

Course Specification

— (Postgraduate Programs) عبدالمحسن بن عبدالعزيز آل سعود

Course Title: Aquatic Ecotoxicology

Course Code: BIO-6224

Program: Master of Science in Applied Biology (Biodiversity, Wildlife Conservation & Management)

Department: Biology عبدالمحسن بن عبدالعزيز آل سعود

College: Science

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1

Last Revision Date:

عبدالمحسن بن عبدالعزيز آل سعود



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:	Error! Bookmark not defined.
C. Course Content:	Error! Bookmark not defined.
D. Students Assessment Activities:	7
E. Learning Resources and Facilities:	7
F. Assessment of Course Quality:	9
G. Specification Approval Data:	9

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A. General information about the course:

1. Course Identification:

1. Credit hours: 3(Lecture 2+ Lab 2)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track

B. ☒ Required ☐ Elective

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

4. Course General Description:

Aquatic ecotoxicology is defined as a scientific discipline that studies the properties and behaviour of pollutants in aquatic ecosystems, as well as the impact of pollutants on organisms, populations, and communities. This course will introduce foundational knowledge and concepts of the field of aquatic ecotoxicology. It examines how environmental and chemical properties influence the fate and bioavailability of contaminants in aquatic environments; and introduces principles of ecotoxicology and methods used to study aquatic ecotoxicology, as well as applications of knowledge gained from aquatic ecotoxicology studies. The role of aquatic ecotoxicology in solving practical problems related to the substantiation of the criteria for water quality assessment and standardization of human-induced water contamination is demonstrated. Briefly, this course will allow students to deepen their knowledge of the taxonomic, functional, physiological, and pathological impacts of pollution and adaptive strategies in biota.

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

Basic concepts in environmental science and tools considered in biomonitoring through license courses:

- Biodiversity and Ecosystem Ecology (Bio-251).
- Environmental Impact Assessment (Bio-252).

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

7. Course Main Objective(s):

The main objective of this course is to train students to work in the development of measures to preserve the aquatic ecosystems and the quality of the environment, their monitoring, with knowledge of the properties and behavior of pollutants in aquatic ecosystems, as well as their impact on living organisms, populations, and communities.

After completing this course, students will:

- be familiar with how the unique, dynamic properties of priority pollutants that are typical for water bodies and the environment influence the fate and bioavailability of contaminants in the aquatic environment.
- be able to identify if and why some contaminants are toxic to aquatic organisms while others are not.



- be familiar with how to design ecotoxicity tests based on data needs.

2. Teaching Mode: (mark all that apply)

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

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	
	Total	60

B. Course Learning Outcomes, Teaching Strategies, Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	- To know methods and approaches of modern ecotoxicology; and sources and types of pollution of water bodies. - To know several concepts related to ecotoxicology,	1.1	Two credits weekly lectures	-Quizzes -Presentations -Assignments -written exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	namely, acute, subacute, and chronic toxicity.			
	- To know the effect of the most common toxicants on aquatic organisms; basic research methods; basic features and methods of analysis of ecotoxicological processes in the aquatic environment; mechanisms of adaptation to changing environmental conditions necessary for the smooth functioning of ecosystems.	1.1	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.2	- To know the stress agents in the aquatic ecosystems and coordination between biological mechanisms of defense.	1.2	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
2.0	Skills			
2.1	- To link the stress agents with biological mechanisms in aquatic organisms to justify the observed symptoms and illnesses of stress.	2.1-2.2	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.2	- To detect the reaction of different-level components of water bodies to toxic effects. - To differentiate exposure and effect biomarkers and their biological roles	2.3	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.3	- To determine the presence of stress factors of the environment on the body and to know preventive measures to minimize such effects.	2.1-2.2	-Two credits weekly lectures -Tutorials	-Presentations -Reports
3.0	Values, autonomy, and responsibility			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	To identify and investigate through autonomous approaches the sources and toxicity of classic contaminants for aquatic organisms: case study of pesticides, metals, and Polychlorinated biphenyls.	3.3	Group discussions	-Presentations -Reports
3.2	To identify and investigate through autonomous approaches the sources and toxicity of classic contaminants for aquatic organisms: case study of nanoparticles, Genetically Modified Organisms, and drugs.	3.3	Group discussions	-Presentations -Reports

