Republic of Yemen

Ministry of Higher Education & Scientific Research

21 SEPTEMBER UNIVERSITY of MEDICALS & APPLIEED

SCIENCES

Faculty of Laboratory Medicine.

Department of Biochemistry and Molecular biology
Course Specification of Cellular and Molecular Biology
Course No. (03.11.314)
2022/2023

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
- Dr. Nabil Alowiri	Dr\ Nawal Al-Henhena	Dr/ Nawal Al- Henhena	Dr\Gamil Taher Abdul Mughni	- Associate Prof. Dr. Ebtesam Al-Zabedi

I. Course Identification and General Information:

1	**Course Title:**	Cellular and Molecular Biology			
2	**Course Code & Number:**	03.11.314			
3	**Credit Hours:**	**Theory Hours**			
		Lecture	**Exercise**	Practical	**Credit Hours**
		2	0	2	3
4	**Study Level/ Semester at which this Course is offered:**	1st Level / 1st Semester			
5	**Pre –Requisite (if any):**	None			
6	**Co –Requisite (if any):**	None			
7	**Program (s) in which the Course is Offered:**	Master Degree Biochemistry and Molecular biology			
8	**Language of Teaching the Course:**	English			
9	**Study System:**	Semester			
10	**Mode of Delivery:**	Regular			
11	**Location of Teaching the Course:**	University Campus			
12	**Prepared by:**	Dr. Nabil Alowiri			
13	**Date of Approval:**	2023			

II. Course Description:

This course provides an introduction to the principles and techniques of molecular biology and genetics. Topics covered include DNA structure and replication, gene expression, regulation of gene expression, DNA repair, mutagenesis, cloning, and genetic engineering.

III. Alignment Course Intended Learning Outcomes with program outcomes

	III. Course Intended Learning Outcomes (CILOs)	Referenced PILOs
A. Knowledge and Understanding: ***Upon successful completion of the course, students will be able to:***		
a1	**Understand** the basic principles of molecular biology and genetics	**A1**
a2	**Describe** the different methods of molecular cloning and different methods of genetic engineering	**A2**
B. Intellectual Skills: ***Upon successful completion of the course, students will be able to:***		
b1	**Design** and carry out molecular biology and genetic experiments	**B1**
C. Professional and Practical Skills: ***Upon successful completion of the course, students will be able to:***		
c1	**Isolate and purify** DNA and RNA from different sources, check of purity of isolated DNA and RNA, restriction fragmentation and separation of oligos by agarose electrophoresis, RAPD analysis of DNA, cDNA synthesis using PCR, Southern and Northern blotting experiments.	**C1**
D. Transferable Skills: ***Upon successful completion of the course, students will be able to:***		
d1	**Demonstrate** oral and written effective communication skills	

C. Alignment Course Intended Learning Outcomes with Teaching Strategies and Assessment methods:			
(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
A1	Understand the basic principles of molecular genetics and genetic disorders	Lectures	Exams
A2	**Discuss** the genetic variation and genetic diseases, drugs that act on the membrane	Lectures	Exams
(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
B1	**Design** and carry out molecular genetic experiments	Lectures	Exams, Assignments
C Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
C1	**Isolate and purify** DNA and RNA from different sources, check of purity of isolated DNA and RNA, restriction fragmentation and separation of oligos by agarose electrophoresis, RAPD analysis of DNA, cDNA synthesis using PCR, Southern and Northern blotting experiments..	Lectures Practical sessions	Lab reports, Exams
(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
D1	**Demonstrate** oral and written effective communication skills	Lectures Practical sessions	Lab reports, Exams

NO.	Units/Topics List	Sub Topics List	Number of Weeks	contact hours	Learning Outcomes (CILOs)
1	**Introduction to Cell**	- An overview of the cell and cell structure - Membrane biology - Major cell functions - Regulation of cell functions	1	2	**a1,a2,b1,c1,d1**
2	**Nucleic acids**	- Types of nucleic acids - DNA structure and function - RNA structure, types, and function	1	2	**a1,a2,b1,c1,d1**
3	**Genome organization: from nucleotides to chromatin**	- Eukaryotic genome - Bacterial genome and Plasmids - Bacteriophages and mammalian DNA viruses - Mitochondrial genome - Definition of a gene, gene structure, chromosomal organization of genes and noncoding DNA	1	2	**a1,a2,b1,c1,d1**
4	**DNA replication**	- Models of replication - Initiation of replication - Elongation of replication - Termination of replication - Proofreading of DNA - DNA replication in prokaryotes and Eukaryotes	1	2	**a1,a2,b1,c1,d1**
5	**Gene expression** - **Transcription**	- Transcription in prokaryotes and eukaryotes - Regulatory region and transcriptional unit of Gene - Inhibitors of transcription - Reverse transcription. - Post-transcriptional processing of RNA: splicing, cap addition and polyadenylation - Polynucleotide phosphorylase.	1	2	**a1,a2,b1,c1,d1**
6	**Gene expression**	- General features of the genetic code	1	2	**a1,a2,b1,c1,d1**

