هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA

T15

Course Specifications
(Postgraduate Degree)

Course Title:	**Microbial Biodiversity**
Course Code:	**BIOD 508**
Program:	**M. Sc. Biodiversity**
Department:	**Biology**
College:	**Science**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: **3 Credit Hours (2 Theoretical + 1 Practical)**
2. Course type ☒ Required ☐ Elective
3. Level/year at which this course is offered: **Level 2/First year**
4. Pre-requisites for this course (if any)**: BIOD 501**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
1	**Lecture**	26
2	**Laboratory/Studio**	26
3	**Seminars**	
4	**Others** (specify)	
Total		52

B. Course Objectives and Learning Outcomes

1. **Course Description:**

- This course provides the microbial diversity in marine, freshwater, terrestrial habitats, and systems, and various forms. It focuses on the molecular methods that are used within the field, the importance of microbial diversity in different environments, and the mechanisms that establish and regulate diversity within microbial communities. It also provides laboratory training on methods to study microbial communities including recent metagenomics advances, metatranscriptomics, metaproteomics, and functional metagenomics. Besides, it provides a series of case studies on the meta-omics of environmental and human-associated microbial communities.

2. Course Main Objective

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

- Explore, characterize, and quantify the microbial diversity in a certain environment.
- Provide a broader understanding of microorganisms' genetic and functional diversity in various ecosystems.
- Use molecular methods for studying microorganisms from atypical environments.
- Explore the structure and function of an extreme microbiome through genomics.
- Highlight the role of microbial communities in biogeochemical cycles.
- Understand the genetic and functional diversity of microorganisms in different ecosystems.
- Provide more insights into the structural and functional atypical microbial diversity.

3. Course Learning Outcomes

	Course Learning Outcomes (CLOs)	Aligned PLOs*
1	**Knowledge and Understanding:**	
1.1	Describe common microorganisms groups in various ecosystems and their role in biogeochemical main processes.	K1
1.2	Recognize techniques and methods for studying microbial population composition, function, and the occurrence of individual groups.	K3
1.3	Describe genomic approaches for studying the nature and processes of microbial diversity.	K4
1...		
2	**Skills:**	
2.1	Analyze the structure of DNA of different microbial strains.	S2
2.2	Use genomic-based methods to study microbial diversity in nature and its mechanisms.	S2
2.3	Interpret results, explore different databases, use different retrieval and analysis tools.	S3
2...		
3	**Values:**	
3.1	Employ cultivation-independent methods to conduct studies on the composition and the function of the microbial communities as well as the occurrence of individual groups.	V2
3.2	Evaluate and perform scientific studies on genetics and functional microbial diversity in different ecosystems.	V2
3.3	Employ bioinformatics tools and databases to study microbial diversity.	V1
3...		

* Program Learning Outcomes

C. Course Content

No	List of Topics	Contact Hours
1	Introduction, Tree of the life, Origin of the Life, Mechanisms of microbial evolution	2
2	Taxonomy, Phylogeny, and Molecular Chronometer	2
3	Analysis of Microbial Diversity	2
4	Introduction to microbial communities and metagenomics	2
5	Microbial diversity of terrestrial ecosystems (soil, forests, desert, sediment, tundra)	2
6	Microbial diversity of aquatic ecosystems (Freshwater and Marine)	2
7	Microbes in extreme environment	2
8	Prokaryotic Microbial diversity	2
9	Animal virus. and Plant virus diversity	2
10	Eukaryotic Microbes in Nature Fungi, Algae, and Protozoa diversity	2
11	Microbial interactions: Symbioses, allelopathy, syntrophy, quorum sensing, Enzyme discovery through meta-omics	2
12	Methods of characterizing microbial communities: Cultivation and PCR	2
13	Methods of characterizing microbial communities: Genomics, Metagenomics, and Microbial Bioinformatics.	2
Total		26

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding:**		
1.1	Describe common microorganisms groups in various ecosystems and their role in biogeochemical main processes.	- Lectures. - Group discussions. - Brainstorming. - The use of educational techniques (Videos). - Student's seminars. - Individual presentation. - Field study.	- Oral discussions. - Long and short essays. - Exams (Mid and Final) - Homework. - Quizzes. - Field reports.
1.2	Recognize techniques and methods for studying microbial population composition, function, and the occurrence of individual groups.		
1.3	Describe genomic approaches for studying the nature and processes of microbial diversity.		
1…			
2.0	**Skills:**		
2.1	Analyze the structure of DNA of different microbial strains.	- Lectures. - Group discussions. - Brainstorming. - Simulation. - Research paper-based learning. - The use of interactive video. - Individual presentation. - Field study.	- Peer assessment. - Self-evaluation. - Oral discussion. - Exams (Mid and Final) - Quizzes. - Individual and group presentations. - Field reports.
2.2	Use genomic-based methods to study microbial diversity in nature and its mechanisms.		
2.3	Interpret results, explore different databases, use different retrieval and analysis tools.		
2…			
2…			
3.0	**Values:**		
3.1	Employ cultivation-independent methods to conduct studies on the composition and the function of the microbial communities as well as the occurrence of individual groups.	- Research activities. - Oral presentations. - An internet search, assignments, and essays. - Group discussion. - Case studies. - Individual, and group presentations.	- Student's essays and assignments. - Group reports. - Group presentations. - Discussion in lectures. - Student's written participation. - Analytical reports. - Case studies. - Posters.
3.2	Evaluate and perform scientific studies on genetics and functional microbial diversity in different ecosystems.		
3.3	Employ bioinformatics tools and databases to study microbial diversity.		
3…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities and Short Quizzes	Distributed over 8 weeks	10
2	Pre-Final Practical Exam	8	10
3	Pre-Final Theoretical Exam	8	25
4	Final Practical Exam	15	15
5	Final Theory Exam	16	40
6			
7			
8			
9			
	Total		100

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Eight office hours per week per faculty member.
- Academic advising sessions 1hr/ week per faculty member.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	- Ponmurugan, P. and Kumar, J. S. (2020). Microbial Biodiversity, pp. 220. Cambridge Scholars Publishing. ISBN: 9781527548596. - James W. Brown, J. W. (2014). Principles of Microbial Diversity, 1st edition, pp. 406. ASM Press. ISBN-13: 978-1555814427. - Bull, A. T. (2004). Microbial Diversity and Bioprospecting. ASM Press.
Essential Reference Materials	- *Journal American Society of Microbiology.* - *The Journal of Microbiology.*
Electronic Materials	- Saudi Digital Library. - UNESDOC Digital Library. - www.sciencedirect.com
Other Learning Materials	- Multimedia that is associated with the textbook and the relevant websites.

2. Educational and research Facilities and Equipment Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- A sufficient number of classrooms, well equipped practical laboratories are available to accommodate 30-40 students.
Technology Resources (AV, data show, Smart Board, software, etc.)	- Data show projectors and wireless internet connection available for students and faculties. - Smart blackboard. - Computer Portable PowerPoint presentations.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	- Lecture slides. - Reference Book. - A Note Book for writing notes. - Well-equipped biology laboratory.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching and assessment.	- Students.	• Indirect - Questionnaires.
- Quality of learning resources.	- Program committee. - Staff members. - Students.	• Direct - Questionnaires. - Reports. - Meetings.
- The extent of achieving the course learning outcomes.	- Program leaders. - Peer Reviewer.	• Direct & Indirect - Questionnaires. - Reports. - Meetings,

Evaluation Areas/Issues (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Biology Department Members who constructed the program
Reference No.	Committee members – The academic year 1441/1442
Date	