هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Principles of Environemental Chemistry**
Course Code:	**CHM 1237**
Program:	**Bachelor of Science in Chemical Laboratories**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	**2024-** 1
Last Revision Date:	15 September 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (2, 0, 0)					
2(2 Lectures, 0 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 3/ Second year					
4. Course general Description:					
This course describes fundamentals of environmental chemistry, atmosphere, hydrosphere, geosphere, environmental pollution and its sources. The course covers essential topics in environmental chemistry where concepts such as toxicological chemistry, ecology, industrial pollution, acid rains, smog and analytical methods of environmental toxins will be taught.					
5. Pre-requirements for this course (if any)**:**					
General Chemistry 1- CHM 1101					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
By the end of completion of this course students will be to: ✓ **Understand the fundamental concepts of environmental chemistry.** ✓ **Evaluate Water pollution and treatment.** ✓ **Recognize Air pollution and its impact on the environment.** ✓ **Identify Geosphere and Geochemistry** ✓ **Develop awareness of the impact of environmental problems in Industrial waste and Hazardous waste, and ways to reduce them.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**30**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**00**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recognize the basic knowledge of environmental science**	**K1; K2; K4**	lecturing	Short quizzes
1.2	**To list different pollution sources of water and their treatment**	**K1; K2; K4**	Lecturing, group discussions, Homework and assignment	Oral tests, Homework and assignment marks, and written exams
1.3	**To describe the air and solid pollution**	**K1; K2; K4**	Lectures and group discussion	Participation, Quizzes and MCQs,
2.0	**Skills**			
2.1	**To explain the water treatment from different pollutants**	**S1; S2**	Lecture and oral discussions	Solved problem marks, Short quizzes, and homework assignment
2.2	**To appraise the quality of water, air and soil**	**S1; S2**	Brainstorming and self-study, group discussion	Work portfolio and homework

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	**To demonstrate skills to participate in class by asking questions and giving answers.**	**S4**	Motivate students to ask questions and to give responses.	Participation marks
3.0	**Values, autonomy, and responsibility**			
3.1	**To appraise teamwork and create awareness to maintain scientific integrity during different assessments, projects, and mini-reports.**	**V1, V2**	• Group discussion and assignments • homework	• Oral tests Assignments • homework marks

C. Course Content

No	List of Topics	Contact Hours
1.	**ENVIRONMENTAL SCIENCE:** **Definition of Environmental Science** **Environmental Chemistry and Environmental Biochemistry, Water, Air, Earth, Life, and Technology, The Anthrosphere, Technology and the Anthrosphere. Ecology and the Biosphere, Energy, and Cycles of Energy, Matter, and Cycles of Matter, Human Impact and Pollution, Technology: The Problems It Poses and the Solutions It Offers**	**2**
2.	**Water pollution and treatment** Water Quality and Quantity, The Properties and types of Water. Water characterization (Acidity, Alkalinity, Salinity, Calcium and Other Metals in Water, total organic carbon (TOC), total nitrogen, water hardness, Dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD). **Nature and Types of Water Pollutants,** Elemental Pollutants, Heavy Metals, Metalloids, Organically Bound Metals and Metalloids, Inorganic Species 7.9 Oxygen, Oxidants, and Reductants, Organic Pollutants, Pesticides in Water, Polychlorinated Biphenyls, Radionuclides in the Aquatic Environment, Water Disinfection, Natural Water Purification Processes, Water Reuse and Recycling	**6**

3	**Air pollution** The Atmosphere and Atmospheric Chemistry, Importance of the Atmosphere, Physical Characteristics of the Atmosphere, Inorganic Pollutant Gases. Sources, measurement and control of (sulfur pollutants (Sox), nitrogen pollutants (NOx), carbonaceous pollutants (CO, CO2, hydrocarbons), humidity, ozone), industrial smog and photochemical smog.	**6**
4	**Soil environmental chemistry** Geosphere and Geochemistry, Nature and Composition of Soil, Acid-Base and Ion Exchange Reactions in Soils, Nitrogen, Phosphorus, and Potassium in Soil, Micronutrients in Soil, Fertilizers, Wastes and Pollutants in Soil, preparation of waste for disposal.	**2**
5	**Toxicological chemistry** Introduction to Toxicology and Toxicological Chemistry, Dose-Response Relationships, toxic elements and elemental forms, toxic inorganic compounds, toxicological chemistry of organic compounds, Health Hazards, removal of toxins.	**4**
6	**Industrial waste** Metal Resources and Industrial Ecology, Petroleum and Natural Gas, Coal, Classification of Hazardous Substances and Wastes, Sources of Wastes, Environmental Chemistry of Hazardous Wastes, Physical and Chemical Properties of Hazardous Wastes, Fates of Hazardous Wastes, Waste Reduction and Minimization, Recycling, Physical Methods of Waste Treatment, Chemical Treatment, Thermal Treatment Methods, Preparation of Wastes for Disposal, Ultimate Disposal of Wastes	**6**
7	**Hazardous waste:** Introduction, Classification of Hazardous Substances and Wastes, Sources of Wastes, Flammable and Combustible Substances, Reactive Substances, Corrosive Substances, Toxic Substances, Physical Forms and Segregation of Wastes, Environmental Chemistry of Hazardous Wastes, Physical and Chemical Properties of Hazardous Wastes, Transport, Effects, and Fates of Hazardous Wastes, Hazardous Wastes and the Anthrosphere	**4**
Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	6th/ 7th week	20 %
2.	Midterm 2	11th/ 12th week	20 %
3.	Quizzes, Home Works, class participation, and mini projects	During the semester	20 %
5.	Final Exam	16thweek	40 %
6.	Total	All weeks	100 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Stanley Manahan, Stanley E. Manahan, **Environmental Chemistry**, CRC Press; 7th edition (December 29, 1999), ISBN-10 : 1566704928, ISBN-13 : 978-1566704922
Supportive References	1. Jonathan D. Raff , Ronald A. Hites , **Elements of Environmental Chemistry**, Wiley; 3rd edition (July 9, 2020), ASIN : B08CS91QCS. 2. V. P. Evangelou, **Environmental Soil and Water Chemistry: Principles and Applications**, Wiley-Interscience; 1st edition (Oct. 12 1998), ISBN-10 : 0471165158, ISBN-13 : 978-0471165156
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students.

Items	Resources
Technology equipment (projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (depending on the nature of the specialty)	-

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	**Students**	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved		
Lab Performance	**Students**	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	COUNCIL OF DEPARTMENT OF CHEMISTRY
REFERENCE NO.	3 (NO. 1/3)
DATE	5/3/1446- 8/09/2024