

ENVIRONMENTAL CHEMISTRY AND TOXICOLOGY

Program	BSc in Chemistry					
Module Name	Applied Chemistry					
Module Number	11					
Module code	Chem-M3111					
Course Title	Environmental Chemistry and Toxicology					
Course Code	Chem3114					
Prerequisite	Chem1022					
Module coordinator's name and address	TBA					
Instructor(s) name and address	TBA					
Lecture days, Hours & room	TBA					
Cr. Hrs/ EtCTS	3/5					
Work load (per week)	Lecture	Tutorial	Lab.	Home study	Assessment	Total
	48	16	-----	66	5	135
Target group	3 rd year chemistry students					
Mode of delivery	Semester based					
Semester	Semester II					
Status of the course	Core Compulsory					

Course Description

Major chemical cycles and effects of environmental pollution in these systems; basics of atmospheric chemistry; aquatic chemistry; soil chemistry; pollution of air, water and soil; chemical toxicology: toxicants and their metabolism; energy production and its impact on the environment; analytical methods in environmental studies; Introduction to green chemistry.

Learning Outcomes

By the end of this course students should be able to:

- Familiarize with the concept of environmental chemistry
- Identify the common causes of environmental pollution
- Describe about aquatic chemistry and water pollution
- Explain about atmospheric chemistry and air pollution;
- Familiarize with the concept of green chemistry;
- Study some toxic organic chemicals and their effects; and
- Devise methods to decrease pollution

Course Outline and Schedule

Week	Contents	Methodology	Activities	Readings
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1 st & 2 nd	1. Introduction to Environmental Chemistry <ul style="list-style-type: none"> Basic concepts in Environmental chemistry Properties of chemicals in the environment Environmental transformation and degradation <ul style="list-style-type: none"> ➤ Abiotic transformation and degradation ➤ Biotransformation and degradation Matter and cycles of matter 	<ul style="list-style-type: none"> Lecture Group discussion Oral questions Asking questions 	<ul style="list-style-type: none"> Listen Question & answering Home/class works Taking short note 	Manahan pp 15-21 , 62 M. H Yu pp 235 - 255
	Assignment 1 (10 %)			
3 rd ,4 th & 5 th	2. Aquatic chemistry and Water pollution <ul style="list-style-type: none"> Introduction to the Fundamentals of aquatic chemistry The Properties of water, a unique substance Water Quality Water quality requirements Nature and types of Water pollutants 	<ul style="list-style-type: none"> Lecture Group discussion Oral questions Asking questions 	<ul style="list-style-type: none"> Listen Question & answering Home/class works Taking short note 	Manahan Pp 71 – 92; 200 - 236
	Test 1 (10 %)			
6 th ,7 th & 8 th	3. Atmospheric chemistry and Air pollution <ul style="list-style-type: none"> Importance and physical characteristics of the atmosphere Atmospheric chemical reactions Air quality Nature and classification of air pollutants <ul style="list-style-type: none"> ➤ Gaseous inorganic air pollutants ➤ Organic air pollutants ➤ Photochemical smog ➤ Chlorofluro compounds and ozone layer depletion ➤ Green House Gases and Global warming 	<ul style="list-style-type: none"> Lecture Group discussion Oral questions Asking questions Field Study 	<ul style="list-style-type: none"> Listen Question & answering Home/class works Taking short note 	Manahan pp 278 – 314; 341 – 361; 365 – 387; 391 – 412; 416 - 438 M. H Yu pp 183-202
	Assignment 2 (10 %)			

9 th & 10 th	4. Soil Chemistry <ul style="list-style-type: none"> • Soil and agriculture • Nature and composition of soil • Nutrients in soil • Reactions in soil <ul style="list-style-type: none"> ➤ Wastes and pollutants in soil 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions 	<ul style="list-style-type: none"> • Listen • Question & answering • Home/class works • Taking short note 	Manahan pp 484 – 497; 505 - 507
Test 2 (10 %)				
11 th & 12 th	5. Environmental Toxicity and toxicology <ul style="list-style-type: none"> • Introduction • Organic and inorganic pollutants • Agricultural and pharmaceutical contaminants • Pesticides • PCB's(polychlorinated biphenyls) • Nitrogen and phosphorous compounds • Toxic heavy metals and organo-metallic compounds <ul style="list-style-type: none"> ➤ mercury ➤ lead ➤ arsenic ➤ Chromium 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Field study 	<ul style="list-style-type: none"> • Listen • Question & answering • Home/class works • Taking short note • 	Manahan pp 727 – 753; 727 – 753; 221 – 232; 727 – 753 , 203 – 205; 203 – 205 M. H Yu 219- 230
Presentation (5 %)				
13 th & 14 th	6. Green chemistry <ul style="list-style-type: none"> • Introduction • The concept of Atom Economy • Design and application of surfactants for carbon dioxide • Designing an environmentally safe marine synthetic antifoulant 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Field study 	<ul style="list-style-type: none"> • Listen • Question & answering • Home/class works • Taking short note 	Clark & Macquarrie Pp 12; 482 - 500
15 th	Field study, report and defense	<ul style="list-style-type: none"> ✓ Forming group ✓ Giving Guidance 	<ul style="list-style-type: none"> • Observation • Reporting • Presenting 	
Field trip report (5 %)				
16 th	Final written examination (50 %)			

Mode of Assessment

Assessment Breakdown	%
continuous assessment and field tripe report	50
End of Semester Examination	50

Course Policy

Beside the university's policy on course delivery and evaluation, students are expected to actively participate in learning process by obeying the following course policies:

- Coming class on time (punctuality)
- Attend all class sessions
- Be prepared to learn and actively participate during class discussion
- Do all assignments, group works, project works, and presentations on time
- All students are expected to complete their own work to the best of their ability and cheating is strictly forbidden
- Do not miss quizzes, assignments, and exams unless you are forced due to health and other reasonable problems
- Cite all sources consulted to any extent (including material from the internet), whether or not assigned and whether or not quoted directly. It is strictly forbidden to take others work and present as own.
- Make-up class shall be conducted if classes are missed due to national holidays and/or when unpredicted conditions result in class dismissal

References

1. Manahan, Environmental Chemistry, 7th edition, ©2000 by CRC Press, Lewis Publishers
2. S.C. BHATIA, Environmental Chemistry ©2007, Satish Kumar Jain for CBS Publishers and Distributors
3. P.S.SINDHU, Environmental Chemistry ©2002, New Age International Publishers
4. Ming-Ho Yu (2005), Environmental Toxicology, Second edition, CRC Press
5. A.K.DE, Environmental Chemistry, 6th edition, ©2002, New Age International Publishers
6. Reeve, Environmental Analysis, ©1994, Wiley and Sons Publishers
7. Renep.Schwarzenbach, Philip M. Gschwend& Dieter M.Imboden, Environmental Organic Chemistry 2nd edition ,©2003, Wiley and Sons, Inc., Hoboken, New Jersey Publishers
8. Clark J, Macquarrie D, Handbook of Green Chemistry and Technology.Blackwell Science Ltd, 2002