Environmental Monitoring and Measure Analysis			
Course code	**NVE4355**	Credit no.	**3 CH**
Department	**Environmental Engineering**	Faculty	**Engineering**
Pre-requisites Course code	**Env. Eng. Fundamentals + Lab** **NVE3320C**	Co-requisites Course code	
Course coordinator	**Dr Zmnako A. Awrahman**		
Email	zmnako@kissr.edu.krd zmnako.awrahman@komar.edu.iq	IP no.	**105**
Course website	**Google Classroom**		
Learning hours	**Wednesday and Thursday (08:00 - 09:30)**		
Contact hours	**Wednesday (12:00-14:00)** **You can anytime with appointment as well.**		
Course type	**Departmental requirements**		
Offer in academic year	**Spring 2016**		

Course Description

Introduction to environmental monitoring, sampling techniques and analytical and statistical methods to measure and document environmental contamination in air, water, soils and sediments. This course emphasis on sources of pollutants, pollutants types, environmental biomarkers, sampling techniques, instrument selection and toxicokinetics including sample management.

Course objectives

Environmental monitoring is crucial to the assessment of ecological threats. There are many advanced standard sampling techniques that specifically developed to assess the level of environmental contaminants for different ecosystems, including air, soil, water and organisms. New analytical techniques are continuously developed when the existing techniques are not sufficient. However, the sampling methods are almost standard.

This course will consist of three hours of lecture per week (two 1.5 hour lectures). At the end of the course, students should be able to:

a. Understand the biomonitoring of the environment
b. Learn the sampling techniques and sample preservation
c. Determine the analytical techniques that are required to collect samples for a variety of contaminants/pollutants.
d. Statistical analysis interpretation of environmental data.
e. Able to recognize the basic problems with several established environmental techniques such as Dose-Response.

Expected learning outcome

1. Understand the basic terminologies related to environmental contaminations, monitoring, pollutants and ecosystems **(ABET outcome A)**.
2. Apply environmental sampling techniques in practice for water, soil, sediment and air **(ABET outcome A & B)**.
3. Classify and categorise sources and types of pollution **(ABET outcome A)**.
4. Analyse and investigate data and statistical techniques related to environment **(ABET outcome A &B)**.
5. Interpret the environmental data so that policy makers understand them **(ABET outcome A & B)**.

Grading scale

Points	Score %
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	75-79
C	70-74
C-	65-69

D+	60-64
D	55-59
D-	50-54
F	0-49
W	Withdrawal
I	Incomplete

Note: The minimum passing grade is **C-** to pass this course that is equivalent to **65%**

Course outline

Chapter 1: Introduction to Environmental Monitoring and Mitigation
Chapter 2: Biological Monitoring
Chapter 3: Sources of Pollutants in Water, Soil and Air
Chapter 4: Pesticides
Chapter 5: Organic and Inorganic Contamination
Chapter 6: Endocrine Disruptor Chemicals (EDCs)
Chapter 7: Wastewater Pollution
Chapter 8: Pollutant Exposure
Chapter 9: Environmental Sampling Techniques
Chapter 10: Statistical Analysis in Environment Studies

PS: Please note that the lecture's title might slightly change for some of the classes due to the necessity and relatedness of materials connected with the class.

Course teaching and learning activities

- Interactive class discussion
- Homework and assignments
- Tests and quizzes
- Report writing

Markings and evaluations

Assessment Tool	Description	Weight
Quizzes (5)	Quizzes are scheduled as shown in the semester schedule.	**15 %**
Assignments	Short assignments on environmental microbiology issues in Kurdistan and Middle East.	**10 %**
Mid-term	The mid-term will be conducted after week 7 of the semester.	**25 %**
Contribution	Students will be evaluated by the instructor based on their participation in the class, commitment, pop quizzes and other activities.	**5 %**
Final Exam	The final exam will be conducted in week 16 of the semester	**45 %**

Essential and Recommended books and readings

1. Reeve, R. N. (2002). *Introduction to Environmental Analysis*. John Wiley & Sons, LTD, West Sussex, England.
2. Burden, F. R.; Donnert, D.; Godish, T.; and McKelvie, I (2002). *Environmental Monitoring Handbook*. McGraw-Hill, New York, USA.
3. Elzinga, C. L.; Salzer, D. W.; Willoughty, J. W. and Gibbs, J. P. (2001). *Monitoring Plant and Animal Populations*. Blackwell Science publishing.
4. Wiersma, G. B. (2004). *Environmental Monitoring*. CRC Press, Boca Raton, USA

Note: Based on the subject of each class, further readings will be advised

Course Policy

Attendance policy:

Students are expected to attend each class for the entire semester. Students are responsible for material present in lectures. Only students with official KUST absence, family crises and illness are excused from the classes. Three occasions of lateness count as one absence. The student who misses 10 percent of the classes will be placed on probation.

Make up policy:

Since all examination are announced in advance, zero grade will be given to any missed examination unless a student has an acceptable reason, such as illness, for not being able to take the examination during all those days when the examination was announced.

Academic dishonesty:

Plagiarism in any form will not be tolerated. All submitted assignments will be screened for plagiarism. Any submitted assignment exceeding a total of 25% "match" and/or 15% of the text from a single source will be considered plagiarized, and will result in an automatic zero. Students found guilty of any type of academic dishonesty are subject to failure in this course, plus further punishment by the University Consul.

