Course Syllabus

1	**Course title**	Biotechnology
2	**Course number**	0304383
3	**Credit hours**	3
	Contact hours (theory, practical)	(3,0)
4	**Prerequisites/corequisites**	General Microbiology, Molecular Biology
5	**Program title**	B.Sc. Biological Sciences
6	**Program code**	04
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Biological Sciences
10	**Course level**	3rd year level
11	**Year of study and semester (s)**	2023/2024 First Semester
12	**Other department (s) involved in teaching the course**	N/A
13	**Main teaching language**	English
14	**Delivery method**	☒Face to face learning ☐Blended ☐Fully online
15	**Online platforms(s)**	☒Moodle ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	1st Oct 2023

17 Course Coordinator:

Name: **Dr. Tareq Alhindi** **Contact hours**: Appointment via MS-Teams or e-mail

Office number: Biological Sciences Building, Room # 315

Phone number: 22236

Email: t.alhindi@ju.edu.jo

18 Other instructors:

N/A

19 Course Description:

The course introduces both principles and application of recombinant DNA technology to microbes, animals and plants in the hope of using genetically engineered products to clear the environment and improve human health prospects. This would be achieved through tackling the history of biotechnology, basic principles of recombinant DNA technology, common methods of applications of animals, human, and medical biotechnology. Common methods of applications of plant biotechnology. Methods of applications of microbial and environmental biotechnology. Ethical issues of biotechnology and patenting. Current societal issues in biotechnology and bioethics. During the course, the students will be introduced to the ethics and biorisk of recombinant DNA technology.

20 Course aims and outcomes:

A- Aims:

SLOs of the course:

1. Familiarize the students with the basic concepts in biotechnology.
2. Familiarize the students with the basic principles and applications of recombinant DNA Technology.
3. Introduce the student to the importance of proteins as products of biotechnology
4. Familiarize the students with the fields of biotechnology (microbial, plant, animals, human, and medical biotechnology).
5. Introduce the students to the applications of microbial and environmental biotechnology.
6. Introduce the student to the basic of biofuel technologies.
7. Introduce the students to ethical issues and biorisk related to biotechnology.
8. Familiarize the students with the current societal issues in biotechnology and bioethics.
9. Familiarize the students with the current advances of biomaterials and nanotechnology.

B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

SLOs / CLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)
1	x				x	
2	x	x				
3	x	x				
4	x	x			x	
5	x	x			x	
6	x	x			x	
7	x				x	
8	x				x	
9	x				x	

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Introduction	1	Face to Face	-	-	Exam/ Assignment	Ch. 1
	1.2	Ancient biotechnology (selective breeding & fermentation)	1	-	-	-	-	-
	1.3	Modern biotechnology, Types of biotechnology	1	-	-	-	-	-
2	2.1	A review of cell structure. The molecule of life (DNA & RNA)	1,2	-	-	-	-	Ch. 2
	2.2	Chromosome structure, DNA replication, and genomes	1,2	-	-	-	-	-

	2.3	RNA and protein synthesis	1,2	-	-	-	-	-
3	3.1	Mutations: Causes and consequences	1,2	-	-	-	-	-
	3.2	Introduction to recombinant DNA technology and DNA cloning	2	-	-	-	-	Ch. 3
	3.3	What makes a good vector? Cloning strategies.	2	-	-	-	-	-
4	4.1	How do you identify and clone a gene of interest?	2	-	-	-	-	-
	4.2	What can you do with a cloned gene? Applications of recombinant DNA technology	2	-	-	-	-	-
	4.3	Genomics and bioinformatics: Hot new areas of biotechnology	2	-	-	-	-	-
5	5.1	RNAi applications	2	-	-	-	-	
	5.2	Proteins as biotechnology products	3	-	-	-	-	Ch. 4
	5.3	Protein structures.	3	-	-	-	-	-
6	6.1	Protein expression: Upstream processing, Protein purification methods: Downstream processing. Proteomics (microarrays).	3	-	-	-	-	-
	6.2	Introduction to animal biotechnology	4,8	-	-	-	-	Ch. 5
	6.3	Animals in research	4,7,8	-	-	-	-	-
7	7.1	Cloning and Transgenic animals.	2,4,8	-	-	-	-	-
	7.2	Producing human antibodies in animals.	4	-	-	-	-	-
	7.3	**Midterm Exam**		-	-	-	-	
8	8.1	The structure of microbes	4	-	-	-	-	Ch. 6
	8.2	Microorganisms as tools	4	-	-	-	-	-
	8.3	Using microbes for a variety of everyday applications	4	-	-	-	-	-
9	9.1	Microbial genomes	2,4	-	-	-	-	-
	9.2	Microbial diagnostics	4	-	-	-	-	-
		Combating bioterrorism	4,7,8	-	-	-	-	-