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
- Dr. Nabil Alowiri	Dr\ Nawal Al-Henhena	Dr/ Nawal Al- Henhena	Dr\Gamil Taher Abdul Mughni	- Associate Prof. Dr. Ebtesam Al-Zabedi

	- **Translation and Post-translational modifications**	- Ribosome as the site of protein synthesis - Activation of amino acids - Initiation, elongation and termination of protein synthesis in prokaryotes and eukaryotes - Fidelity of protein synthesis - Bioenergetics of protein synthesis - Control of translation. - Post-translational processing of the polypeptide chains - Acylation, methylation, phosphorylation and glycosylation.			
7	**DNA repair and mutations**	- General classes of DNA damage - Mechanisms of DNA repair - Types of mutations and their phenotypic consequences	1	2	**a1,a2,b1,c1,d1**
8	Molecular biology techniques - **Analysis of Individual DNA and RNA Sequences**	- Molecular Cloning - Restriction Enzymes - Vectors - Plasmids - Libraries - Screening Libraries with Nucleic Acid - Probes	2	4	**a1,a2,b1,c1,d1**
9	Molecular biology techniques - **Methods of Nucleic Acid Analysis and Proteins**	- Southern Blotting - Northern or RNA Blotting - Western Blot Analysis of Proteins	1	2	**a1,a2,b1,c1,d1**
10	Molecular biology techniques - **The Polymerase Chain Reaction (PCR)**	- Conventional PCR - Modifications of PCR method - RT-PCR - Gel Electrophoresis - Real time PCR (qPCR) - Primers and primer Design - Applications of PCR	2	2	**a1,a2,b1,c1,d1**
11	Molecular biology techniques	- Introduction - Sequencing Methods and	2	4	**a1,a2,b1,c1,d1**

	- **DNA Sequence Analysis**	Terminology - Sanger Sequencing - Second/Next Generation Sequencing - Pyrosequencing -			
12	Molecular biology techniques - **Advanced Techniques**	- Fluorescence in Situ Hybridization - Comparative Genome Hybridization - RNA Expression Arrays	1	2	**a1,a2,b1,c1,d1**
13	**Final Exam**		1	2	
	Number of Weeks /and Units Per Semester		**16**	**32**	

V. Teaching Strategies of the Course:

1-	Lectures
2-	Practical session
3-	Self-leaning
4-	**Group research**

VI. Assessment Methods of the Course:

No	Assignment	
1	**Written Exams (Short Essays) and Quizzes**	a2,a4.b1,b2,c1,c2,d3
2	Written Exams(MCQ)	a2,a4.b1,b2,c1,c2,d3
3	Structured Oral Exams	a2,a4.b1,b2,c1,c2,d3
4	Objective Structured Practical Exams (OSPE)	a2,a4.b1,b2,c1,c2,d3
5	Student presentation	a2,a4.b1,b2,c1,c2,d3

VII. Assignments:

No.	Assignments	Week Due	Mark	Proportion of Final Assessment	Aligned CILOs (symbols)
2	**Activity**	Throughout the semester	20	20%	a2,a4.b1,b2,c1,c2,d3
5	**Final Exam**		80	80%	a2,a4.b1,b2,c1,c2,d3
Total			**100**		

Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

Lizabeth A. Allison – 2007 - Textbook of Fundamental molecular biology - Blackwell Publishing Ltd

2- Essential References.

1- WILLIAM B. COLEMAN and GREGORY J. TSONGALIS – 2010 - MOLECULAR DIAGNOSTICS – SECOND EDITION - SPRINGER NEW YORK DORDRECHT HEIDELBERG LONDON
2- Asklepios Bratislava – 2010 - INTRODUCTION TO MEDICAL AND MOLECULAR BIOLOGY -

3- Electronic Materials and Web Sites *etc*.

1- Harvard Molecular & Cellular Biology
2- Kimball's Biology Pages
3- Genetic Engineering and Biotechnology News

XI. *Course Policies:*

1	**Class Attendance:** Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	**Tardiness:** -If the student dose not attend for more than 6 times, the student will be obligated to withdrew from the course
3	**Exam Attendance/Punctuality:**

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
- Dr. Nabil Alowiri	Dr\ Nawal Al-Henhena	Dr/ Nawal Al- Henhena	Dr\Gamil Taher Abdul Mughni	- Associate Prof. Dr. Ebtesam Al-Zabedi

	No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	**Assignments & Projects:** Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	**Cheating:** Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	**Forgery and Impersonation:** Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	**Other policies:** The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration