j.abdelghani@hu.edu.jo) to meet at any other time.*

REFERENCES AND LEARNING RESOURCES

Required Textbook: Environmental Chemistry: A Global Perspective.

Author ***Title*** Vanloon and Duffy. Oxford University Press. 2005, second edition.

STUDENT LEARNING OUTCOMES MATRIX*

Core Curriculum Learning Outcomes	Program Learning Outcomes	Course Objectives	Course Student Learning Outcomes	Assessment Method
CC-LO-5 Think critically and creatively in a variety of methods in order to make decisions and solve problems.	CHEM-LO-1: Apply critical thinking and demonstrate problem-solving skills in two or more of the major fields of chemistry.	1. Discuss the main concepts in the science of environmental chemistry	1.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 1.2 Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter.	• Exams • "On-line' reading assignments • homework assignments
		2. Describe the most anthropogenic environmental problems that affect our life	2.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 2.2 Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter. 2.3 Perform mathematical calculations and data analysis related to chemistry disciplines. 2.4 Perform experimental procedures and lab measurements, examine data, and interpret results required to carry out a chemical research.	• Exams • Quizzes • "On-line' reading assignments
		3. Perform mathematical calculations and data analysis related to environmental problems including ozone hole, acid and biocides movement in the soil.	3.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 3.2 Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter. 3.3 Perform mathematical calculations and data analysis related to chemistry disciplines. 3.4 Perform experimental procedures and lab measurements, examine data, and interpret results required to carry out a chemical research.	• Exams • Quizzes • "On-line' reading assignments • homework assignments
		4. Explain principles and theories related to environmental problems including atmospheric aerosols	4.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 4.2 Explain principles and theories related to chemical structure,	• Exams • Quizzes • "On-line' reading assignments

		and natural colloids in hydrosphere	reactivity, reaction mechanisms, and properties of matter.	• homework assignments
.CC-LO-4. Communicate competently with others using oral and written English skills CC-LO-6. Demonstrate competency in the use of research skills and various information sources. CC-LO-7. Identify the general concepts of humanities and natural sciences in a manner that reveals their value in life.	CHEM-LO-4: Use modern literature search methods to obtain information about chemistry topics and write reports.	5. Relate and value the role of environmental chemistry in our daily life	5.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 5.2 Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter.	• "On-line" reading assignments • Term project
	CHEM-LO-6: Communicate results to chemists and non-chemists.	6. Discuss the applications of advanced instrumental methods (UV-VIS, HPLC-DAD, HPLC-MS, and ASS) in environmental analysis	6.1 Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical 6.2 Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter.	• Term project

ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.

Special Needs Section:
Tel:
Location:
Email:

COURSE REGULATIONS

Participation

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance*. It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

Plagiarism

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples and it applies to all student assignments or submitted work:

- **Use of the work, ideas, images or words of someone else without his/her permission or reference to them.**
- **Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.**
- **Misrepresentation of the sources that were used.**

The instructor has the right to fail the coursework or deduct marks where plagiarism is detected

Late or Missed Assignments

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.

- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

Student Complaints Policy

Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

COURSE ASSESSMENT

Course Calendar and Assessment

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

Assessment	Grade Weighting	Deadline Assessment
Exam 1	30%	3-14/4/2022
Exam 2	25%	8-19/5/2022
Presentation	5%	
Final Exam (3)	40%	TBA

Description of Exams

Test questions will predominately come from material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. Exam will consist of a combination of multiple choice, short answer, match, true and false and/or descriptive questions.
Homework: Will be given for each chapter, while the chapter in progress you are supposed to work on them continuously and submit in next lecture when I finish the chapter.
You are also expected to work on in-chapter examples, self-tests and representative number of end of chapter problems. The answers of self-tests and end of chapter exercises are given at the end of the book.

