Course Specification
(Bachelor)

Course Title:	Applied Biotechnology
Course Code:	BIOL 454
Program:	Bachelor of Science in Biology
Department:	Biology
College:	College of Science
Institution:	Majmaah University
Version:	2nd
Last Revision Date:	#4; 01.03.1444H

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3 (2 + 2) hours					
Equivalent to **4.5 ECTS Credits**					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (8 / Third**)**					
4. Course general Description:					
This course deals with the basic concepts of microbiology, biotechnology, genetic engineering techniques to apply for the industrial uses. This course also cover applications of biological products produced by biotechnological methods. This course explains methods, procedures and advantages of biotechnological methods.					
5. Pre-requirements for this course (if any)**:**					
BIOL 453, Genetic Engineering					
6. Co-requirements for this course (if any)**:**					
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7. Course Main Objective(s):					
The main objective of this course to understand the applications of biotechnological methods in various fields of plant, animal, agriculture, environment and healthcare sectors.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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

Workload (based on the academic semester)

No	Activity	Work Load /Hours
1.	Contact hours	60
2.	Self-study (Assignments, quizzes, reports, Discussions, Library, research)	60
	Total Workload	120
Equivalent to **ECTS credit points**		**4.5**

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	Recognize the basic of using biological techniques (microbiology, biotechnology, genetic engineering)	K3	Lectures, Group discussion	Quizzes, Midterm and final exams Electronic exam
...				
2.0	Skills			
2.1	Summarize the different biological methods and their	S3	Lectures, Group discussion Brain storming	Quizzes, Midterm and final exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	applications in various biological industries			Electronic exam
2.2	Distinguish cell types, plant, animal species and their genetic modifications and their applications in medical industries	S3	-Do-	-do-
2.3	Demonstrate experiments of applied biotechnology (Fermentation, Genetic engineering, Vermicomposting etc.,),	S4	Practical sessions	Practical exam Report
2.4	Experiment on applications of basic molecular biology, microbiology, genetics and genetic engineering	S4	-Do-	-do-
3.0	Values, autonomy, and responsibility			
3.1	Effectively plan and prepare the scientific report related to applied biotechnology	V2	Team work Reports	Assignment submission, Oral presentation
3.2	Organize the collected information's and presentation	V2	-do-	-do-
...				

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Biotechnology** – Definitions, Scope of biotechnology, Biotechnology in the world, Commercial application of biotechnology	2
2.	**Applied Plant Biotechnology -** Plants genetic engineering, Transgenic plants, Production of disease resistant plants, Uses	4
3.	**Agricultural biotechnology:** Micropropagation techniques, Biofertilizers – Mass cultivation and application techniques of Rhizobium, Azolla.	4
4.	**Applied animal and Insect biotechnology:** Genetic manipulation methods, transgenic animals – Examples, Application of transgenic animals. **Genetically modified insects**–application	4
5.	**Applied Environmental Biotechnology** – microbial ecology/ environmental biotechnology, waste water and sewage treatment, Land	4

	fill technologies, composting, Biological monitoring of hazardous wastes, Pollution mon Bioremediation, Biomining, Bioleaching	
6.	**Food biotechnology** – Food and beverage fermentations, Microorganisms as food : Single cell protein (SCP), Mushroom cultivation; Fermentation Technology and its products -Amino acids, Organic acids, Enzymes and food processing	2
7.	**Industrial Biotechnology** – Biofuels production, Enzyme technology,	4
8.	**Applied biotechnology in healthcare**: Pharmaceuticals and biopharmaceuticals, Antibiotics, Vaccines and monocolonal antibodies, Biopharmaceuticals/therapeutic proteins, Gene therapy	4
9.	**Safety in applied biotechnology** – concepts of hazard and risk, problems of biologically active biotechnology products, bioterrorism, ethical considerations	2
10.	**Practicals**: • Lab safety • Preparation of MS medium, Callus culture from carrot explant • Rhizobium isolation medium YEMA, Azolla culture • Animal cell culture – Protocol and media • Isolation of Plasmid DNA • Cloning • Polymerase chain reaction • Immobilization of yeast cells • Azo dye degradation using Microorganisms • Fermentation method – Alcohol, Antibiotics, Organic acids production	30
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home work/Group project	2	5
2.	Mid exam 1	5 – 6	10
3.	Quiz	7	5
4.	Mid exam 2	10 – 11	10
5.	E. Exam	12 – 13	10
6.	Practical Exam	14-15	20
7.	Final Exam	16 -17	40
...			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	Short notes on Applied Biotechnolgy, Dr. Vijayakumar – Note book, Majmaah University
Supportive References	• Basic Biotechnology, 3rd Edition - Colin Ratledge, Bjorn Kristiansen - Cambridge University Press (2006) ISBN: 9780521549585 • Applied Animal Biotechnology - V. Kumaresan - SARAS Publications (2020) ISBN: 9788189941291 • Applied Biotechnology - Sudhir U. Meshram, G.B. Shinde - S. Chand Publishing (2009) ISBN-13: 978-9380026565 • Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition - Bernard R. Glick, Cheryl L. Patten - ASM Press (2010) ISBN-13: 978-1555814984 • Industrial Biotechnology: Products and Processes - Christoph Wittmann, James C. Liao - Wiley-Blackwell (2016) ISBN-13: 978-3527335154 • Biotechnology for Beginners, 2nd Edition - Reinhard Renneberg, Vanya Loroch - Academic Press (2017) ISBN-13: 978-0128012246
Electronic Materials	• https://www.journalbji.com/index.php/BJI
Other Learning Materials	Electronic materials of Lecture notes and PowerPoints available in 'Black board' database

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom and fully equipped laboratory facilities are available
Technology equipment (projector, smart board, software)	E.podium and smart board facilities are available
Other equipment (depending on the nature of the specialty)	Library and Internet facilities are available

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct assessment
Effectiveness of Students assessment	Program Leader	Direct assessment
Quality of learning resources	Students	Indirect assessment

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Faculty	Direct assessment
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Biology Department Council
REFERENCE NO.	7
DATE	04/04/1446 [7TH OCTOBER 2024]