



Course Specification

(Bachelor)

Course Title: Radiation Physics

Course Code: PHYS3706

Program: Environmental Sciences

Department: Physics

College: Science

Institution: Umm Al-Qura University

Version: Course Specification Version Number

Last Revision Date: Pick Revision Date.



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A. General information about the course:

1. Course Identification

1. Credit hours: (...3 hrs)

2. Course type

- A. University College Department Track Others
- B. Required Elective

3. Level/year at which this course is offered: (6th Level / 3rd Year)

4. Course General Description:

The course covers the principles of radiation physics related to the environment and provides both theoretical and experimental conceptual background in radiation physics sufficient to enable students to make proper assessment of radiation hazards in the environment.

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

General Physics PHYS1101

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

7. Course Main Objective(s):

The main objective of this course is to provide the theoretical background needed to proper understanding of

- radioactivity and radioactive materials,
- recognizing the natural radioactivity and laws of decay.
- Inspecting the methods of interaction of radiation with matter.
- Recognizing the types and structure of various radiation detectors.
- Recognizing the concepts of ionizing radiation
- Identifying the effect of nuclear radiation on the environment
- Inspecting various dosimeters and their use in radiation physics
- Inspecting various means of protection from ionizing radiation

Practical Part:

Students will conduct various experiments in the practical part of the course. Each student will perform the experiments, collect data, extract results, and prepare a written report every week.



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	45
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		75

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Demonstrate fundamentals and concepts of radioactivity, interaction of radiation with matter, radiation biology and health effects	K1	<ul style="list-style-type: none"> • Lecturing; • Brain storming 	Mid exam. Final exam. Homework. Oral Questions.
2.0	Skills			





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	Assess, evaluate, or calculate radiation measurements, quantities and dosimetry calculations, and radiation Safety Measures	S1	<ul style="list-style-type: none"> Lecturing; Brain storming 	Final exam. Homework. Oral Questions.
2.2	Effectively communicates physics concepts, processes, and results, both orally and in writing	S5		
2.3	Develop experimental skills through lab experiments and simulations.	S3	Laboratory experiments, demonstrations	Lab reports
3.0	Values, autonomy, and responsibility			
3.1	Work responsibly and effectively within a team to practice and interact.	V3	Research presentation	Research presentation
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Review of Physical Principles related to radiation	2
2.	Atomic and Nuclear Structure	3
3.	Radioactivity and Radiation Sources	3
4.	Interaction of Radiation with Matter	2
5.	Radiation biology and health effects	3
6.	Radiation Detection	2
7.	Radiation Quantities and Dosimetry Calculations	3
8.	Nuclear Fission and power production	3
9.	Environmental Radioactivity	2
10.	Environmental Dispersion	3
11.	Radiation Protection Standards and Regulations	2
12.	Environmental Protection	2
	Practical Part: Students will conduct various experiments in the practical part of the course. Each student will perform the experiments, collect data, extract results, and prepare a written report every week	45
Total		30





D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Exam	10	20
2.	Quizes	7, 14	10
3.	Laboratory work	Every week	20
4.	Final Exam	17	50

*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	<ol style="list-style-type: none"> 1. Herman Cember, and Thomas E. Johnson, PhD Introduction to Health Physics. 4th edition. 2009. The McGraw-Hill Companies, Inc. 2. Eisenbud, M. and Gesell, M., "Environmental Radioactivity", 4th edition, Academic Press, London, 1997.
Supportive References	<ol style="list-style-type: none"> 1. James E. Martin. Physics for Radiation Protection. 2013. Wiley-VCH Verlag & Co. 2. James E. Turner. Atoms, Radiation, and Radiation Protection. 3rd Edition. 2007. WILEY-VCH Verlag GmbH & Co. 3. Daniel A. Gollnick BASIC RADIATION PROTECTION TECHNOLOGY. 6th Edition. 2018. Pacific Radiation
Electronic Materials	IAEA Publications IAEA Training Courses ICRP Publications EPA Publications
Other Learning Materials	http://www.inhb.fr/nuclear-data/nuclear-data-table/ https://www.nrc.gov/reading-rm/basic-ref/students/for-educators.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	projector
Other equipment (depending on the nature of the specialty)	



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Questionnaire, Course report
Effectiveness of Students assessment	Peer Reviewers	Questionnaire, Course report
Quality of learning resources	Program Leaders	Questionnaire, Grades
The extent to which CLOs have been achieved	Peer Reviewers	Exam , Course report
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	PHYSICS DEPARTMENT, FACULTY OF SCIENCE
REFERENCE NO.	
DATE	18/4/2025





Course Specification

— (Bachelor)