Quizzes: Unannounced quizzes will be given during or/and at the end of each chapter based upon the previous lectures. It will enforce that you come prepared to the class.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria*:

Letter Grade	Description	Grade Points
A+	Excellent	4.00
A		3.75
A-		3.50
B+	Very Good	3.25
B		3.00
B-		2.75
C+	Good	2.50
C		2.25
C-		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

"Lecture hours and weeks are approximate and may change as needed"

Note: For environmental analytical chemistry 412 sections with 2 lecture periods per week (S/T, M/W or T/R), one lecture period covers 1.5 lecture hours (80 minutes). The course content specifies the sections in chapters 1-21 of the textbook that will be included in quizzes, homework and exams.

Chapter 1	Basic concepts in environmental chemistry	**Week 1/2**	**4 lecture hours**
1. 2	**Environmental composition**		
1. 3	**Chemical process**		
1. 4	**Anthropogenic effects**		
Chapter 2	The Earth's atmosphere and calculations in atmospheric chemistry	**Week 2/3**	**4 lecture hours**
2. 1	**The earth's atmosphere**		
2. 2	**Solar influence on the chemical composition of the atmosphere**		
2. 3	**Reactions and calculations I atmospheric chemistry**		
Chapter 3	Stratospheric chemistry of ozone layer	**Week 3-4**	**5 lecture hours**
3. 1	**concerns about Stratospheric ozone**		
3. 2	**formation and turnover of ozone**		
3. 3	**processes for catalytic decomposition of ozone**		
3. 4	**Chlorofluorocarbon (CFCs)**		
3. 5	**Other reactions involving** Stratospheric ozone		
3. 6	**Antarctic and arctic ozone hole formation**		
Chapter 4	Tropospheric Chemistry: photochemical smog	**Week 5-6**	**3 lecture hours**
4. 1	**What is smog**		
4. 2	**The chemistry of photochemical smog**		
4. 3	**Exhaust gases from internal combustion of engine**		
Chapter 5	**precipitation**	**Week 7**	**3 lecture hours**
5.1	**composition of rain**		
5. 2	**atmospheric production of nitric acid**		
5. 3	**atmospheric production of sulfuric acid**		
Chapter 6	**Atmospheric Aerosols**	**Week 8-9**	**4 lecture hours**
6. 1	**sources of** Aerosols		
6. 2	Aerosols concentrations and life time		
6. 3	**Air pollution control for particulate emissions**		
Chapter 11	**Gases**	**Week 9-10**	**4 lecture hours**
11.1	**Simple gases**		
11.2	**Gases that react with water**		
11.3	**Alkalinity**		
Chapter 12	**organic matters**	**Week 11**	**2 lecture hours**
12.1	**Origins of organic matters**		
12.2	**Environmental issue related to aqueous organic matter**		
12.3	**Humic material**		
Chapter 13	**metals in hydrosphere**	**Week 11-13**	**3 lecture hours**
13. 1	**Aquo complexes of metals**		
13.2	**Classification of metals**		
13.3	**Three metals- theror behiovor in the hydrosphere**		
13.4	**Metal complexes of ligands of anthropogenic origin**		

13.5	**Suspended matter in the hydrosphere**		
Chapter 14	**Environmental chemistry of colloids**	**Week 13-14**	**3 lecture hours**
14.1	**Surface properties of colloidal materials**		
14.2	**Quantitative descriptions of colloidal materials**		
14.3	**Phosphorus environmental chemistry**		
14.4	**Quantitative descriptions of adsorption**		
14.6	**colloidal material in the natural environment**		
Chapter 20	**Organic biocides in the soil**	**Week 15**	**3 lecture hours**
14.1	**What are biocides**		
14.2	**Chemical stability**		
14.3	**Mobility of biocides**		
University Exams			***Week 16***

Review	***Week 15***
University Exams	***Week 16***

ASSESSMENT RUBRICS

Assessment Rubrics to be determined by the department. Add samples below.