C. Course Content:

No	List of Topics	Contact Hours
1.	Chapter 1: Generalities 1. Models in ecotoxicology 1.1. Methodology and fundamental research principles: microcosms and mesocosms 1.2. Sentinel organisms and bioindication 2. Water quality guidelines and thresholds 1.1. Toxicological assessment of safety and risk 1.2. No Observed Effect Concentration (NOEC) 1.3. Acceptable Daily Intake (ADI) 1.4. Toxicological Reference Values (TRV) 3. Evaluation of acute, subacute, and chronic toxicity of xenobiotics	3
2.	Chapter 2: Stress 1. Symptoms and illnesses of stress 2. Biological mechanisms in aquatic organisms under stress. 3. Bioremediation of aquatic environments	3
3.	Chapter 3: Use of bioindicators in ecotoxicology 1. Abundance and biomass 2. Taxonomic and functional diversity	3

4.	Chapter 3: Biomarkers in aquatic organisms 1. Exposure and effect biomarkers 2. Metallothioneins (MTs) 3. Biomarkers of oxidative stress and neurotoxicity	3
5.	Chapter 4: Pesticides 1. First generation pesticides 2. Organic pesticides 3. Mode of action of pesticides in aquatic organisms 4. Toxicity of pesticides	3
6.	Chapter 5: Metals 1. Sources of contamination 2. Metal speciation and bioavailability 3. Toxicity for aquatic organisms	3
7.	Chapter 6: Polychlorinated biphenyls 1. Sources of pollution 2. Toxicity for aquatic organisms	3
8.	Chapter 7: Emergent contaminants: nanoparticles, Genetically Modified Organisms, and pharmaceuticals 1. Sources of pollution 2. Toxicity for aquatic organisms	3
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5 th week	15%
2.	Midterm exam-2	10 th week	15%
3.	Assignments, presentations, attendance, data search, participation	Throughout the course duration	10%
	Lab final exam		20%
4.	Final exam	16 th week	40%

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

E. Learning Resources and Facilities:

1. References and Learning Resources:



Essential References	Sotnikova, Elena Vasilyevna. Technosphere toxicology [Text]: textbook for university students studying in the directions 280200 - "Environmental protection" and 280700 - "Technosphere safety" / E. V. Sotnikova, V. P. Dmitrenko-St. Petersburg [et al.]: Lan, 2013 - 400 Bashirov V. Industrial toxicology: a course of lectures; textbook / V. Bashirov-Orenburg: OSU, 2012 - 84 p. http://biblioclub.ru/index.php?page=book&id=259200 Sotnikova Elena Vasilyevna. Technosphere toxicology / E. V. Sotnikova, V. P. Dmitrenko-Moscow: Lan", 2015 - 400 p. http://e.lanbook.com/books/element.php?pl1_id=64338. Smith, R. L. and Smith, T. M. Elements of Ecology 9 th edition Pearson Education(2014). ISBN13: 978-0321934185 • M.J., S. Jennings, M. Attrill, Marine Ecology: Progresses, Systems, and Impacts. 2nd. ed., Oxford Univ.Press, London (2011). ISBN-13: 978-0199227020 • Kalff, J. 2002. Limnology. Pearson Education, Prentice Hall. 2nd. ed., (2011) ISBN-13: 9780130337757 Principles of Ecotoxicology, Fourth Edition. https://www.researchgate.net/publication/323150282_Ecotoxicology
Supportive References	http://podolskyr.people.cofc.edu//biol211/lectures.htm
Electronic Materials	http://www.usc.edu.au/learn/courses-and-programs/courses/course-library/sci/sci102biodiversity-and-ecology • http://podolskyr.people.cofc.edu//biol211/ http://pustaka.unp.ac.id/file/abstrak_kki/EBOOKS/Environmental%20Toxicology%203rd%20edition.pdf
Other Learning Materials	YouTube videos and AI tools

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Each classroom is equipped with a PC and a retro projector.
Technology equipment (Projector, smart board, software)	Computers or iPADS equipped with different softwares.
Other equipment (Depending on the nature of the specialty)	YouTube videos and AI tools

F. Assessment of Course Quality:

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

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

-	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445