Course Title: Immunology and Epidemiology

Course Code: BIOE3204

Program: Environmental Sciences

Department: Biology

College: Science

Institution: Umm Al-Qura University

Version: 47

Last Revision Date: January 20, 2025



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A. General information about the course:

1. Course Identification

1. Credit hours: (3 credit hours)

3 credit hours

2. Course type

A. University College Department Track Others

B. Required Elective

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

4. Course general Description:

The course "Immunology and Epidemiology" provides an in-depth exploration of the human immune system and its interactions with environmental factors. It covers foundational concepts in immunology, including the structure and function of immune cells, antigens, antibodies, and immune responses. The epidemiology component examines disease patterns, causes, and impacts, with a focus on environmental factors influencing public health. Special attention is given to infectious diseases associated with Hajj and Umrah, considering Makkah's unique status as a global pilgrimage hub. Students will gain practical skills in analyzing epidemiological data and understanding the role of the immune system in environmental health issues. The course is designed to equip students with the knowledge to address public health challenges and contribute to environmental science solutions.

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

Entomology + Environmental Microbiology

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

Entomology + Environmental Microbiology

7. Course Main Objective(s):

1. To understand the structure and function of the immune system and its components.
2. To analyze the relationship between immunology and environmental factors.
3. To study the principles of epidemiology, including disease causation and transmission.
4. To evaluate the impact of environmental changes on disease epidemiology and immune responses.
5. To develop practical skills in interpreting epidemiological data and applying it to environmental health scenarios.
6. To promote critical thinking and problem-solving skills in addressing public health and environmental challenges.
7. To understand the epidemiology and control measures of infectious diseases associated with Hajj and Umrah.





2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	42
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		72

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	Explain the structure and function of the immune system	K1	Lectures, discussions, multimedia presentations	Quizzes, midterm, final exam
1.2	Describe the principles of epidemiology and disease causation	K3	Case studies, group discussions	Assignments, final exam
1.3	Explain the mechanisms of antigen-antibody interactions and their role in immunity	K4	Interactive lectures, videos	Midterm, final exam
2.0	Skills			





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Analyze the relationship between immunology and environmental factors	S1, S2	Problem-solving exercises, real-world examples	Projects, assignments
2.2	Evaluate epidemiological data to identify trends and propose solutions	S3	Practical exercises, statistical analysis workshops	Projects, case study reports
2.3	Investigate the influence of environmental changes on disease patterns	S4	Group projects, critical analysis of research	Assignments, final exam
3.0	Values, autonomy, and responsibility			
3.1	Develop critical thinking in addressing public health issues	V1	Student presentations, debates	Peer evaluations, reports
3.2	Understand Hajj and Umrah-related infectious disease control measures	V3	Focused discussions, case analysis	Quizzes, midterm, final exam
3.3	Collaborate effectively in group tasks to solve epidemiological challenges	V2	Group discussions, collaborative projects	Group reports, evaluations

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Immunology and Epidemiology: Overview of course, history and scope of immunology and epidemiology	2
2.	Components of the Immune System: Immune cells, tissues, and organs; innate and adaptive immunity	2
3.	Antigens, Antibodies, and Immune Responses: Antigen properties, antibody structure, antigen-antibody interaction	2
4.	Hypersensitivity and Autoimmune Disorders: Types of hypersensitivity; examples of autoimmune diseases; mechanisms of autoimmunity	2
5.	Infectious Diseases and the Immune System: Host-pathogen interactions; role of immunity in infectious disease control	2
6.	Introduction to Epidemiology Concepts: Definitions, measures of disease frequency (incidence, prevalence)	2





7.	Disease Causation and Risk Factors: Epidemiological triad, causation models, environmental and genetic risk factors	2
8.	Epidemiological Study Designs: Observational studies (cohort, case-control), experimental studies	2
9.	Disease Transmission and Control: Modes of transmission, reproductive number (R0), strategies for disease prevention	2
10.	Environmental Factors in Epidemiology: Impact of climate change, pollution, and urbanization on health	2
11.	Emerging Diseases and Global Health Issues: Examples (e.g., COVID-19, MERS), challenges in global health governance	2
12.	Hajj and Umrah: Infectious Diseases and Public Health Challenges: Common diseases (e.g., meningitis, respiratory infections), prevention strategies	4
13.	Case Studies: Immunology and Environmental Health: Detailed analysis of case studies on outbreaks and immune responses	4
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activities	–	10%
2.	Midterm Exam	6	20%
3.	Lab quiz	6-7	10%
4.	Final Lab	13-14	20%
5.	Final Exam	15	40%
Total			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	<ul style="list-style-type: none"> – Abbas, A. K., Lichtman, A. H., & Pillai, S. (2021). <i>Cellular and Molecular Immunology</i> (10th ed.). Elsevier. – Gordis, L. (2019). <i>Epidemiology</i> (6th ed.). Elsevier.
Supportive References	<ul style="list-style-type: none"> – Janeway, C. A., Travers, P., Walport, M., & Shlomchik, M. J. (2020). <i>Immunobiology: The Immune System in Health and Disease</i> (9th ed.). Garland Science.





