



Course Specification

— (Bachelor)

Course Title: **Plant Vegetation**

Course Code: BIOE2302

Program: **Environmental Sciences**

Department: **Biology**

College: **Science**

Institution: **Umm AL-Qura University**

Version: *Course Specification Version Number*

Last Revision Date: 24 December 2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (2hr.)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (2nd year-third Level)

4. Course General Description:

Study the basis of identification of plant communities, principle features of plant communities, vegetation development, vegetation succession, qualitative and quantitative characters of vegetation as well as environmental bioindicators.

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

Principle of Ecology (BIOE1502)

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

None

7. Course Main Objective(s):

By the end of this course, the students can identify the main environmental factors affecting vegetation structure and distribution, compare different plant groups (communities) and different plant habitats, and gain skills for vegetation analysis.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2hr/week	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
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1.	Lectures	30
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
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	Describe the methods of studying vegetation analysis and units of vegetation.	K2	Lectures	Brainstorming
2.0	Skills			
2.1	Compare between qualitative and quantitative methods of vegetation analysis.	S1	Lectures	Activities evaluation
2.2	Analyze the vegetation by using multivariate analysis.	S3	Lectures	Discussion groups
3.0	Values, autonomy, and responsibility			
3.1	Manage tasks and activities related to discipline effectively and efficiently.	V2	Discussion groups	Activities evaluation
3.2	Assess presentation performance to discuss advanced scientific topics.	V3	Activities	Activities evaluation
...				





C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to plant communities- Vegetation development	4
2.	Factors affecting plant distribution.	2
3.	Uites of vegetation- Methods of study (Qudtares- transects)	4
4.	Floristic composition- Life form of plants stratification- Phenology-Seed Dispersal- sex forms.	4
5.	Major quantitative and qualitative characteristics of plant communities.	4
6.	Multivariate analysis of plant communities (similarity- classification- ordination- direct gradients).	4
7.	Mid-Term Exam	
8.	Plant Succession, types of Succession (Hydrosere, Psamosere, Lithosere).	4
9.	Desertification definition and the major causes of desertification	4
10.	Final Exam	
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Oral presentation Activities	Peridiocaly	20
2.	First periodic Exam	7 th	15
3.	Second periodic Exam	11th	15
4.	Final Lecture Exam	17 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	-Beeby & Brennan: First Ecology - Ecological Principles and Environmental Issues 3rd edition -Begon, M. et al. (1996 and subsequent editions) Ecology. Blackwells, Oxford -Krebs, C. (2008, or earlier editions). Ecology: The Experimental Analysis of Distribution and Publisher: Benjamin Cummings
Supportive References	
Electronic Materials	Blackboard website Website of Saudia Digital Library



Other Learning Materials

Microsoft Office package. - Multi-media associated with the textbook and the relevant websites

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	The lecture room is suitable for 35 students. The laboratory is suitable for 20 students.
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	Students	Indirect - Questionnaires
Effectiveness of Students assessment	Program committee. - Staff members. - Students.	Direct - Questionnaires. - Reports. - Meetings
Quality of learning resources	Program leaders. - Peer Reviewer.	Direct & Indirect - Questionnaires. - Reports. - Meetings
The extent to which CLOs have been achieved	Peer Reviewers Students	Direct & Indirect
Other	NA	NA

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: **Environmental Pollution**

Course Code: **BIOE2503**

Program: **Environmental Sciences**

Department: **Biology**

College: **Science**

Institution: **Umm Al-Qura University**

Version: **2024**

Last Revision Date: **31 December 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: (Level 3 /2nd year)

4. Course general Description:

This course introduces students to environmental pollution issues, emphasizing causes, pathways, risks, mitigation, and prevention. Also, it deals with major marine pollution problems, such as land surface and food chain pollution. It covers processes responsible for the occurrence and release of pollutants in the environment, dispersion mechanisms, the hazards associated with different types of contaminants, problems of accumulation of toxic substances, and procedures for reducing emissions and remediation of contaminated environments.

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

Principle of Ecology (BIOE1502)

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

7. Course Main Objective(s):

By the end of the course, the student will acquire an appropriate background about sources of pollutants and different types of pollution, as well as an environmental impact assessment.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30 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 hrs.
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify) - office hours	30 hrs.
Total		60 hrs.

