Course Specification

(Postgraduate Programs)

Course Title:	**Biodiversity Studies and Applied Ecology**
Course Code:	**BIO-6120**
Program:	**Master of Science in Applied Biology (Biodiversity, Wildlife Conservation & Management)**
Department:	**Biology**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**1**
Last Revision Date:	

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A. General information about the course:

1. Course Identification:

1. Credit hours: 4 (Lecture 3 + lab 2)				
2. Course type				
A.	☐University	☐College	☐Department	☒ Track
B.	☒ Required		☐ Elective	
3. Level/year at which this course is offered: (Level 1 / first year)				
4. Course general Description:				

The aim of the course is that the students understand biodiversity in the context of ecosystem dynamics, ecosystem functioning and provision of ecosystem services. Students will know how to assess biodiversity with different methodologies and they will be able to conduct a critical analysis of measures to manage biodiversity.

This course focuses on the units of biodiversity, from genes to ecosystems, how they are structured in space, and their importance to human well-being and ecosystem health, in addition to the knowledge acquired within the framework of Applied Ecology. Topics explored include the origin and distribution of biodiversity, how biodiversity is defined and measured, how it varies in space and time, and how its loss impacts human societies. It will provide postgraduate students with a strong ecological and evolutionary basis to understand the natural causes and consequences of current global environmental changes.

The target audience will be composed of students from Biology, Forestry, and Geographical Sciences, although interested students from any program are welcome to take the course, so long as they have taken an appropriate prerequisite course in major concepts of ecology.

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

None

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

None

7. Course Main Objective(s):

By the end of this course, students will be able to:

- **Describe the various elements of biodiversity and how they relate to one another.**
- **Calculate basic indices of biodiversity (e.g. Shannon's entropy, Jaccard Index, Hill Numbers Phylogenetic Diversity etc.).**
- **Explain the basic generating processes that support and structure biodiversity in space.**
- **Link elements of biodiversity to key ecosystem processes that support human health and well-being.**
- **Discuss the cultural, ecological, and economic value of biodiversity.**
- **List the major drivers of biodiversity decline and discuss the ultimate pressures**

on these drivers.
• Apply tools and techniques relevant to molecular diversity
• Design a field-based survey with rationale and appropriate methodology to propose further solutions to the major environmental problems facing the biosphere.

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**	45
2.	**Laboratory/Studio**	30
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify) ……**	-
	Total	75

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	**- Students are familiar with local, regional, and global patterns of biodiversity in terrestrial and aquatic habitats, their causes and**	**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
	significance, and the impact of global change.			
	- Students understand the methodical and conceptual basics of the molecular analysis of feeding relations, molecular identification, and of DNA Barcoding and have a command of diagnostic molecular working techniques.	**1.1**	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.2	**- Students understand the structure and function of basic ecosystems.** **- Students are able to analyze, assess, and communicate functional ecological relationships at the scale of individuals to ecosystems.**	**1.2**	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
2.0	Skills			
2.1	**- Students are able to identify and present relevant issues in Ecology.** **- The students are able to formulate scientific questions based on the state of knowledge. They can then develop hypotheses, test them with suitable methods, and reflect the results in scientific discourse.**	**2.1-2.2**	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.2	**- Students are able to interlink, evaluate, and communicate backgrounds and current findings on global change and its interrelations with ecological processes.**	**2.3**	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.3	**- Students are able to analyze and manipulate scientific data. Furthermore, they are able to**	**2.1-2.2**	-Two credits weekly lectures -Tutorials	-Presentations -Reports

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	explain the results and to critically discuss them.			
3.0	Values, autonomy, and responsibility			
3.1	**- Students are able to work together with a small group to prepare and deliver a presentation.**	**3.3**	Group discussions	-Presentations -Reports
3.2	**- Students are able to formulate an interdisciplinary research issue, select suitable methods of investigation and analyze and evaluate the results in teams.**	**3.3**	Group discussions	-Presentations -Reports

C. Course Content:

No	List of Topics	Contact Hours
1.	**<u>Chapter 1.</u> Introduction** **1. Refreshing basic ecology important for biodiversity: Origin of species, succession, disturbances, etc.** **2. Definition of biodiversity and clarification of terms (taxonomic, spatial levels, endemism)** **3. Levels of biodiversity (microbial, genetic, species, ecosystem, landscape).** **4. Drivers of biodiversity (natural selection, speciation, life history, phylogeny, and stress).**	6
2.	**<u>Chapter 2.</u> Molecular techniques for analyzing biodiversity: Barcoding and metabarcoding** **1. Basic study techniques for molecular markers** **1.1. eDNA extraction** **1.2. eDNA amplification** **1.3. eDNA sequencing** **2. Alignment and Sequence Analysis** **3. Molecular phylogeny**	6
3.	**<u>Chapter 3.</u> Magnitude and Distribution of biodiversity**	6

	1. Evolution of biodiversity: overview of ecological communities, number of species worldwide, change in biodiversity over time in different regions of the world. 2. Concept of diversity hot spots and cryptic species. 3. Biodiversity in Saudi Arabia: In the past and present. 4. Global distribution of biodiversity (latitudinal diversity gradient).	
4.	Chapter 4. Assessment and Monitoring of biodiversity 1. Indicators for Biodiversity. 2. Strategy and techniques of sampling 3. Methodology of assessment and biomonitoring	6
5.	Chapter 5. Integrative Aquatic and Terrestrial Ecology	3
6.	Chapter 6. Landscape Ecology: Landscape Patterns and biogeochemical Processes (a study case)	6
7.	Chapter 7. Environmental and Biodiversity Problems in water bodies (a study case)	6
8.	Chapter 8. Global Change Ecology: causes and manifestations	3
9.	Chapter 9. Bioremediation and Biodiversity restoration Principles, definitions, degradation, tools and methods, restoration and ecosystem functioning, discussion of case studies	3
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5th week	15%
2.	Midterm exam-2	10th week	15%
3.	Assignments, presentations, attendance, data search, participation	Throughout the course duration	10%
	Final lab xam	15th week	20%
4.	Final exam	16th 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	• Biodiversity: An Introduction by Gaston and Spicer, 2nd ed. (2004) • The Challenges of Biodiversity Science by Loreau (2010) • 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
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/
Other Learning Materials	Soft materials specialized in Ecology and Biodiversity

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom**
Technology equipment (Projector, smart board, software)	**Projector, smart board**
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
Effectiveness of students assessment	Faculty	Direct
Quality of learning resources	Faculty	Direct

Assessment Areas/Issues	Assessor	Assessment Methods
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**