	– Merrill, R. M. (2017). <i>Introduction to Epidemiology</i> (8th ed.). Jones & Bartlett Learning.
Electronic Materials	– Access to PubMed and ScienceDirect for current research articles. – WHO website (www.who.int) for epidemiological updates and resources.
Other Learning Materials	Lecture notes, case studies, and supplementary videos available on Blackboard.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms with audio-visual equipment; laboratory space for case study analysis
Technology equipment (projector, smart board, software)	Projector, smartboard, software tools for statistical analysis (e.g., SPSS, R)
Other equipment (depending on the nature of the specialty)	Access to online journals, simulation tools for epidemiological modeling, whiteboards

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, peer reviewers	Course evaluation surveys, peer reviews
Alignment of course content with learning outcomes	Faculty, program leaders	Curriculum reviews, outcome mapping
Effectiveness of Students assessment	Students, external reviewers	Student feedback, exam moderation
Quality of learning resources	Students, faculty	Resource usage surveys, material reviews
The extent to which CLOs have been achieved	Faculty, external reviewers	CLO analysis reports, student performance
Overall student satisfaction with the course	Students	End-of-course surveys, focus groups

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE

BY DR. LEENA NEYAZ & DR. HISHAM MALAK





REFERENCE NO.

DATE





Course Specification

— (Bachelor)

Course Title: Environmental Biotechnology

Course Code: BIOE3512

Program: Environmental Sciences

Department: Biology

College: : Applied Science

Institution: Umm Al-Qura University

Version: 1447

Last Revision Date: 6/1/2025



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A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (level 6th / 3rd year)

4. Course general Description:

The course is structured to provide the students with fundamental concepts of environmental biotechnology, highlighting the importance of microbial ecology, their metabolism, methods for their characterization and scopes for implementation, bioremediation and biodegradation principles, processes and applications will be discussed along with advanced applications in wastewater, oil recovery, biohydrometallurgy, biofuel, carbon storage and capture, energy production, and various instruments used in ecological biotechnology laboratories, etc. Additionally, the course will address the application of new technologies specific to the Saudi environment.

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

Ecological Genetics; BIOE3505

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

None

7. Course Main Objective(s):

On successful completion of the course students will be able to

- Explain the importance of microbial diversity in environmental systems, processes and biotechnology.
- Describe existing and emerging technologies that are important in the area of environmental biotechnology particularly in the context of Saudi Arabia.
- Describe biotechnological solutions to address environmental issues including pollution and water recycling.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45 hrs.	%100





No	Mode of Instruction	Contact Hours	Percentage
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	15
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45

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	Understand the essential concepts and fundamental principles of environmental biotechnology.	K1	1- In-class lecturing where the previous knowledge is linked to the current and future topics. 2- Homework assignments. 3- Discussions (connecting what they learn in the class and applying this information in laboratory).	1- homework and quizzes. 2- Midterm and final written exams (theoretical and practical). 3- Evaluation of reports. 4- Oral presentation. 5-Course work reports.
1.1	Recognize the linkage of biotechnology to society.	K3		
1.2	State the principles and applications of Environmental Biotechnology.	K3		
1.3	The student is expected to recognize environmental and ecological challenges in the Kingdom of Saudi Arabia.	K3		



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.4	Demonstrate a strong understanding of fundamental concepts and methods related to environmental technology, along with effective problem-solving for environmental issues.	K4	4-Handout of lecture notes for each topic.	
2.0	Skills			
2.1	Compare the different types of environmental biotechnologies.	S1	1- Application of essential scientific techniques through lectures, classes and essays.	1-Evaluation of the topics prepared by students according to the content, arrangement, and covering of the topic. 2-Midterm and final exams. 3-Checking the homework assignments. 4-Course work reports.
2.2	Develop innovative strategies using biotechnology methods to tackle environmental issues and challenges.	S2	2- Small group discussion. 3- Ask the students to make small search project during the semester.	
2.3	Select and utilize both standard and advanced digital technologies, instruments, and materials to effectively analyze environmental issues.	S3	4- Making connections between different topics across the course. 5- Class discussions (Engage students in interaction with questions and answers).	
2.4	Assess and discuss sources of local environmental threats, as well as evaluate biotechnological techniques for mitigating their impacts.	S4	6- Homework assignments. 7-Use of microscopic illustrations. 8-Laboratory training. 9-Activities and homework.	





