مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Gene Therapy
2	**Course number**	0304982
3	**Credit hours**	3 Credit Hour
	Contact hours (theory, practical)	3 theory
4	**Prerequisites/corequisites**	-
5	**Program title**	PhD in Biological Sciences
6	**Program code**	0304
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Biological Sciences
10	**Course level**	PhD
11	**Year of study and semester (s)**	1st semester 2023/2024
12	**Other department (s) involved in teaching the course**	None
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**	

17 Course Coordinator:

Name: Amer Imraish	Contact hours: 1:30 – 3:00 Monday & Wednesday
Office number: Biology 301	Phone number:
Email: a.imraish@ju.edu.jo	

18 Other instructors:

19 Course Description:

As stated in the approved study plan. Construction and analysis of recombinant DNA, Gene delivery and the expression systems. types of gene therapy and their applications. DNA vaccination and the immune response to gene therapy. Also, the course will deal with the important aspects of bioethics.

20 Course aims and outcomes:

A- Aims:

- Students will understand the latest topics in gene therapy.
- Students will have an understanding of the reasons to use gene therapy in different diseases.
- Students will be able to critically compare between gene therapies systems to provide the best treatment.
- Students will be able to recommend ideas to overcome challenges in gene therapy systems
- Students will be able to discuss topics relating to gene therapy with others in a meaningful way.

B- Students Learning Outcomes (SLOs):

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

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	
To provide knowledge about viral and non-viral systems used in gene therapy					
To discuss the advantages and challenges of viral and non-viral systems					
To discuss the latest research developments in gene therapy					

21. Topic Outline and Schedule:

Week	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	**The Concepts of Gene Therapy:**		Face to Face	Synchronous	Exams and seminars	A Handbook

	*Types of Gene Therapy *Gene Therapy Strategies *Choice of the Therapeutic Target *Administration Routes *Delivery Systems *Expression and Persistence of the Therapy *Cell Targeting *Immune Response to the Therapy *Highlights in the History of Gene Therapy *Current Status of Gene Therapy *Ethical Questions and Concerns About Gene Therapy					of Gene and Cell Therapy
2-4	**Non-viral Vectors for Gene Therapy** - Physical Methods *Hydrodynamic Delivery *Microinjection *Electroporation *Nucleofection *Ultrasound and Sonoporation *Ballistic Gene Delivery/Gene Gun *Magnetofection and Magnetoporation *Microneedles - Chemical Systems *Polymer-Based Nanocarriers *Lipid-Based Systems *Inorganic Materials		Face to Face	Synchronous	Exams and seminars	A Handbook of Gene and Cell Therapy
5-6	**Viral Vectors for Gene Therapy** - Lentiviral Vectors *Replicative Cycle *From Lentivirus to Lentiviral Vectors *Additional Improvements to Lentiviral Vectors *Lentiviral Vector Production *Lentiviral Vectors in Clinical Trials - Gamma Retrovirus		Face to Face	Synchronous	Exams and seminars	A Handbook of Gene and Cell Therapy

	- Adenoviral Vectors *Replicative Cycle *From Adenovirus to Adenoviral Vectors *Adenoviral Vector Modifications *Adenoviral Vector Production *Adenoviral Vectors in Clinical Trials - Adeno-associated Virus (AAV) *Replicative Cycle * From AAV to AAV Vectors *AAV Modifications *AAV Production *AAV in Clinical Trials - Herpes Simplex Virus *Replicative Cycle *From HSV to HSV Vectors * HSV Modifications * HSV Production * HSV in Clinical Trials					
7-9	**Barriers to Gene Delivery** - Extracellular Barriers *Unspecific Interactions *Endothelial Barriers *Inflammatory and Immune Response - Intracellular Barriers *Cellular Uptake * Endosomal Escape *Intracellular Trafficking *Nuclear Delivery - Technical Barriers *Physical Restrictions * Cellular Targeting *Gene Persistence *Sustainable Gene Expression		Face to Face	Synchronous	Exams and seminars	A Handbook of Gene and Cell Therapy

10-11	**Gene Therapy Strategies: Gene Augmentation** - Gene Replacement - Gene Addition - Gene Addition to Modulate Autophagy * The Autophagy Pathway * Autophagy Terms Glossary * Upregulation of the Autophagy Pathway as a Therapeutic Strategy for Machado-Joseph Disease/Spinocerebellar Ataxia Type 3		Face to Face	Synchronous	Exams and seminars	A Handbook of Gene and Cell Therapy
12-13	**Gene Therapy Strategies: Gene Silencing** - Antisense Oligonucleotides *ASOs Generations *Important Considerations for the Use of ASOs in Gene Therapy *Functional Mechanisms *ASOs Applications in Gene Therapy - RNA Interference * Gene Expression Regulation in Eukaryotes *The Small Interfering RNA Pathway *The MicroRNA Pathway *Small Interfering RNAs Versus MicroRNAs *Small Interfering RNAs Versus Short Hairpin RNAs *Gene Therapy Applications of RNAi *RNAi Terms Glossary *Gene Silencing as Therapy for Machado-Joseph Disease/Spinocerebellar Ataxia Type 3 - Future Prospects on Gene Silencing		Face to Face	Synchronous	Exams and seminars	A Handbook of Gene and Cell Therapy
14-15	**Gene Therapy Applications** **Students seminars**		Face to Face	Synchronous		

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

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

24 Course Policies:

A- Attendance policies:

Students are allowed to not attend seven lectures (15%) in the whole semester. In this case, students must attend every lab weekly. If a student does not attend a lab, then he/she has a maximum numbers of four lectures to skip.

B- Absences from exams and submitting assignments on time:

If a student does not attend an exam, he/she will get zero grade in that exam, unless, he/she shows a medical report that proves he/she could not attend the exam. In this case, a makeup exam will be offered to the student as soon as possible.

C- Health and safety procedures:

Students need to be aware of the basic procedure of laboratory safety. Part of the first lab in the first week of the semester is assigned to teach students these basic laboratory procedures.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

University regulations will be implemented for any cheating attempt, plagiarism and misbehavior.

E- Grading policy:

Evaluation	Grade
Mid-term Exam	30
Seminar and in-class discussion	30
Final Lecture Exam	40

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

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The university provides lab materials and equipment. Moreover, the university provides personnel to help in exams.

25 References:

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

A Handbook of Gene and Cell Therapy. 1st edition. By: Clévio Nóbrega, Liliana Mendonça, Carlos A. Matos 2020.

B- Recommended books, materials, and media:

Gene and Cell Therapy: Biology and Applications, Giridhara R. Jayandharan, 2018.

26 Additional information:

Name of Course Coordinator: -Dr. Amer Imraish ---Signature: ---------- Date: ----------
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------