Classroom Participation: Oral Presentation										
Element	**Excellent**			**Satisfactory**			**Needs Improvement**			**Points**
	8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
Organization	▪ readings; ▪ - uses readings to support points; ▪ - often articulates "fit" of readings with topic at hand.		- sometimes uses readings to support points; -occasionally articulates "fit" of readings with topic at hand .			- rarely uses readings to support points; - rarely articulates "fit" of readings with topic at hand		-cannot use readings to support points; cannot articulates "fit" of readings with topic at hand .		
	▪ -always a willing participant, ▪ responds frequently to questions; ▪ - routinely volunteers point of view .		-often a willing participant, - responds occasionally to questions; - occasionally volunteers point of view .			-rarely a willing participant, - rarely able to respond to questions; - rarely volunteers point of view .		-never a willing participant., - never able to respond to questions; - never volunteers point of view .		
	▪ -always a willing participant; ▪ -acts appropriately during all role plays; ▪ - responds frequently to questions; ▪ - routinely volunteers point of view.		-often a willing participant; -acts appropriately during role plays; - responds occasionally to questions; -occasionally volunteers point of view.			-rarely a willing participant. -occasionally acts inappropriately during role plays; - rarely able to respond to direct questions; -rarely volunteers point of view .		-never a willing participant -acts inappropriately during role plays;, - never able to respond to direct questions; - never volunteers point of view.		
	▪ -always demonstrates commitment through thorough preparation; ▪ - always arrives on time; ▪ - often solicits instructors' perspective outside class.		- rarely unprepared; rarely arrives late; - occasionally solicits instructors' perspective outside class .			-often unprepared; occasionally arrives late; - rarely solicits instructors' perspective outside class .		-rarely prepared; - often arrives late; -never solicits instructors' perspective outside class		
	▪ There is a logical sequence of information.									
				▪ There is some logical sequence of information.			▪ There is little or no logical sequence of information.			
				▪ Title slide and closing slides are included.			▪ The slide and/or closing slides are not included.			

	▪ Title slide and closing slide are included appropriately.			
Slide Design (text, colors, background, illustrations, size, titles, subtitles)	▪ Presentation is attractive and appealing to viewers.	▪ Presentation is somewhat appealing to viewers.	▪ Little to no attempt has been made to make presentation appealing to viewers.	
Content	▪ Presentation covers topic completely and in depth. ▪ Information is clear, appropriate, and accurate.	▪ Presentation includes some essential information. ▪ Some information is somewhat confusing, incorrect, or flawed.	▪ Presentation includes little essential information. ▪ Information is confusing, inaccurate, or flawed.	
Language	▪ Spelling, grammar, usage, and punctuation are accurate ▪ Fluent and effective	▪ There are minor problems in spelling, grammar, usage, and/or punctuation.	▪ There are persistent errors in spelling, grammar, usage, and/or punctuation. ▪ Less or not fluent and effective.	
Delivery	▪ Ideas were communicated with enthusiasm, proper voice projection and clear delivery. ▪ There was sufficient eye contact with audience. ▪ There were sufficient use of other non-verbal communication skills. ▪ Appropriate delivery pace was used.	▪ There was some difficulty communicating ideas due to voice projection, lack of preparation, incomplete work, and/or insufficient eye contact. ▪ Insufficient use of non-verbal communication skills. ▪ Delivery pace is somewhat appropriate.	▪ There was great difficulty communicating ideas due to poor voice projection, lack of preparation, incomplete work, and/or little or no eye contact. ▪ No use of non verbal communication skills. ▪ Inappropriate delivery pace was used.	
Interaction with Audience	▪ Answers to questions are coherent and complete. ▪ Answers demonstrate confidence and extensive knowledge.	▪ Most answers to questions are coherent and complete. ▪ Answers somehow demonstrate confidence and extensive knowledge.	▪ Answers to questions are neither coherent nor complete. ▪ Is tentative or unclear in responses.	
	Total Score (Y x 5/16) =			