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.5	Effectively communicates theoretical knowledge to diverse audiences.	S1		
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate dedication to professional and academic values and ethics.	V1	1- Engage student in carrying out internet search. 2- The ability to debate the scientific basis of physiological mechanisms of body systems.	
3.2	Create plans for academic and professional self-development, as well as for social achievement, and make independent decisions.	V2	3- Writing group reports. 4- Solving problems in groups during tutorial. 5- Checking the homework assignments in groups during discussion.	1- Oral exams. 2- Evaluation of student essays assignments and search work.
3.3	Collaborate effectively in teams while taking responsibility for your contributions.	V3	6- Cooperative learning and application of scientific method in thinking the scientific problem solving. 7- Work as part of a team. 8- Conducting group experiments and writing group reports. Dividing students into groups to cooperate with	3- Observation of student ethical and moral behavior. 4- Students' attendance is recorded during lectures. 5- Assessment of the student reports. 6- Grading homework assignments.





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			each other during the experiments.	

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Environmental Biotechnology, definition, objectives, scopes and applications.	2
2.	Genetic manipulation strategies in environmental biotech (Genetic Engineering, Gene Cloning, Recombinant DNA Technology, CRISPR-Cas9 Technology)	4
3.	Wastewater treatment (Biology of Wastewater, biological oxygen demand, nutrient cycle). Primary, secondary, tertiary, and advance wastewater treatments.	2
4.	Pollution indicators (air, water, and soil pollution indicator).	2
5.	Pollution control strategies (air, water, and soil pollution indicators)	2
6.	Sludge treatment, contaminated land, and bioremediation.	2
7.	Midterm Exam	2
8.	Aerobes; oxygen requirement, metabolic pathways, enzymes and oxygen utilization, and health implications	2
9.	Effluents; composition, potential harm, environmental regulations and sustainable practices.	2
10.	Phytotechnology; terrestrial photo-systems, metal phytoremediation and Rhizofiltration.	2
11.	Hyper accumulation; plant adaptation, types of elements, beneficial aspects, phytoremediation applications, examples of hyperaccumulating plants, challenging and limitations.	2
12.	Solid waste treatments; waste segregation, methods of treatment, environmental considerations, waste reduction and reuse, technological advancements, legislation and regulations.	2
13.	Environmental Biotechnology and alternative solutions (biomass energy production, biopesticides, biofertilizers, bio-enzymes)	2
14.	Environmental biotechnology and the Saudi environment.	2
Total		30
No	List of Practical Topics	Contact Hours
1.	Introduction to Microbial ecology and biosafety	3
2.	Various instruments used in ecological biotechnology laboratories (Ritter Biogas Batch Fermentation System, New Brunswick Bio-flo Reactors and Fermenters, HACH Lange spectrophotometer, BINDER vacuum drying chamber, Microwave Reactor, Tubular Furnace)	6





	Bio-nanocomposites synthesis Unit, Zeta Potential Analyzer, UV reactor, Sonicator, Sigma 4-16KHS)	
3.	Approaches for detection and identification of microorganisms in the environment.	6
4.	Land filling	3
5.	Composting	3
6.	Midterm exam	3
7.	Biodegradation and Biotransformation of Organic Pollutants	3
8.	Biotransformation of Inorganic Pollutants	3
9.	Domestic and Industrial Wastewater Treatment	3
10.	Wetlands-Constructed Wetland and Floating Wetlands	3
11.	Bioreactors in Wastewater Treatment-Anaerobic Digesters	3
12.	CSTR, Trickling Filters, Membrane Bioreactors	6
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Lec. Activities	3	10%
2.	Mid Term Exam (Theoretic)	7	20%
3.	Lab Quiz	7	10%
4.	Final Exam (Practical)	15	20%
5.	Final Exam (Theoretic)	16	40%
	Total		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	<ol style="list-style-type: none"> Mohapatra, P. K. (2013). <i>Textbook of environmental biotechnology</i>. IK International Pvt Ltd. Jördening, H. J. and Winter, J. (2005). <i>Environmental Biotechnology: Concepts and Applications</i>, Wiley-VCH. (available at UTS Library E-book).
Supportive References	<ol style="list-style-type: none"> Vallero, D. A. (2010). <i>Environmental Biotechnology: A Biosystems Approach</i>, Elsevier. (available at UTS Library) Evans, G. M. and Furlong, J. C. (2011). <i>Environmental Biotechnology:</i>





	Theory and Application, Wiley-Blackwell. (available at UTS Library)
Electronic Materials	Journal review articles, with links available on the Environmental biotechnology field website.
Other Learning Materials	Biosafety system in the lab for practical exercises.

