

Course Specification

— (Postgraduate Programs) عبد المحسن بن أبي طالب عزيمه بالدار وحديثي الناصر

Course Title: Advanced Cell and Molecular Biology

Course Code: Bio-6114

Program: Master of Science in Applied Biology (Cell and Molecular Biology)

Department: Biology عبد المحسن بن أبي طالب عزيمه بالدار وحديثي الناصر

College: Science

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1

Last Revision Date: Pick Revision Date.

عبد المحسن بن أبي طالب عزيمه بالدار وحديثي الناصر



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عبد المحسن بن أحمد العزيمي عبد الله بن محمد بن الناصر

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A. General information about the course:

1. Course Identification:

1. Credit hours: 4 (Lecture 3+ Lab 2)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track

B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 1 / first year)

4. Course General Description:

This graduate course focuses on the study of nucleic acids and proteins and their interactions within cells, which play a crucial role in facilitating appropriate growth, division, and development. This course provides an in-depth examination of the biological systems at the molecular level in both prokaryotic and eukaryotic organisms. This course is centered on the organization, operation, and chemical processes involved in nucleic acids. The topics covered in this course include the structure and function of nucleic acids, the structure and replication of DNA, the transcription and processing of RNA, and the process of translation. The course emphasizes regulation and control of gene expression. The course offers students an understanding and recognition of the experimental methods employed in the field of molecular biology.

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

None

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

None

7. Course Main Objective(s):

The course intends to provide students with essential knowledge about the composition and operation of nucleic acids. Furthermore, it aims to provide students with a thorough comprehension of DNA replication, repair, transcription, RNA processing, and translation of RNA transcripts into proteins in both prokaryotes and eukaryotes. Moreover, the course objectives include providing students with a thorough understanding of the fundamental principles that regulate the control of gene expression in both prokaryotes and eukaryotes.



2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	• Traditional classroom	√	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	45
2.	Laboratory/Studio	30
3.	Field	-
4.	Tutorial	-
5.	Others (specify).....	-
	Total	75

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	Describe DNA replication processes	K1	-Lectures -Class participation	-Written exams -Class participation -Assessment of assigned work
1.2	Outline forms of DNA damage and the mechanisms to repair	K2	-Lectures -Class participation	-Written exams -Class participation -Assessment of assigned work
1.3	Explain the intracellular mechanisms of transcription and	K3	-Lectures -Class participation	-Written exams -Class participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	discuss the regulation and control of gene expression			-Assessment of assigned work
2.0	Skills			
2.1	Summarize critically the fundamentals of nucleic acids translation processes and analyze this information until the synthesis of proteins	S1	-Lectures -Classroom discussions -Cooperative education	-Classroom participation -Presentations
2.2	Relate the participation of the major organelles in eukaryotic cells to protein synthesis	S2	-Lectures -Classroom discussions -Cooperative education	-Classroom participation -Presentations
3.0	Values, autonomy, and responsibility			
3.1	Organize and summarize information from a variety of sources (textbooks, research papers and review articles), and use information technology to present scientific data to a varied audience	V1	--Lectures -Classroom discussions	-Classroom participation -Presentations
3.2	Demonstrate the ability to communicate scientific issues effectively both	V2	-Lectures -Classroom discussions	-Classroom participation -Presentations

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	orally and in writing format			
3.3	Show independence in performing assigned work and cooperate as a member of a team	V3	Group discussions	-Assessment of assigned work -Presentations

C. Course Content:

No	List of Topics	Contact Hours
1.	DNA Replication: -DNA Replication Is Semiconservative -DNA Replication Is Usually Bidirectional -Telomeres Solve the DNA End-Replication Problem	2
2.	DNA Damage and Repair: -Mutations Can Occur Spontaneously During Replication Homologous Recombination and Mobile Genetic Elements -Bacterial DNA-Only Transposons Can Be Composite or Non-composite -Eukaryotes Also Have DNA-Only Transposons - Retrotransposons	2
3.	Gene Expression: I. Transcription -Mechanisms of Transcription -Transcription Involves Four Stages: RNA Polymerase Binding, Initiation, Elongation, and Termination -Transcription in Eukaryotic Cells Has Additional Complexity Compared with Prokaryotes -The Directional Flow of Genetic Information -Transcription and Translation Involve Many of the Same Components in Prokaryotes and Eukaryotes -Where Transcription and Translation Occur Differs in Prokaryotes and Eukaryotes -In Some Cases, RNA Is Reverse-Transcribed into DNA	8
4.	RNA Processing and Turnover: -The Nucleolus Is Involved in Ribosome Formation -Transfer RNA Processing Involves Removal, Addition, and Chemical Modification of Nucleotides -The Abundance of mRNA Allows Amplification of Genetic Information	8
5.	Gene Expression: II. The Genetic Code and Protein Synthesis	3

	-The Genetic Code -The Mechanism of Translation -Posttranslational Processing	
6.	Bacterial Gene Regulation: -The Genes Involved in Lactose Catabolism Are Organized into an Inducible Operon -The <i>lac</i> Operon The Genes Involved in Tryptophan Synthesis (a Repressible Operon)	2
7.	Eukaryotic Gene Regulation: Genomic Control -Eukaryotic Gene Expression Is Regulated at Five Main Levels -Gene Amplification and Deletion Can Alter the Genome -DNA Rearrangements Can Alter the Genome	4
8.	Eukaryotic Gene Regulation: Transcriptional Control -Different Sets of Genes Are Transcribed in Different Cell Types -Enhancers and Silencers Are DNA Elements Located at Variable Distances from the Promoter -Several Common Types of Transcription Factors Bind to DNA and Activate Transcription	8
9.	Eukaryotic Gene Regulation: Post-transcriptional Control -Control of RNA Processing and Nuclear Export Follows Transcription -Translation Rates Can Be Controlled by -Initiation Factors and Translational Repressors	4
10.	-Posttranslational Control: -MicroRNAs Produced by Normal Cellular Genes Silence the Translation of mRNAs -Modifications of Protein Structure, Function, and Degradation -Ubiquitin Targets Proteins for Degradation by Proteasomes	4
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5 th week	20 %
2.	Midterm exam-2	10 th week	20%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Quizzes, Participation, presentations, reports, attendance	Throughout the course duration	20%
4.	Final exam	16 th week	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	-Bruce Alberts et al., Essential Cell Biology, Third edition, London, UK. (2009). ISBN-13: 978-0815341291. -Lodish, et al. Molecular Cell Biology. 5th ed. New York, NY: W.H. Freeman and Company, (2003). ISBN: 9780716743668. -Becker's WORLD OF THE CELL TENTH EDITION Jeff Hardin and James P. Lodolce(2022) -Robert F. Weaver. (2011) Molecular Biology, 5th Edition, McGraw-Hill Education. -Michael M. Cox, Jennifer Doudna, Michael O'Donnell. (2015) Molecular Biology: Principles and Practice, 2nd Edition, W. H. Freeman
Supportive References	
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (Projector, smart board, software)	Projector and Smartboard
Other equipment (Depending on the nature of the speciality)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of students' assessment	Program Leaders	Direct
Quality of learning resources	Peer Reviewer	Direct
The extent to which CLOs have been achieved	Program Leaders	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445

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