



Course Specification

(Bachelor)

Course Title: Genetic Engineering

Course Code: BIOL 453

Program: Bachelor of Science

Department: Biology Department

College: College of Science

Institution: Majmaah University

Version: 3rdVersion

Last Revision Date: 29/12/2023



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A. General information about the course:

1. Course Identification

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

Equivalent to ECTS Credit Point: 4.5

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: 7th level / final year

4. Course general Description:

The Genetic Engineering course offers an in-depth exploration of the molecular techniques used to manipulate genes, genomes, and organisms. Students will learn the foundational principles and practical applications of genetic engineering, including gene cloning, gene editing, recombinant DNA technology, and the production of genetically modified organisms (GMOs). The course also introduces cutting-edge technologies such as gene therapy, while discussing their ethical, legal, and societal implications.

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

Molecular Biology, BIO 352

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

N/A

7. Course Main Objective(s):

- Develop a comprehensive understanding of the principles of genetic manipulation, including DNA structure, gene expression, and the molecular mechanisms that support genetic engineering technologies.
- Examine the diverse applications of genetic engineering across fields such as medicine, agriculture, biotechnology, and environmental science.
- Understand current advancements and evolving trends in genetic engineering technologies.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	91%
2	E-learning	6	9 %
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom 		



No	Mode of Instruction	Contact Hours	Percentage
	• 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	Workload (in hours)
1.	Contact Hours	60
2.	Self-study hours or Academic learning hours (Assignment, 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			
1.3	Understand genetic techniques and demonstrate the use of molecular tools to manipulate genetic material.	K3	<ul style="list-style-type: none"> ▪ Lecture Notes ▪ Power Point Presentation ▪ Individual and group discussion. 	<ul style="list-style-type: none"> ▪ Assignments ▪ Quizzes ▪ Midterm and final exams





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.3	Analyze how genetic engineering techniques are used in the development of transgenic organisms, genetically modified crops, gene therapy, and biopharmaceutical production.	S3	<ul style="list-style-type: none"> ▪ Lecture Notes ▪ Power Presentation ▪ Individual and group discussion. 	<ul style="list-style-type: none"> ▪ Assignments ▪ Quizzes ▪ Midterm and final exams
2.4	Perform experiments involving genetic manipulation in microorganisms	S4	<ul style="list-style-type: none"> ▪ Practical Notes ▪ Power Presentation ▪ Laboratory assignments ▪ Individual and group discussion. Practical works - videos 	<ul style="list-style-type: none"> ▪ Assignments ▪ Quizzes ▪ Practical exams Lab reports
3.0	Values, autonomy, and responsibility			
3.1	Commit toward group task contributing ideas.	V2	Students will practice as groups (team work)	Assessment of team presentation and reports.
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Structure and Replication of DNA	3
2.	Introduction of Genetic Engineering	3
3.	Gene cloning and cloning vectors	3
4.	Restriction Enzymes, Vectors, Types of Gene transfer methods	3
5.	Methods of Nucleic acid isolation	3
6.	Methods of DNA amplifications (Polymerase Chain Reaction)	3
7.	Agarose Gel Electrophoresis & Southern and Northern Blotting	3
8.	SDS Gel Electrophoresis and Western Blotting	3
9.	Methods of DNA Sequencing	3
10.	Mutagenesis and Mutation detection methods	3
Total		30



Practical content

No	List of Topics	Contact Hours
.١	Nucleic Acid isolation from Bacteria	6
.٢	Agarose Gel Electrophoresis	6
.٣	Protein Isolation from Bacteria and Human Cells	6
.٤	SDS Gel Electrophoresis	6
.٥	PCR	6
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments, quizzes and group project	Week 1-15	10 %
2.	Mid-term Exam 1	Week 8	10 %
3.	Mid-term Exam 2	Week 12	10 %
4.	Bb electronic exam	Week 13	10 %
5.	Practical workbook notes	Week 14	10 %
6.	Practical exam	Week 15	10 %
7.	Final Exam	Week 16	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	– Gene Cloning and DNA Analysis: An Introduction (sixth edition) by T.A. Brown
Supportive References	– An Introduction to Genetic Engineering (Fourth Edition) by Neil Crickmore
Electronic Materials	– Saudi Digital Library
Other Learning Materials	Videos, slides and presentations that are available with the instructor.



2. Required Facilities and equipment

Items	Resources
<p>Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)</p>	<ul style="list-style-type: none"> The number of seats in classrooms and lab. is suitable and no need for extra seats. The classrooms provided with smart board and e-podium and laboratories provided with smart board.
<p>Technology equipment (projector, smart board, software)</p>	The classrooms are provided with smart board and e-podium
<p>Other equipment (depending on the nature of the specialty)</p>	Department need a computer room containing at least 30 systems for Bb exams and e-learning.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students assessment	Program Leaders	Indirect
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Program Leaders	Direct
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	4-4-1446 (07/10/2024)