2. Required Facilities and equipment

Items	Resources
<p>facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)</p>	<ol style="list-style-type: none"> 1. One classroom 2 hours per week for each section 2. Laboratory 3 hours per week for each practical section
<p>Technology equipment (projector, smart board, software)</p>	<ol style="list-style-type: none"> 3. Computers or internet connection. Active Board. 4. Data show is required in every room.
<p>Other equipment (depending on the nature of the specialty)</p>	<p>Thermolyze Shaker, Orbital shaking Incubator, Ph Meter, Hot air oven, Flask Shaker, Auto Clave, Portable Autoclave, Horizontal Laminar Flow Cabinet, Water Bath, Microscope Trinocular with Fluorescence attachment and attached Digital camera, Chlorophyll meter, Computerized Microwave digestion system, Comet Assay Tank, PCR machine, gel documentation system Micropipettes, Master mix, DNA Primers, glassware, DNA and RNA isolation kits. Cloning, RT- PCR (one step), PCR and ELISA kits and PCR beads.</p>

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Peer Review, Students	Direct (Independent Reviewer), Indirect (survey)
Effectiveness of Students assessment	Faculty members	Direct (Random Correction)
Quality of learning resources	Students	Indirect (survey)
The extent to which CLOs have been achieved	Faculty members	Direct
Other		

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

Assessment Methods (Direct, Indirect)





G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	





Course Specification

— (Bachelor)

Course Title: Chemical Treatment of Environmental Pollution

Course Code: CHM3233

Program: Environmental Sciences

Department: Chemistry

College: Science

Institution: Umm Al-Qura University

Version: Course Specification Version Number

Last Revision Date: 20/12/2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (6th level/3rd year)

4. Course general Description:

This course aims to give deep understanding of different types and characteristics of environmental hazardous wastes, all elements and steps of petrochemical hazardous waste management, risks related to hazardous wastes and approaches to hazardous waste minimization, remediation, treatment and disposal.

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

CHM2227

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

BIOE2504

7. Course Main Objective(s):

By finishing the course, the student will be familiar with:

- Hazardous material releases, fires, and explosions. Also, fundamentals of combustion and emissions
- Waste characteristics, control technologies, management strategies, facility innovations, process alternatives, costs, case histories, and future trends for each industrial and commercial operation.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	E-learning	---	---
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	---	---
4	Distance learning	---	---



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 CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Summarize the characteristics of hazardous material releases, fires, and explosions	K2	- Lectures - Scientific discussion	Mid-term exam Final exam
1.2	Recognize waste minimization, recycling, and cleaner production	K4	- Lectures - Web based study	Mid-term exam Final exam
2.0	Skills			
2.1	Evaluate wastewater treatment in the petrochemical production industry	S2	Lectures	-Homework -Final exam
2.2	Identify the waste treatment in several industries.	S4	Scientific discussion	Mid-term exam Final exam
2.3	Use surfactant technologies for	S1	Lectures	Mid-term exam Final exam



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	remediation of oil spills			
3.0	Values, autonomy, and responsibility			
3.1	Write and present a chemical report related to wastewater treatment in the petrochemical production industry.	V2	- Group discussion	Observation by the instructor
3.2	Demonstrate commitment to professional and academic values, and ethics in the field of soil remediation	V1	- Project - Presentation	Write a report and Observation of group's teamwork performance

C. Course Content

No	List of Topics	Contact Hours
1.	Characteristics of Hazardous Industrial Waste	2
2.	Treatment of Nonferrous Metal Manufacturing Wastes	2
3.	Waste Treatment in the Aluminum Forming Industry	2
4.	Treatment of Wastes from Metal Finishing Industry	2
5.	Waste Management in the Pulp and Paper Industry	2
6.	Treatment of Nickel-Chromium Plating Waste	2
7.	Wastewater Treatment in The Petrochemical Production Industry	4
8	Mid-term Exam	2
9.	Characteristics of Hazardous Material Releases, Fires, and Explosions	2
10.	Remediating Oilfield Waste and Spills	4
11.	Surfactant Technologies for Remediation of Oil Spills	4
12.	Chemical Reactions in Marine Sediments	2
Total		30