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	To understand the importance of using nonpolluting sources of energy for the environment.	K1	-In-class lecturing -Homework assignments -Discussions (connecting what they learn in the class. -Handout of lecture notes for each topic . -Small group discussions.	<ul style="list-style-type: none"> • Homework and Quizzes. • Midterm and final written exams • Evaluation of reports • Oral presentation
1.2	To apply fundamental principles to develop conceptual models of pollutant mobility and fate in the receiving environment.	K3		
2.0	Skills			
2.1	To differentiate between types of environmental pollution, their causes, consequences and methods to control and management.	S1	- Lectures. - Individuals and small group tasks.	-Written and practical test Report and research
2.2	To apply web-based searching on topics related to environmental pollution.	S3		



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	Develop plans for academic and/or professional self-development.	V1	Interactive learning – small group activities	<ul style="list-style-type: none"> • Project production -Discussion sessions
3.2	Demonstrate the using proper presentation forms and scientific language.	V2		

C. Course Content

No	List of Topics (Lecture)	Contact Hours
1.	Definition of pollution; pollutants; classification of pollutants; solubility of impurities (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring contaminants. The concept of the environment and the introduction of environmental regulations and the impact of human, pollution, pollutant, types, noise pollution, light pollution, dust pollution, plastic pollution, Environment Degradation, Ozone Layer Depletion	4
2.	Soil pollution, definition, causes of land pollution, anthropogenic causes of soil pollution, Excess use of fertilizers and pesticides. Effects of soil pollution	4
3.	Phytoremediation, types, Limitations and Concerns,	2
4.	Noise pollution: What is Noise? Sources of Noise Pollution - Effects on Humans -Damaging Levels of Sound Effects on Humans. Effects on Wildlife	2
5.	Marine Pollution, various causes of ocean pollution, Sewage Primary treatment, secondary treatment and advanced treatment, Toxic chemicals from industries, Large scale oil spills, Ocean mining, Devastating effects of ocean pollution	4
6.	Food pollution, Causes of food pollution, Food pollutants (Pesticides, Perchlorate ClO ₄ , Organic compounds of mercury, Benzene), Food pollution risks, Pollution affect a food web, Common food pollution diseases	2
7.	Mid Term	2
8.	Radioactive contamination, background radiation. Source contamination radiation <ul style="list-style-type: none"> • Radioactive Contamination: external and internal contamination • Fugitive dusts and resuspension • Noble Gases • Fallout/Fission products 	4
9.	Pharmaceutical pollutants, cosmetics, personal hygiene, and its impact on the	2



	environment and ways of safe disposal medical and pathological wastes, the proper way of getting rid of it	
10.	Light Pollution o Causes of light pollution (excessive lighting, sky pollution). o The impact of light pollution on the environment and human health.	2
11.	Thermal Pollution o Increase in environmental temperatures as a result of human activities. o Effects of thermal pollution on rivers and lakes.	2
12.	Waste Management and Pollution Reduction o Waste management strategies (recycling, waste disposal). o Techniques for reducing pollution from waste.	2
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam	7 th	30%
2.	Final Exam	17 th	50%
3.	Activities	Periodic	10%
4.	Quiz	11 th	10%

*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

- The following book will be the key course reference book:
Jalil, M.T.M. (2025). Sustainable Approaches Mitigate Environmental Pollution. In: Yaser, A.Z., Abu Samah, M.A., Ariffin, F., Haghi, A.K. (eds) Controlling Environmental Pollution. Springer, Singapore.
https://doi.org/10.1007/978-981-97-8931-3_9
- Tanaka, S. (2022). Environmental Pollution and Remediation. In: Tanaka, S., Kurasaki, M., Morikawa, M., Kamiya, Y. (eds) Design of Materials and Technologies for Environmental Remediation. The Handbook of Environmental Chemistry, vol 115. Springer, Singapore.
https://doi.org/10.1007/698_2021_819
- Wang, H., Zhang, J., Huang, H., Wang, X., Yang, X., Coulon, F. (2024). Physicochemical Remediation of Soil Contamination: From Laboratory to Field. In: Ortega-Calvo, J.J., Coulon, F. (eds) Soil Remediation Science



	and Technology. The Handbook of Environmental Chemistry, vol 130. Springer, Cham. https://doi.org/10.1007/698_2023_1071
	- M.K. Hill. Understanding Environmental Pollution. Cambridge University Press, 3rd Edition, 2010.
	- C. Baird and M. Cann. Environmental Chemistry. W.H. Freeman, 4th Edition, 2008.
	- C.V.A. Duke and C.D. Williams, Chemistry for Environmental and Earth Sciences. Cambridge University Press, 2008.
Supportive References	
Electronic Materials	Websites on the internet that are relevant to the topics of the course
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> • Lecture room • Library
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> •Computers and internet connection. • Active Board •Data show is required in every room
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	student	Direct
Effectiveness of Students assessment	Staff and student	Direct, Indirect
Quality of learning resources	Staff and student	Direct, Indirect
The extent to which CLOs have been achieved	independent member teaching staff	Direct, Indirect
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: Environmental Physics

