



Course Specification

(Bachelor)

Course Title: Environmental Analysis

Course Code: Chem 457

Program: BSc in Chemistry

Department: Chemistry

College: Science

Institution: King Saud University

Version: TP-153

Last Revision Date: 06 May 2025



Table of Contents

A. General information about the course	3
B. Course learning outcomes, teaching strategies and assessment methods.....	4
C. Course content	5
D. Students assessment activities	6
E. Learning resources and facilities	6
F. Assessment of course quality	7
G. Specification approval.....	7



A. General information about the course

1. Course Identification

1. Credit hours: (2 Hours)

2 (1 Lecture + 1 Practical)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others

B. ☒ Required ☐ Elective

3. Level/year at which this course is offered:

Level 7th / Fourth Year

4. Course general description:

This course explores the chemical aspects of environmental systems and pollution. Topics include air, water, and soil pollution, including their sources, effects, measurement, and control methods. The course also addresses specialized topics such as medical and radioactive pollutants, noise pollution, and the environmental impact of pesticides. Emphasis is placed on natural protection methods and sustainable waste management, including the treatment and recycling of solid, liquid, and medical wastes. The course prepares students to analyze and address real-world environmental challenges using chemical principles.

5. Pre-requirements for this course (if any):

CHEM 353

6. Co-requirements for this course (if any):

None

7. Course main objective(s):

1. To provide students with a comprehensive understanding of the chemical processes affecting the environment across air, water, and soil systems.
2. To identify sources and effects of major environmental pollutants.
3. To introduce methods for measuring and monitoring various pollutants in environmental media.
4. To explore sustainable approaches to waste treatment and environmental protection.
5. To apply chemical principles to analyze and solve real-world environmental problems.

2. Teaching mode (mark all that apply)

No	Mode of instruction	Contact hours	Percentage
1	Traditional classroom	43	100%
2	E-learning		
3	Hybrid -Traditional classroom -E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact hours
1	Lectures	15
2	Laboratory/Studio	28
3	Field	-
4	Tutorial	-
5	Others (specify)	-
Total		43

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the fundamental concepts and chemical principles underlying environmental pollution and natural systems	K1	-Lectures -Oral discussion -Instructor-led Q&A	Quizzes, midterm exam, final exam, and practical exams
1.2	Define and recall key scientific information related to environmental pollutants, their sources, effects, and behaviors	K3	-Lectures -Oral discussion -Laboratory experiments -Visual aids, -Instructor-led Q&A	Written assignments- Midterm and final exams -Laboratory reports -Practical exams
2.0	Skills			
2.1	Compare and evaluate various pollution treatment and analytical	S1	Case studies, group discussions, and	Group presentations, lab



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	techniques used in environmental chemistry		video demonstrations	reports, midterm, and final exams
2.2	Demonstrate self-directed learning skills to research and apply relevant information on environmental pollution topics	S4	Independent study, research tasks, and Self-directed learning using online resources	Research paper, class discussion participation
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate awareness of environmental ethics and the importance of sustainable practices in pollution prevention and control	V1	Ethical debates, real-world case analysis, and reflective activities	Reflection papers, case study analysis reports, and oral presentations

C. Course Content

No	List of topics	Contact hours
1	Introduction to environmental analysis and environmental monitoring	2
2	Hazardous waste, chemical safety and security, and environmental risk assessment	1
3	Atmospheric chemistry, air pollution, air pollutant sampling, analysis, and control	3
4	Water chemistry, water pollution, water and wastewater sampling, analysis, and treatment	3
5	Soil chemistry, soil pollution, soil and sediment sampling, analysis, and remediation	3
6	Organic and inorganic environmental pollutants and emerging contaminants	1
7	Environmental analytical quality assurance, method validation, and quality control	1
8	Environmental regulations, policies, standards, and legislation	1
Total		15
No	List of topics (practical section)	Contact hours
1	Introduction to environmental analysis, laboratory safety, traditional analytical tools, and good laboratory practices	2
2	Estimation of acetic acid in glacial vinegar	2
3	Estimation of total acidity in water	2
4	Estimation of alkalinity of water	2





5	Quiz	2
6	Estimation of phenol in water	2
7	Estimation of ammonia in water	2
8	Estimation of dissolved oxygen in water	2
9	Quiz	2
10	Estimation of manganese in soil	2
11	Estimation of fluoride in water	2
12	Estimation of phosphate in soil by blue molybdenum method	2
13	Comprehensive review	2
14	Final practical exam	2
Total		28

D. Students Assessment Activities

No	Assessment Activities*	Assessment timing (in week no)	Percentage of total assessment score
1	Midterm exam	9	20
2	Written assignments, research, and activities	1–14	10
3	Laboratory reports, quizzes, and practical exams	1–13	30
4	Final exam	17	40

*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	Pradyot Patnaik, Handbook of Environmental Analysis, Chemical Pollutants in Air, Water, Soil, and Solid Wastes, 3rd ed., CRC Press, 2017.
Supportive References	-Chaudhery Hussain, Rustem Kecili, Modern Environmental Analysis Techniques for Pollutants, Elsevier, 2019. -Stanley Manahan, Environmental Chemistry, 11th ed., CRC Press, 2022.
Electronic Materials	Digital libraries such as ScienceDirect: www.sciencedirect.com – A database of peer-reviewed scientific articles and journals. Access provided through the university library portal.
Other Learning Materials	Instructor-prepared handouts. PowerPoint presentations used during lectures and discussions.

2. Required Facilities and Equipment

Items	Resources
Facilities	-Classroom with 20 seats -Chemical laboratory equipped for 20 students





Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	
Technology equipment (projector, smart board, software)	-Classrooms and laboratories equipped with desktop computers, data show (projector), smart board, and high-speed internet access
Other equipment (depending on the nature of the specialty)	-Laboratory glassware and apparatus -Environmental sampling tools (for air, water, and soil) -Instruments such as spectrophotometers, pH meters, and gas detectors -Chemicals and reagents for analytical experiments -Safety equipment including fume hoods, fire extinguishers, eyewash stations, gloves, and lab coats

F. Assessment of Course Quality

Assessment areas/issues	Assessor	Assessment methods
Effectiveness of teaching	Student	-Student course evaluation surveys -Informal feedback sessions or suggestion boxes
Effectiveness of students assessment	Faculty/Program Committee	-Peer review of exam questions and assessment tools -Moderation of grading -Departmental discussions on assessment standards
Quality of learning resources	Program Leaders/Teaching Staff	-Faculty feedback and student surveys on textbooks and materials -Internal reviews of course content and delivery resources -Workshops by experts
The extent to which CLOs have been achieved	Faculty or Peer Reviewer	-Mapping CLOs to assessment results -Reviewing students' performance data -External peer review of exams and grading consistency
Other		

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

Assessment methods: Direct, Indirect.

G. Specification Approval

COUNCIL / COMMITTEE	
REFERENCE NO.	
DATE	22/10/2023