D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework and/or activities.	---	10%
2.	Quiz	---	10%
3.	Midterm Exam.	8	30%
4.	Final Exam. (2 hours exam)	16-17	50%
Total		---	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	<ul style="list-style-type: none"> •Industrial Combustion Pollution and Control (Environmental Science & Pollution), Charles E. Baukal , 2004 by Marcel Dekker, Inc. All Rights Reserved •Pollution control in the petrochemicals industry, M. Brett Borup, E. Joe Middlebrooks, 1987 by CRC Press Taylor & Francis Group •Handbook of Fire and Explosion Protection Engineering Principles for the Oil, Gas, Chemical, and Related Facilities, DENNIS P. NOLAN, 2019 Elsevier Inc. All rights reserved •Oil Spill Remediation, Colloid Chemistry-Based Principles and Solutions, P. Somasundaran, P. Patra, R.S. Farinato, K. Papadopoulos, 2014 by John Wiley & Sons, Inc. All rights reserved.
Supportive References	<ul style="list-style-type: none"> •Advances in Hazardous Industrial Waste Treatment, LAWRENCE K. WANG, NAZIH K. SHAMMAS, YUNG-TSE HUNG, 2009 by Taylor & Francis Group, LLC. •Handbook of Industrial and Hazardous Wastes Treatment, LAWRENCE K. WANG, YUNG-TSE HUNG, NAZIH K. SHAMMAS, 2010 by Taylor and Francis Group, LLC.
Electronic Materials	<ul style="list-style-type: none"> • http://www.chemweb.com • http://www.sciencedirect.com • http://www.rsc.org
Other Learning Materials	Lecture Handouts available on the coordinator website

2. Required Facilities and equipment



Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	-Classrooms capacity (40) students. -Providing hall of teaching aids including computers and projector.
Technology equipment (projector, smart board, software)	-Room equipped with computer and projector and TV.
Other equipment (depending on the nature of the specialty)	-No other requirements

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Questionnaire (indirect)
Effectiveness of Students' assessment	Students	Questionnaire (indirect)
Quality of learning resources	Program Leader	Results data analysis (direct) and questionnaire (indirect)
The extent to which CLOs have been achieved	Course instructor	Questionnaire (indirect)
Other	---	---

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CHEMSITY DEPARTMENT, FACULTY OF SCIENCE
REFERENCE NO.	
DATE	21/12/2024





Course Specification

(Bachelor)

Course Title: **Biostatistics**

Course Code: **MTH1611**

Program: **Environmental sciences**

Department: **Biology**

College: **Science**

Institution: **Umm Al-Qura University**

Version: **47**

Last Revision Date: **06 / 02 /2025**



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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2 (30 Lectures, 0 Lab, 0 Tutorial)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (Second term, first year)

4. Course General Description:

Introduction to methods and concepts of statistical analysis and sampling, with special attention to those occurring in biological sciences. Topics include Frequency Distributions, Graphs, Descriptive statistics and Inferential Statistics. The class is applied using examples from real life and through statistical software

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

Not Applicable

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

Not Applicable

7. Course Main Objective(s):

The purpose of the course is to teach fundamental concepts and techniques of descriptive and inferential statistics with applications in biology. Basic statistics, including, descriptive statistics, inference statistics. The analytic methods and applications will be linked to topics including real life problems, and program evaluation.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Two hours/week	100%
2	E-learning	0	0%
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 	0	0%
4	Distance learning	0	0%



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 (Midterm exam and Quizes)	0
Total		30

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	To understand the basics terms of biostatistics, types of variables numerical or categorical , and different sampling types.	K1	Lecture	Homework and exams, quizzes
1.2	To understand the concepts of descriptive statistic, tables graphs and measures, and how they are used in statistical analysis.	K2	Lecture	Homework and exams, quizzes
1.3	To understand the difference between descriptive and inferential statistics and when do we use them in real life.	K3	Lecture	Homework and exams, quizzes
2.0	Skills			



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	Develop connections within branches of statistics and between statistical analysis and Biology.	S1	Lecture /individual or group work	Homework and exams, quizzes
2.3	Choose an appropriate graphical or tabular display for a given data set and question	S2	Lecture /individual or group work	Homework and exams, quizzes
2.4	Estimate the population parameter by the statistic.	S3	Lecture /individual or group work	Homework and exams, quizzes
2.5	Determine which basic statistical method(s) is/are most appropriate to analyze the data at hand	S4	Lecture /individual or group work	Homework and exams, quizzes
2.6	Interpret the results of statistical problem and data analysis	S5	Lecture /individual or group work	Homework and exams, quizzes
3.0	Values, autonomy, and responsibility			
3.1	Work independently and with groups for solving statistical problem.	v1	Lecture /individual or group work	Homework and exams, quizzes
3.2	Use computer skills and library effectively.	v2	Lecture /individual or group work	Homework and exams, quizzes
3.3	Apply the statistical skills in solving the life problems	v3	Lecture /individual or group work	Homework and exams, quizzes



C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to descriptive and inferential statistics	2
2.	Variables and Types of Data	2
3.	Data Collection and Sampling Techniques	2
4.	Experimental Design	2
5.	Organizing Data	2
6.	Histograms, Frequency Polygons, and Ogives	2
7.	Measures of Central Tendency	3
8.	Measures of Variation	3
9.	Measures of Position	3
10.	Exploratory Data Analysis	3
11.	Scatter plots, and Correlation measures	3
12.	Simple Linear regression	3
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During semester	20%
2.	Periodic Exam	8 th or 9 th	30%
3.	Final Exam	17 th or 18 th	50%
...			

*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	Bluman, A. G. (2018). <i>A Brief Version: Elementary Statistics: A Step by Step Approach</i> . McGraw-Hill Education: elevnth edition, ISBN: 1259755339
Supportive References	Probability and statistics for engineers and scientists, Ronald E. Walpole, Prentice Hall (2012).
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment



Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> Each classroom should be equipped with a whiteboard and a projector. Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Instructor	Direct
Quality of learning resources	Students	Direct
The extent to which CLOs have been achieved	Instructor	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	





Course Specification

— (Bachelor)

Course Title: Biodiversity and Conservation Biology

Course Code: BIOE3511

Program: BSc Environmental Sciences

Department: Department of Biology

College: Applid Science

Institution: Umm Al-Qura University

Version: 1447

Last Revision Date: 28.12.2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (3 hrs.)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (Level 6/Year 3)

4. Course general Description:

The Biodiversity and Conservation Biology course provides an introduction to conservation and biodiversity principles. This course discusses the issue of biodiversity loss, conservation strategies and ecological restoration. It also includes training sessions on utilizing the IUCN Species Red List criteria. Topics will be investigated from a local, regional, and global standpoint.

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

Flora (BIOE2303)

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

Fauna (BIOE2201)

7. Course Main Objective(s):

This course aims to provide students with knowledge of biodiversity and the essentials of conservation biology

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	69 hrs.	100 %
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 		
4	Distance learning		





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	42
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		72

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	Understand what is meant by biodiversity and its value.	K1		
1.2	Outline the main reasons for decline and threats to biodiversity locally, regionally, and globally.	K1	-Lecture -Open discussion	
1.3	Recall the basic concepts of conservation practices.	K3	-PowerPoint presentation	Quizzes. Midterm exam.
1.4	Be able to articulate the historical development of restoration concepts and the role that restoration can serve in the future stewardship of natural resources.	K1	-Documentary -Take home Assignment	Final exam. Checking the homework assignments
1.5	Be able to use ecological and management principles and select appropriate methods and tools for designing and conducting restoration projects.	K2		





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.6	Be capable of discerning elements of successful versus failed restoration projects.	K3		
2.0	Skills			
2.1	Interpretation conservation priorities	S2	-Problem-based learning. -Group activities -practical lessons -Seminars. -Self-assessment	- Oral quiz. - Worksheets - Evaluation of the topics prepared by students according to the content, arrangement, and covering of the topic.
2.2	Apply the IUCN Species Red List categories and criteria.	S3		
2.3	Analyze the range of options for biodiversity conservation	S2		
2.4	The ability to read a variety of different kinds of texts and materials effectively, emerging with a good understanding of their core arguments and analyses.	S1, S2		
3.0	Values, autonomy, and responsibility			
3.1	Improve communication skills (orally)	V1	- Oral presentations. - Group learning - Assignments Self- learning.	- Evaluation of student essays and assignments. - Open discussion.
3.2	Work independently and as part of a team to finish some assignments.	V3		
3.3	Computer skills and e-learning interaction	V3		
3.4	Communicating personal ideas and thoughts.	V2		

C. Course Content

1. Theoretical

No	List of Topics	Contact Hours
1.	Biodiversity: concept, the value of biodiversity, biodiversity informatics	2
2.	Biodiversity levels: genetic diversity, species diversity and habitats diversity; measuring biological diversity	2
3.	Extinction: extinction rate, vulnerability to extinction, IUCN Red list categories and criteria; endemic species	2



4.	Causes of species extinctions and biodiversity degradation: habitat destruction, fragmentation and degradation, overexploitation, exotic species and disease	2
5.	Problems of small population, monitoring of population, establishing new population	2
6.	Conservation biology: concept, historical overview Ex-situ conservation strategies: (genetic resources, seed banks, botanical gardens, zoos, aquaria)	2
7.	In-situ conservation strategies: protected area types, establishing priorities, international approaches (hot spot areas, wilderness areas, centers of diversity)	2
8.	Designing protected areas	2
9.	Managing protected areas	2
10.	Restoration ecology: historical development, role in stewardship, future needs	2
11.	Ecological Concepts: Ecological Succession, Reference conditions.	2
12.	Restoration Process: Steps in the Process. Understanding Limitations i) Biological Limitations. ii) Physical Limitations. iii) Chemical Limitations.	2
13.	Overcoming Restoration Limitations (a few examples) i) Revegetation. ii) Mulching. iii) Equipment. iv) Phytoremediation. v) Collaborative Restoration.	2
14.	Restoration in Various Settings (examples): a) Wetlands. b) Rivers. c) Wildlife. d) Temperate Forests. e) Grasslands. f) Tropical Forests.	2
15.	International approach to conservation and sustainable development: international agreements. Status and efforts of conservation biology in Saudi Arabia	2
Total		30