Course Code: PHYS2801

Program: Environmental Sciences

Department: Physics

College: Sciences

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: (2)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (3rd Level/ 2nd Year)

4. Course General Description:

The course covers the principles of thermodynamics, energy production, light interaction with matter, as well as mass and energy transfer related to environmental systems such as atmosphere, ocean or solid earth. It also introduces the climatic changes of the globe and their consequences.

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

General Physics PHY1101

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

7. Course Main Objective(s):

Students are introduced to the application of physics to environmental problems (from climate change to air pollution). The course deals with approaches widely used in the environmental field. At the end of the course, students will be able to:

- discuss about environmental issues using the correct scientific approach and dealing with the multiple interactions among different components and formation/transformation/deposition processes;
- describe physical-chemical processes underlying the themes of interest (E.g. greenhouse effect, ozone hole, photochemical smog, atmospheric aerosols etc., in terms of their phenomenology and using proper theory;
- know principles of characterizing physical-chemical-optical properties of atmospheric components;
- Discuss the climatic changes occurring based on the improper use of resources and the consequences on the globe



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 PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Demonstrate the fundamentals and principles of environmental physics	K1	<ul style="list-style-type: none"> Lecturing; Brain stormin 	Mid exam. Final exam. Homework. Oral Questions.
1.2	Differentiate between different types of	K4		



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	pollutant diffusion and transfer.			
2.0	Skills			
2.1	assess, evaluate, or calculate mass and energy transfer, and effects of light and heat through different environmental systems.	S1	<ul style="list-style-type: none"> Lecturing; Brain storming 	Final exam. Homework. Oral Questions.
2.2	Effectively communicates with physics concepts, processes, and results, both orally and in writing related Environmental Physics	S4		
3.0	Values, autonomy, and responsibility			
3.1	Collaborate effectively within teams	V3	Research presentation	Research presentation
...				

C. Course Content

No	List of Topics	Contact Hours
1.	The Scope of Environmental Physics	2
2.	Properties of Gases and Liquids	3
3.	Transport of Heat, Mass, and Momentum	3
4.	Transport of Radiant Energy	3
5.	Radiation Environment	2
6.	Radiative Properties of Natural Materials	3
7.	Interception of Radiation by Plant and Animal Canopies	2
8.	Momentum Transfer	3
9.	Heat Transfer	3
10.	Mass Transfer (Gases and Water Vapor)	2
11.	Steady State Heat Balance	2
12.	Transient Heat Balance	2
Total		30



D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Exam	10	30
2.	Quizes	7, 14	10
3.	Activities	over the term	10
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	John L. Monteith and Mike H. Unsworth. Principles of Environmental Physics: Plants, Animals, and the Atmosphere. 3 rd Edition. 2011. John Wiley & Sons, Ltd.
Supportive References	Kyle Forinash. Foundations of Environmental Physics. 2010. Island Press.
Electronic Materials	
Other Learning Materials	

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, Exam Grades
The extent to which CLOs have been achieved	Peer Reviewers	Questionnaire
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	26/12/2024





Course Specification

— (Bachelor)

Course Title: Environmental GIS Applications

Course Code: GETO4518

Program: Environmental Sciences

Department: Biology

College: Faculty of Sciences

Institution: Umm Al-Qura University

Version: 1

Last Revision Date: 29/12/2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (2h/ Week)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (3 / 2nd year)

4. Course general Description:

Effective environmental planning requires knowledge regarding Geographic Information Systems (GIS) technology. Understanding how everything is running is the first step for managing and protecting the natural environment. This course shows the importance of the use of GIS in the environmental fields. It covers subjects such as disaster management, estimation of flood damage, land use and land cover changes, management of natural resources and more. The ability of GIS for monitoring, analyzing, and modeling environmental issues and the interaction between human and natural environment are explored in the course.