10	10.1	What is bioremediation?	4,5	-	-	-	-	Ch. 7
	10.2	Bioremediation basics	5	-	-	-	-	-
	10.3	Clean-up sites and strategies	5	-	-	-	-	-
11	11.1	Applying genetically engineered strains to clean up the environment	2,5	-	-	-	-	-
	11.2	Environmental disasters: Case studies in bioremediation	5,8	-	-	-	-	-
	11.3	Challenges for bioremediation	5,8	-	-	-	-	-
12	12.1	The future of agriculture: Plant transgenics	4	-	-	-	-	Ch. 8
	12.2	Methods used in plant transgenesis (selective breeding, cloning, antisense technology)	2,4	-	-	-	-	-
	12.3	Practical applications	2,4	-	-	-	-	-
13	13.1	Health and environmental concerns	4,7,8	-	-	-	-	
	13.2	Glycolysis	6	-	-	-	-	Ch. 9
	13.3	Fermentation in food industry.	6	-	-	-	-	-
14	14.1	Fermentation to produce biofuels.	6	-	-	-	-	-
	14.2	Medical products and applications of biotechnology	4	-	-	-	-	Ch. 10
	14.3	Gene therapy	2,4	-	-	-	-	-
15	15.1	Nanobiotechnology	9	-	-	-	-	-
	15.2	Ethic and biotechnology	7,8	-	-	-	-	Ch. 11
	15.3	Patents and licenses. Economics, the role of science	1,7,8	-	-	-	-	Ch. 12

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Quizzes & Assignments	20	All topics	1,2,3	TBD	Variable
Midterm Exam	30	Midterm material	1,2,3		Paper

Final Exam	50	All course material	1,2,3		Online

23 Course Requirements

Provided online study material, (optional) Textbook eLearning account

24 Course Policies:

A- Attendance policies:

Attendance is required, and students missing some of the 1-hour classes will jeopardize their successful completion of the course, due to the discussion nature of the course and the key elements discussed during the course that cannot be found in the textbook. Also, students are required to refer to Student Handbook for questions related to attendance and absence.

B- Absences from exams and handing in assignments on time:

According to the University of Jordan regulations, refer to student handbook

المادة)17(: أ -كل من يتغيب بعذر عن امتحان معلن عنه باستثناء المتحان النهائي، عليه أن يقدم ما يثبت عذره لمدرس المادة خالل ثالثة أيام عمل من تاريخ زوال العذر، وفي حالة قبول مدرس المادة لهذا العذر فعليه إجراء امتحان معوض للطالب وإذا لم يقبل مدرس المادة العذر تعتبر عالمته صفرًا ، في هذا المتحان .

C- Health and safety procedures:

Although this course has no laboratory component, health and safety is emphasized throughout the course due to the nature of topics discussed. This is mainly related to working with human, animal and plant objects, and the health and safety concerns related to the consumption of genetically modified products or additives.

D- Honesty policy regarding cheating, plagiarism, and misbehavior:

According to The University of Jordan regulations. Students shall refer to Student Handbook for questions related to cheating and plagiarism.

E- Grading policy + Weighting (i.e. weight assigned to exams as well as other student work)

Quizzes & Assignments	20%
Midterm Exam	30%
Final exam	50%

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F- Available university services that support achievement in the course:

E-Learning portal, and online resources from the e-library to access scientific literature.

25 References:

A- Required book (s), assigned reading, and audio-visuals:

"**Introduction to Biotechnology, 4th Edition**" by Thieman, W.J and Palladino M.A., Pearson Education, ©2020. ISBN: 1-292-26177-3

B- Recommended books, materials, and media:

Articles, Videos, and other material will be provided to students through the online portal (E-Learning)

26 Additional information:

N/A

Name of Course Coordinator: **Dr. Tareq Alhindi**	Signature: -	Date: 1 Oct 2023
Head of Curriculum Committee/Department:	Signature: --	
Head of Department:	Signature: --	
Head of Curriculum Committee/Faculty:	Signature: --	
Dean: Dr. Mahmoud Al-Gaghoub	Signature: --	