What counts as plagiarism?

- Copying and pasting information from a web site or another source, and then revising it so that it sounds like your original idea.
- Doing an assignment/essay/take home test with a friend and then handing in separate assignments that contain the same ideas, language, phrases, etc.
- Quoting a passage without quotation marks or citations, so that it looks like your own.
- Paraphrasing a passage without citing it, so that it looks like your own.
- Hiring another person to do your work for you.

Course calendar

Course calendar: Please check the academic calendar for spring 2016

Week	Beg/End Dates	Topics (Chapters)	Course Assignments per chapter
1	**(28-2 to 3-3) / 2016**	**Chapter 1: Introduction to Environmental Monitoring and Mitigation** • What is environment? • What is monitoring? • Reason of concern • Past and current environmental problems • Pollutions • Chemical analysis • What is mitigation? • Example of mitigation • Monitoring • Environmental indicators • Environmental health and components.	Expected learning outcome (ELO) 1
2	**(6-3 to 10-3) / 2016**	**Chapter 2: Biological Monitoring** • Criteria for biomonitors • Soil monitoring problems • Sediment monitoring problems • Water monitoring problems • Animal and plant response	ELO 1 and 2
3	**(13-3 to 17-3) / 2016**	**Chapter 3: Sources of Pollutants in Water, Soil and Air** • Water pollutants • Metal contaminations • Bioaccumulation in water • Biomagnification in water • Lateral risk assessment	**Quiz 1** (Chapter 1 to 3.1) ELO 1, 2, 3 and 5
	(20-3 to 24-3) / 2016	**Nawroz Holiday**	
4	**(27-3 to 31-3) / 2016**	**Chapter 3: Sources of Pollutants in Water, Soil and Air (continues)** • Gases • Ozone depletion • Metal contaminations • Chemical contaminations • Salination of soil	ELO 1, 2, 3 and 5

		• Diversity changes	
5	**(3-4 to 7-4) / 2016**	**Chapter 4: Pesticides** • Types of pesticides • Fate of pesticides • Effect of pesticides on insect diversity. • Environmental damages of pesticides	ELO 1, 2, 3 and 5
6	**(10-4 to 14-4) / 2016**	**Chapter 5: Organic and Inorganic Contamination** • Organic pollutants • Types of organic pollution • Fate of organic pollution • Diversity and organic pollution	**Assignment 1 submission** ELO 1, 2 and 3
7	**17-4 to 21-4**	**Chapter 5: Organic and Inorganic Contamination (continues)** • Mining • Metal contamination • Sedimentation problem of rivers • Metal fate • Selective tolerant behaviour	**Quiz 2 (Chapter 3.2 to 5.2)** ELO 1, 2 and 5
	(24-4 to 28-4) / 2016	**Mid-term**	**(Chapter 1 to 5.2)**
8	**(2-5 to 5-5) / 2016**	**Chapter 6: Endocrine Disruptor Chemicals (EDCs)** • EDCs sources • EDCs in water • EDCs in food • EDCs in cosmetics • EDCs effects	ELO 1 and 3
9	**(8-5 to 12-5) / 2016**	**Chapter 7: Wastewater Pollution** • Chemicals in WW • Treatment of WW • Microorganisms in WW • Sanitation of WW • Wastewater in EU, China and Kurdistan	ELO 1, 2 and 3
10	**(15-5 to 19-5) / 2016**	**Chapter 8: Pollutant Exposure**	**Quiz 3 (Chapter 6 to 8.1)** ELO 1, 3 and 4

		• Type of pollutant and human exposure • Health risks • Exposure prevention • Exposure to metals • Exposure to hormones • Treatment	
11	**(22-5 to 26-5) / 2016**	**Chapter 8: Pollutant Exposure (Continues)** • Hazard source to plant • Hazard source to animals • Bioaccumulation in animals and plants • Plant and animal response • Detoxification • Dose-Response curve • Dose Response curve calculation • Problems with D-R	**Assignment 2 submission** ELO 1, 3, 4 and 5
12	**(29-5 to 2-6) / 2016**	**Chapter 8: Pollutant Exposure (continues)** • Experimental design of D-R • Important of D-R • Toxicokinetics models • One compartment model • Biodynamic modelling • Model predictions • Physiological factor effect on model predictions	**Quiz 4 (Chapters 8.2 and 8.3)** ELO 1, 4 and 5
13	**(5-6 to 9-6) / 2016**	**Chapter 9: Environmental Sampling Techniques** • Water sampling • Soil sampling • Sediment sampling • Air sampling • Gas measurements in air	ELO 1 and 2
14	**(12-6 to 16-6) / 2016**	**Chapter 10: Statistical Analysis in Environment Studies** • CANOCO software • PAST software • Multivariate analysis	ELO 1, 3 and 4 **Quiz 5 (Chapters 9 and 10)**

		• Piecewise Regression • ANOVA/ANCOVA	
15	**(19-6 to 23-6) / 2016**	**Review Week for Academic Courses**	
16	**(24-6 to 30-6) / 2016**	**Final Examination for Academic Course**	**All Chapters**