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

Principle of Ecology (BIOE1502)

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

NA

7. Course Main Objective(s):

This course aims at giving the student knowledge in the fields:

- 1) Taking into account the stages of the geographic information system.
- 2) Explains the concept and components of geographic information systems.
- 3) Know the terms called geographic information systems.
- 4) Enumerates analysis tools and their importance.
- 5) Uses geographic information systems software.
- 6) Create information layers.
- 7) Draw maps using geographic information systems programs.



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	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
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	Define the concept of GIS in the environmental field.	K1	Lectures, class assignments	Quizzes, individual assessment, written exams
1.2	Understand the recent techniques of remote sensing and GIS in the environmental applications	K2	Lectures, class assignments	Quizzes, Written exams
2.0	Skills			





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Monitor the environmental changes using satellite images.	S1	Lectures, class assignments	Group work, quizzes assignments
2.2	Apply geographic information system for environmental conservation	S2	Lectures, class assignments	Assignments Group work, Written exams
2.3	Assess the natural hazards and the ability to model the disasters using GIS.	S3	Practical classes	Assignments Group work
2.4	Incorporate different geospatial data to manage the natural resources using GIS	S3	Practical classes	Practical Assignments Group work
3.0	Values, autonomy, and responsibility			
3.1	Work with multi-disciplinary teams to communicate effectively both in written and oral forms.	V1	Discussions, Group presentations	Practical Assignments Written Exams
3.2	Evaluate the use information technology related to the field.	V2	Discussions, Group presentations	Practical Assignments Written Exams

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: Introduction to Geographic Information and GIS.	2
2.	GIS and Environment: Theory and concepts.	2
3.	Data Models: Data models, map basics, vector data – point, line and area.	2
3.	GIS field work in the environmental fields: GPS and mobile GIS.	2
4.	GIS components and data types and structure.	2





5.	Remote sensing components and data types.	2
6.	The use of GIS for natural disaster.	2
7.	Land use and land cover change.	2
8.	The use of GIS for estimation of flood damage.	2
9.	The use of GIS for management of natural resources.	2
10.	Building a GIS structure for Environmental Impact Assessment (EIA).	2
11.	Global Navigation Satellite Systems: Map transformations, GPS.	2
12.	Aerial and Satellite Images, Digital Data Sources: Photos and satellite images digital data.	2
13.	Tables and Relational Databases: Relations databases, table manipulation.	2
14.	Basic Spatial Analysis: Logic Operations, General Arithmetic Operations, General Statistical Operations, Geometric operations.	2
15.	Revision.	2
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Periodical Exam(s)	3-7	15 %
2.	Mid Term Exam (Theoretic)	6	20 %
3.	Reports and essay	9	15 %
4.	Oral presentation	13	10%
5.	Final Examination	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

- Aziz, Muhammad Al-Khuzama, 2002, Geographic Information Systems - Basics and Applications for Geographers, Al-Ma'arif Establishment, Alexandria.
- Al-Qarni, Abdullah Muhammad, 1427 AH, Geographic Information Systems - Basic Principles and Operational Concepts, Specifications, Standards, Design and Spatial Analysis, First Edition, Publisher: Author, Riyadh.





	<ul style="list-style-type: none"> • Bolstad, P. (2019) GIS Fundamentals: A First Text on Geographic Information Systems, 6 th edition, XanEdu, USA.
Supportive References	<ul style="list-style-type: none"> • Demers, Michael, Modeling in Geographic Information Systems with the Cellular Model, 1432 AH, translated book, 2002 AD, translated by: Al-Ghamdi, Ali Maadah Al-Ghamdi, King Saud University, Riyadh. • The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns & Relationships. ESRI Press. (Mitchell, Andy, 1999). • The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics. ESRI Press. (Mitchell, Andy 2005) • GIS Tutorial 2: Spatial Analysis Workbook, 10.1 edition, ESRI Press, 2013
Electronic Materials	<ul style="list-style-type: none"> • http://www.innovativegis.com/basis/MapAnalysis/ • http://www.esri.com/what-is-gis/learn-gis • http://ocw.mit.edu/courses/urban-studies-and-planning/11-521-spatial-database-management-and-advanced-geographic-information-systems-spring-2003/index.htm
Other Learning Materials	---

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Direct
Effectiveness of	Faculty and Program Leaders	Direct