2. Practical

No	List of Topics	Contact Hours
1.	An introduction to the IUCN Red List, the Red List assessment process and role of the Red List Assessor, Terms used in the Red List Criteria	3
2.	Using GeoCAT software to determine EOO & EOO, Red List Categories, Data Quality & Uncertainty	3
3.	Red List Criteria: criterion A	3
4.	Red List Criteria: criterion B	3
5.	Red List Criteria: criterion C	3
6.	Red List Criteria: criterion D	3
7.	Red List Criteria: criterion E	3
8.	Selecting the Final Red List Category & Criteria. Red List Mapping standards, using ArcGIS online.	3
9.	Midterm exam	3
10.	Using the Red List Criteria for regional Red Lists: How to Add the Regional Dimension, The importance of regional Red Lists, Using the IUCN Red List Categories & Criteria for regional assessments	3
11.	Supporting Information for Red List assessments, Data Storage – IUCN Species Information Service (SIS)	3
12.	Presenting and discussing student projects on applying IUCN Red List Categories & Criteria on selective species from Saudi Arabia	3
13.	Presenting and discussing student projects on applying IUCN Red List Categories & Criteria on selective species from Saudi Arabia	3
14.	Presenting and discussing student projects on applying IUCN Red List Categories & Criteria on selective species from Saudi Arabia	3
Total		42

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Speech and discussion; Worksheets	Continuous	5%
2.	Quizzes	Continuous	10%
3.	Med term exam	7,9	15%
4.	Group project	11	10%
5.	Final exam "Practical Test"	16	20%
6.	Final Exam Written Test	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

<p>Essential References</p>	<p>Primack RB (2010) Essentials of Conservation Biology. Oxford University Press. (Arabic translation is available)</p> <p>Hobbs, R. J., E. S. Higgs, and C. Hall. 2013. Novel Ecosystems: Intervening in the New Ecological World Order. John Wiley & Sons</p> <p>Clewell, A. F., and J. Aronson. 2007. Ecological Restoration: Principles, Values, and Structure of an Emerging Profession. Island Press, Washington, DC.</p> <p>Lab sessions: https://www.dropbox.com/sh/etz4hmluotfjhlk/AADRS_JyFbk78WxUHQ-FdEFHa?dl=0</p> <p>IUCN (2012) Guidelines for application of IUCN red list criteria at regional and national levels: version 4.0. IUCN Gland, Switzerland and Cambridge, UK (Arabic translation is available)</p>
<p>Supportive References</p>	<p>Gadelha LMR et al. (2021) A survey of biodiversity informatics: Concepts, practices, and challenges WIREs Data Mining and Knowledge Discovery 11 doi:10.1002/widm.1394</p> <p>Abuzinada AH, Al-Wetaid Y, Al-Basyouni SZM (2005) The National Strategy for Conservation of Biodiversity in the Kingdom of Saudi Arabia. The National Commission for Wildlife Conservation Development. Conservation of Biological Diversity, Riyadh, Saudi Arabia</p> <p>Abuzinada AH, Robinson E, Nader I, Al Wetaid Y (2001) First Saudi Arabian National Report on the Convention on Biological Diversity. The National Commission for Wildlife Conservation and Development, Riyadh, Kingdom of Saudi Arabia</p>
<p>Electronic Materials</p>	<ul style="list-style-type: none"> • Convention on Biological Diversity (CBD) https://www.cbd.int/ • International Union for the Conservation of Nature (IUCN) https://www.iucn.org/ • Conservation International https://www.conservation.org/ • National Center of Wildlife (NCW) https://www.ncw.gov.sa/ • Biodiversity informatics training curriculum (YouTube channel) https://www.youtube.com/user/rosaytown/featured • https://www.iucnredlist.org/assessment/petitions





Other Learning Materials

Conservation Training <https://www.conservationtraining.org/>

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	The students and by the Department	<ul style="list-style-type: none"> • Questionnaires • Discuss students
Effectiveness of Students assessment	Program leaders and peer reviewer	<ul style="list-style-type: none"> • Peer consultation by departmental specialized committee. • Self-evaluation of the program by the departmental plan committee.
Quality of learning resources		
The extent to which CLOs have been achieved		
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

