Course Specification
(Bachelor)

Course Title:	Molecular Biology
Course Code:	BIO 1232
Program:	Bachelor of Science in Biology
Department:	Biology
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	1
Last Revision Date:	20/8/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3 (2 lectures + 2 laboratories)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (5/2)					
4. Course general Description:					
This course deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It offers a detailed analysis of the biological systems at the molecular level in prokaryotic and eukaryotic organisms. It focuses on the structure, function and metabolism of nucleic acids. Topics include nucleic acids structure and function, DNA structure and replication, RNA transcription and processing, as well as translation. It provides students with an appreciation of the experimental approaches used in molecular biology.					
5. Pre-requirements for this course (if any)**:**					
BIO 231					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The objective of the course is to provide the students with the basic knowledge about the structure and function of nucleic acids. It also aims to provide the students with an overview of DNA replication, repair, transcription, RNA processing, and translation of RNA transcripts into proteins in both prokaryotes and eukaryotes. In addition, it provides the students with a detailed understanding of the fundamental principles of how gene expression is regulated in both prokaryotes and eukaryotes.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%

No	Mode of Instruction	Contact Hours	Percentage
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**	24
2.	**Laboratory/Studio**	24
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		48

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Method

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Describe the basic molecular structure and function of nucleic acids and proteins	1.2-2.2	Lecture and take-home research assignment	Quizzes, midterm exam and final exam
1.2	Outline the mechanisms of DNA replication, repair, transcription, gene regulation, RNA processing and translation in prokaryotes & eukaryotes	1.2	Lecture and take-home research assignment	Quizzes, midterm exam and final exam
2.0	**Skills**			
2.1	Analyze and	2.1	Laboratory and	Lab reports and Lab

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	contrast flow of genetic information and regulation of gene expression in both prokaryotes and eukaryotes		take-home research assignment	exam
2.2	Plan and use standard molecular biology techniques to isolate, purify and analyze nucleic acids and proteins	2.1-2.3	Laboratory and take-home research assignment	Lab reports and Lab exam
2.3	Analyze and interpret molecular biology data using standard molecular tools	2.1	Laboratory and take-home research assignment	Lab reports and Lab exam
3.0	**Values, autonomy, and responsibility**			
3.1	Assemble and summarize information from a variety of sources (textbooks, research papers and review articles), and use information technology to prepare, process and present information	2.2-1.3	Lecture, laboratory and take-home research assignment	Quizzes, midterm exam, Lab reports, project presentations, Lab exam and final exam
3.2	Compose and show ideas effectively both orally and in writing	3.2	Lecture, laboratory and take-home research assignment	Quizzes, midterm exam, Lab reports, project presentations, Lab exam and final exam
3.3	Perform independently and as a member of a	3.3	Lecture, laboratory and take-home research	Quizzes, midterm exam, Lab reports, project presentations, Lab exam and final

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	team		assignment	exam

C. Course Content

No	List of Topics (lectures)	Contact Hours
1.	The molecular nature of the genome (gene structure, organization, and function)	2
2.	Structures, properties and functions of nucleic acids	2
3.	DNA replication in prokaryotes and eukaryotes	2
4.	DNA damage and repair mechanisms	2
5.	Transcription (RNA synthesis) in prokaryotes and eukaryotes	2
6.	Post-transcriptional events (capping, polyadenylation, and splicing)	2
7.	Translation (protein synthesis) in prokaryotes and eukaryotes	2
8.	Regulation of gene expression in prokaryotes and eukaryotes	2
9.	Nucleic acids extraction, polymerase chain reaction and gel electrophoresis	2
10.	Restriction enzymes	2
11.	Blot (Southern blot, Northern blot, and Western Blot)	2
12.	DNA sequencing	2
Total		24

No	List of Topics (labs)	Contact Hours
1.	Isolation of DNA	2
2.	Isolation of RNA	2
3.	Polymerase chain reaction	2
4.	Gel electrophoresis	2
5.	Restriction enzymes	2
6.	Southern blot	2
7.	Northern blot	2
8.	Western Blot	2
9.	DNA sequencing	2
10.	Web-based Molecular Biology Tools Gene https://www.ncbi.nlm.nih.gov/gene Protein https://www.ncbi.nlm.nih.gov/protein	2

11.	Web-based Molecular Biology Tools Basic Local Alignment Search Tool (BLAST) https://blast.ncbi.nlm.nih.gov/Blast.cgi Standard Nucleotide BLAST Standard Protein BLAST	**2**
12.	Web-based Molecular Biology Tools Basic Local Alignment Search Tool (BLAST) https://blast.ncbi.nlm.nih.gov/Blast.cgi Primer-BLAST (a tool for finding specific primers)	**2**
Total		**24**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	Around 4th - 5th week	15%
2.	Midterm 2	Around 7th - 8th week	15%
3.	Quizzes, Participation, and Attendance	During the semester	10%
4.	Lab reports	During the semester	5%
5.	Lab Exam	Around 9th week	15%
6.	Final Exam	Around 13th week	40%
Total			**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	Victor A. Bloomfield, Donald M. Crothers, Ignacio Tinoco, John E. Hearst, David E. Wemmer, Peter A. Killman, Douglas H. Turner (2000). Nucleic Acids: Structures, Properties, and Functions, 1st Edition, University Science Books. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick (2013). Molecular Biology of the Gene, 7th Edition, Pearson.

Supportive References	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.
Electronic Materials	Web-based Molecular Biology Tools
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and Laboratories
Technology equipment (projector, smart board, software)	Projector and Smart board
Other equipment (depending on the nature of the specialty)	Molecular Biology-related instruments, including safety cabinet, centrifuges, incubators, thermal cyclers, trans-illuminators, gel electrophoresis apparatus

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Program Leaders	Direct
Quality of learning resources	Peer Reviewer	Indirect
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	**Head of Biology Department**
REFERENCE NO.	
DATE	