Assessment Areas/Issues	Assessor	Assessment Methods
Students assessment		
Quality of learning resources	Students and Faculty members	Direct
The extent to which CLOs have been achieved	Faculty and Program Leaders	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: Instrumental Chemical Analysis

Course Code: CHM2227

Program: Environmental Sciences

Department: Chemistry

College: College of Science

Institution: Umm Al-Qura University

Version: *Course Specification Version Number*

Last Revision Date: 28/12/2024



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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: (3/3)

4. Course general Description:

This course will be concerned with the theory and practice of instrumental methods for the identification and quantitative analysis of chemical substances and the environmental application for detection some pollutants

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

Organic Chemistry (CHM1415)

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

7. Course Main Objective(s):

By the end of this course student have all information about the instrumental analysis and have ability to determine compounds, molecules and trace amounts of different compounds and metals and the environmental applications.

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	0
4.	Tutorial	0
5.	Others (specify)	0
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	Underline a broad knowledge, theories, principles and concept in spectrophotometric, and chromatographic analysis techniques.	K1	Lectures and Scientific discussion	Quiz
1.2	Recognize the properties of electromagnetic radiation and chromatographic	K2	Lectures and Scientific discussion	Quiz and exam.
1.3	Outline extraction in chemical analysis .	K1	Lectures and Scientific discussion	Quiz and exam.
2.0	Skills			
2.1	Apply broad theories, principles, and concepts in various contexts, in spectrophotometric and	S1	Lectures.	Quiz and exam



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	chromatographic techniques			
2.2	Solve complex problems in various contexts related to spectrophotometric chromatographic techniques and overlapped disciplines quantitatively and qualitatively.	S2	- Lectures - Lab work	Final Exam Lab exam
2.3	Use and adapt spectrophotometric, chromatographic and extraction processes, techniques, tools, instruments, and/or materials that are advanced	S3	- Lectures - Lab work	Final Exam Lab exam
3.0	Values, autonomy, and responsibility			
3.1	Write and present a chemical report and solve problems related to spectrophotometric, chromatographic and extraction analysis	V4	<ul style="list-style-type: none"> • Lab Work. • Class discussion and research activity. 	<ul style="list-style-type: none"> • Quiz. • Lab report
3.2	Work collaboratively and constructively in teams with responsibility to perform a specific experiment or preparing a report on the spectrophotometric,	V3	<ul style="list-style-type: none"> • Lab Work. • Class discussion and research activity. 	Assignment activities





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	chromatographic, extraction and separation processes.			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to instrumental chemical analysis	2
2.	General properties of electromagnetic radiation and its interaction with matter.	2
3.	Ultraviolet and visible molecular absorption spectroscopy.	4
4.	Applications of spectrophotometric methods.	4
5.	Introduction to separation methods in analytical chemistry.	2
6.	Extraction in chemical analysis.	4
7.	Chromatography analysis (concepts and principle)	2
8.	Chromatography methods and applications	6
9.	Application of instrumental chemical analysis in environmental monitoring .	4
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework or activities.	-	10 %
2.	Midterm Exam	5	20 %
3.	Practical Exam.	12	30%
4.	Final Exam. (2hours Exam)	16-17	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"> Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Analytical Chemistry, 7th edition, WILEY (2014) Douglas A. Skoog, Donald M. West, James F. Holler and Stanley R. Crouch, Analytical Chemistry, 7th edition, Springer (2014)





	<ul style="list-style-type: none"> Dhruba Charan Dash. Analytical Chemistry) PHI Learning Private Limited, 2017.
Supportive References	Lecture handouts available on the coordinator website
Electronic Materials	<ul style="list-style-type: none"> http://www.chemweb.com http://www.sciencedirect.com http://www.rsc.org
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> Classrooms capacity (30) students. Providing hall of teaching aids including computers and projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	Room equipped with computer and projector and TV
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> No other requirements.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Online survey at the end of the semester (Program survey, Experience survey & course evaluation) and graduates survey).
Effectiveness of teaching	Faculty members	Direct (classroom observation using the Teaching Observation Concepts and Teaching Observation Proforma
Achievement of course learning outcomes.	Faculty members	Direct (60% of the students achieved $\geq 70\%$ of the degree assigned to the course learning outcome).
Assessment of faculty members	Department head	Direct (Performance Assessment of faculty
Quality of learning resources	Students	Indirect (feedback from faculty and students).
Effectiveness of teaching Strategies for Learning Outcomes.	Faculty members	Direct (feedback from faculty).





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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	QUALITY COMMITTEE AND DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	





Course Specification

— (Bachelor)

Course Title: **Fauna**

Course Code: **BIOE2201**

Program: **Environmental Sciences**

Department: **Biology**

College: **Science**

Institution: **Umm Al-Qura University**

Version:

Last Revision Date: **29/12/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: (3 credits)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (2nd year/3rd level.)

4. Course general Description:

This course provides an in-depth exploration of Saudi Arabia's diverse fauna, focusing on their taxonomy, behavior, distribution, and ecological roles across deserts, mountains, coasts, and wetlands. Students will emphasize endemic and migratory species and study evolutionary adaptations, ecological interactions, and conservation challenges, including habitat loss and climate change.

Through lectures, fieldwork, and lab sessions, students will develop skills in species identification, ecological assessment, and biodiversity documentation. Designed for biology and environmental science students, this course fosters an appreciation of Saudi Arabia's unique natural heritage.

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

Principle of Ecology

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

7. Course Main Objective(s):

This course aims to provide a comprehensive understanding of Saudi Arabia's fauna, including their taxonomy, distribution, ecological roles, and adaptations to arid environments. Students will explore the significance of endemic and migratory species, analyze ecological interactions within diverse habitats, and assess the impacts of threats like habitat loss, climate change, and overexploitation. Through hands-on field and laboratory activities, they will develop skills in species identification, specimen preservation, ecological assessment, and data analysis. The course emphasizes the importance of conservation efforts and fosters an appreciation for Saudi Arabia's unique biodiversity and natural heritage.



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5h/week	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	
4.	Tutorial	
5.	Others (discussing idea for group projects/problem sets)	
Total		75

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 taxonomy, distribution, and ecological roles of the fauna of Saudi Arabia, emphasizing key species in various ecosystems.	K2	Through lectures and groups discussion	Written and oral examination
1.2	Describe the adaptations of animals to arid and extreme environments found in Saudi Arabia.	K2	Lectures, documentaries and field trips.	Discussion of key examples of desert animals.



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Mid-term and final exams
1.3	Identify current threats to biodiversity and evaluate the conservation efforts and policies implemented in Saudi Arabia.	K2	Group discussion of relevant published literature. Lectures	Evaluation of Report, and group presentations
1.4	Understand the principles of specimen preservation, field data collection, and species documentation as applied in ecological studies.	K1	Search in local museum's collection, and websites of international museums Lab\field sessions	Evaluation of specimens made by student and lab report
2.0	Skills			
2.1	Employ field survey techniques, including species collection, identification, and documentation using photography and mapping tools.	S1	Field trips, creation of monograph of local species using available tools	Grading of monographs made by students
2.2	Analyze ecological data to assess species distribution, habitat quality, and biodiversity indices.	S3	Lectures Computer room Field trips	Evaluation of lab report
2.3	Demonstrate laboratory skills in specimen preservation, handling, and preparation for scientific study.	S3	Lab sessions	Evaluating specimen preserved/mounted/taxidermy by students
2.4	Communicate findings effectively through scientific writing and presentations, integrating data from fieldwork and laboratory analysis.	S3	Preparing and presenting research projects.	Evaluating group reports and presentations.
3.0	Values, autonomy, and responsibility			





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	Demonstrate an appreciation for the biodiversity of Saudi Arabia and its ecological, cultural, and economic significance.	V1	Museum visits, field trip and lectures	Evaluating monograph made by students
3.2	Adopt sustainable practices in fieldwork and species documentation, ensuring minimal impact on the environment.	V2	Monograph	Evaluating monograph
3.3	Recognize the ethical responsibilities involved in wildlife conservation and ecological research.	V2	Lectures and lab session	Oral and written exams
3.4	Work independently and collaboratively in conducting field and laboratory studies, fostering teamwork and scientific integrity.	V2	Group project (presentation, monograph and animal specimens collection, documenting and preserving)	Preserving specimen, use of taxonomic key and id guide, lab report and presentation.

C. Course Content

No	List of Topics	Contact Hours
Theory Lecture Topics		
1.	Introduction to the Fauna of Saudi Arabia. - Overview of biodiversity, major ecosystems, and their significance in shaping fauna of KSA.	2
2.	Taxonomy, Classification and Biogeography. - Principles of animal taxonomy with examples from Saudi Arabia's fauna. - The role of historical, geological and climatic events, historical and ecological biogeography in shaping the distribution of Saudi Arabia's fauna and endemism.	2
3.	Adaptations to Arid Environments. - Evolutionary traits enabling survival in deserts and extreme climates. - Showing examples of animal species within Saudi fauna	2



	- The role of natural selective pressures in speciation, adaptive radiation and the existence of allopatric and sympatric species.	
4.	Endemic and Migratory Species. - Characteristics, Importance in Saudi Arabia's biodiversity, and focus on residency status of animal species.	2
5.	Biodiversity of Saudi Arabia's Ecosystems: Desert, Mountain, Coastal, and Aquatic Fauna - Desert Ecosystem Fauna: Key Species and Their Ecological Roles in Arid Environments - Mountain and Highland Fauna: Biodiversity of the Asir and Hijaz Mountain Ranges - Wetland and Coastal Fauna: Mangroves, Coral Reefs, Estuaries, and Their Rich Biodiversity - Aquatic Fauna: Cartilaginous and Bony Fish, and Freshwater Species of Saudi Arabia	4
6.	Amphibians of Saudi Arabia. - Diversity, Adaptations, and Ecological Significance - current threats to amphibian of Saudi Arabia - Classification method, general characteristics and identification using taxonomic key.	2
7.	Reptiles of Saudi Arabia. - Focusing on lizards, snakes, turtle and tortoises and sea snakes. - Classification method, general characteristics and identification using taxonomic key.	4
8.	Birds of Saudi Arabia. - Diversity, migratory routes, resident species, and conservation challenges. - Classification method, general characteristics and identification using taxonomic key.	4
9.	Mammals of Saudi Arabia: - Diversity of Carnivores, Ungulates, Small Mammals, Bats, Marine Mammals, and Insectivores - Classification method, general characteristics and identification using taxonomic key.	4
10.	Invertebrates of Saudi Arabia. - Diversity, Ecological Roles, and Adaptations - Classification method, general characteristics and identification using taxonomic key.	4
11.	Conservation Biology. (Threats to biodiversity and efforts to mitigate them).	2
12.	Climate Change and Fauna (Impacts on species distribution and behavior). Wildlife Laws and Policies. (Protection frameworks and conservation strategies in Saudi Arabia).	2
Lab and Field Lesson Topics		
1.	Introduction to Lab Safety and Specimen Preservation Techniques	6



	<ul style="list-style-type: none"> - Lab Safety and Handling Protocols: Comprehensive guidelines for safe handling of chemicals, animal specimens, and tools used in the lab and field. - Ethical Considerations: Best practices for working with preserved specimens and live animals (if applicable). <p>Techniques for Specimen Preservation</p> <ul style="list-style-type: none"> - Preparation and storage of animal specimens from Saudi Arabia, including amphibians and reptiles. - Tools for measuring animal biometrics and documenting species for research purposes. 	
2.	<p>Species Identification and Taxonomic Classification</p> <ul style="list-style-type: none"> - Identification of Saudi fauna using morphological features and taxonomic keys. - Hands-on practice with local specimens. 	3
3.	<p>Field Survey Techniques (focusing on desert reptiles and birds in Saudi Arabia)</p> <ul style="list-style-type: none"> - Transects, quadrats, and camera traps for monitoring biodiversity. Use of tools to measure environmental variables. - Photography Techniques in the field/lab, documenting species for research and conservation. - Monograph, creating monograph of the local fauna (group project) 	3
6.	<p>Behavioral Observations in Native Species (using models as birds and small mammals from various habitats, including deserts and wetlands)</p> <ul style="list-style-type: none"> - Recording and analyzing animal behavior in field settings. - Using behavioral observations to identify cryptic species. 	3
7.	<p>Adaptations of Desert Fauna (with examples such as lizards, desert dwelling mammals, and desert birds)</p> <ul style="list-style-type: none"> - Examination of morphological (examination of animal specimens from field/lab or museum examples) and physiological adaptations (lab experiments) in Saudi desert fauna and how they are used to identify these species. - Comparison of adaptations across reptiles, mammals, and birds. 	3
8.	<p>Mapping Species Distribution (Endemic species, including mountain reptiles and freshwater fish).</p> <ul style="list-style-type: none"> - Using available software and tools to map the distribution of Saudi fauna. - Identifying biodiversity hotspots and endemic species ranges. 	3
9.	<p>Birds Diversity and Ecological Census</p> <ul style="list-style-type: none"> - Conducting population assessments using ecological census techniques. - Application of mark-recapture and species abundance estimation. - With focus on migratory birds and small mammals in wetlands and grasslands. 	6
10	<p>Biodiversity Assessment Techniques (Wetland invertebrates, freshwater fish, and coastal fauna)</p> <ul style="list-style-type: none"> - Habitat quality evaluation and biodiversity indices. - Analysis of the relationship between habitat health and species richness. <p>Conservation Practices in Saudi Arabia</p> <ul style="list-style-type: none"> - Field visits to conservation areas or protected sites (e.g., wildlife reserves or marine sanctuaries). - Developing conservation plans for threatened species or habitats. 	6





	- Marine mammals, migratory birds, and endangered amphibians.	
11	<p>Aquatic Ecosystems and Fauna</p> <ul style="list-style-type: none"> - Assessing water quality and documenting aquatic fauna. - Focusing on Saudi Arabia's wetland and coastal ecosystems and animals including, freshwater amphibians, bony fish, and estuarine invertebrates. <p>Invertebrates in Ecosystems</p> <ul style="list-style-type: none"> - Sampling and analyzing invertebrates from desert, wetland, and mountain ecosystems. - Examination of their ecological roles, including pollination and decomposition. With special focus on desert beetles, mangrove crabs, and mountain insects. 	6
12	<p>Environmental Relationships and Fauna</p> <ul style="list-style-type: none"> - Recording and studying the environmental factors influencing Saudi fauna. - Exploring the ecological interactions between species and their habitats. - Amphibians and reptiles in relation to water availability and temperature. - Synthesizing field data into research outputs. - The relationship between fauna and public health (negative and positive) group project propose applications 	6
Total		75 hrs

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Project, Problem Sets	5-12	10%
2.	Midterm Exam (Lab) or group project	7 week	10%
3.	Exam Midterm (Lecture)	7 week	20%
4.	Final Exam (Lab)	16 week	20%
5.	Final Exam (Lecture)	17-18 week	40%
6.	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	<p>Fauna of Saudi Arabia, Volumes 1-16. (1979-1997).</p> <p>Fauna of Arabia, Volumes 17-25. (1998-2010).</p>
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Supportive References	<p>Cox, C.B., Moore, P.D. and Ladle, R.J., 2016. Biogeography: an ecological and evolutionary approach. John Wiley & Sons.</p> <p>Boland, C., Abdullah, A., Babbington, J., Shobrak, M. and Al-Boug, A., 2020. The Birds of Saudi Arabia. Saudi Aramco.</p> <p>Porter, R., Campbell, O. and Al-Sirhan, A., 2024. Field guide to birds of the Middle East. Bloomsbury Publishing.</p> <p>Freyhof, J., Els, J., Feulner, G.R., Hamidan, N.A. and Krupp, F., 2021. Freshwater fishes of the Arabian Peninsula. Taxa, 20309.</p>
Electronic Materials	<p>https://www.birdsofsaudi Arabia.com/</p> <p>https://www.iucnredlist.org</p> <p>https://www.gbif.org</p> <p>https://www.inaturalist.org</p>
Other Learning Materials	<p>SDL (https://sdl.edu.sa/SDLPortal/Publishers.aspx)</p>

2. Required Facilities and equipment

Items	Resources
<p>facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)</p>	<ul style="list-style-type: none"> - Class Room equipped with computer, projectors and white board. - Lab containing animal specimens, identification guides, tools and chemicals to handle, measure, draw, photograph and preserve animal specimens collected from fieldtrips. - Museums.
<p>Technology equipment (projector, smart board, software)</p>	<p>Computer room, projector, smart board</p>
<p>Other equipment (depending on the nature of the specialty)</p>	<ul style="list-style-type: none"> - Cameras, camera traps, binoculars, gps devices, animal trapping and collecting tools, clippers, ropes, tape measures, rulers, identification guides. - Field trips

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Students, Faculty, Peer Reviewer	Direct, Indirect





Assessment Areas/Issues	Assessor	Assessment Methods
Quality of learning resources	Students	Direct, Indirect
The extent to which CLOs have been achieved	Program Leaders, Peer Reviewer	Direct, Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	تحت إشراف لجنة إستحداث برنامج الأحياء - قسم الاحياء - كلية العلوم
REFERENCE NO.	
DATE	12 / 2024

