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 Biotechnology and Bioinformatics

Course No. (03.11.321)

2022/2023

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

I. Course Identification and General Information:

1	**Course Title:**	Biotechnology and Bioinformatics			
2	**Course Code & Number:**	03.11.321			
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:**				
13	**Date of Approval:**	2022-2023			

II. Course Description:

The students are introduced to the biological and Bioinformatics revolutions in this field. The course is intended to provide students with a comprehensive overview of the most advanced methodologies used in the field of biotechnology, with a special focus on genetics (Genomics, Proteomics, and Epigenetics) to solve real-world problems.

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 acquired knowledge for tackling certain biotechnology-related problems.	**A1**
B. Intellectual Skills: ***Upon successful completion of the course, students will be able to:***		
b1	**Explain** modern, state-of-the-art methodologies used in the field of biotechnology, with a special focus on genetics.	**B1**
b2	**Interpret** analytical data and communicate their findings to others**.**	
C. Professional and Practical Skills: ***Upon successful completion of the course, students will be able to:***		
c1	**Apply** molecular genetic techniques to solve biological problems	**C1**
D. Transferable Skills: ***Upon successful completion of the course, students will be able to:***		
d1		**D1**
d2		

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IV. 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 acquired knowledge for tackling certain biotechnology-related problems	Lecture	Exam
(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1	**Explain** modern, state-of-the-art methodologies used in the field of biotechnology, with a special focus on genetics.	Lecture	Exam
B2	**Interpret** analytical data and communicate their findings to others**.**	Lecture	Exam
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	**Apply** molecular genetic techniques to solve biological problems	Lecture Discussion Presentation	Exam Discussion Presentation
(D Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:			
	Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies

NO.	Units/Topics List	Sub Topics List	Number of Weeks	contact hours	Learning Outcomes (CILOs)
1	**Principles of Biotechnology**	Overview of DNA, and DNA modifying enzymes and vectors Molecular markers and their applications General application of biotechnology in Medicine	**1**	**2**	**A1,b1,c1**
2	**Biochemical Techniques**	Preparation of buffers and reagents	**1**	**2**	**A1,b1,c1**
3	**Genomics and Transcriptomics**	Structural genomics: Classical ways of genome analysis, large fragment genomic libraries; Physical mapping of genomes; Genome sequencing, sequence assembly and annotation; Comparative genomics Functional genomics: DNA chips and their use in transcriptome analysis; Mutants and RNAi in functional genomics; Metabolomics and ionomics for elucidating metabolic pathways, etc. Applications of genomics in human health and industry.	**2**	**4**	**A1,b1,c1**
5	**Proteomics**	Proteomics – Protein structure, function and purification; Introduction to basic proteomics technology; Bio-informatics in proteomics; Proteome analysis, etc. Applications of proteomics in human health and industry.	**2**	**4**	**A1,b1,c1**
6	**Biosafety, IPR and Bioethics**	Biosafety and risk assessment issues; Regulatory framework; National biosafety policies and law, The Cartagena protocol on biosafety, WTO and other international agreements related to biosafety, Cross border movement of germplasm; Risk management issues - containment. General principles for the laboratory and environmental biosafety; Health aspects; toxicology, allergenicity, antibiotic resistance, etc; Impact on environment: gene flow in natural and artificial ecologies; Sources of gene escape, tolerance of target organisms, creation superweeds/superviruses, etc.	**1**	**2**	**A1,b1,c1**
7	**Molecular immunology diagnostics**	Antibody diversity; antigens, haptens, antigens-antibody interactions; immuno-regulation and	**2**	**4**	**A1,b1,c1**

		tolerance; Allergies and hypersensitive response; Immunodeficiency; Vaccines; Immunological techniques. Introduction to the basic principles of molecular technology and techniques used in pathogen detection Principles of ELISA and its applications in viral detection			
8	**Nano-Biotechnology**	The modern concepts to describe the conformation and dynamics of biological macromolecules Preparation and characterization of nanoparticles; Nanoparticular carrier systems; Micro- and Nano-fluidics; Drug and gene delivery system; Microfabrication, Biosensors, Chip technologies, Nano- imaging, Metabolic engineering and Gene therapy	**3**	**6**	**A1,b1,c1**
9	**Introduction and Principle of Bioinformatics**	Introduction, biological databases – primary, secondary and structural, Protein and Gene Information Resources – PIR, SWISSPROT, PDB, genebank, DDBJ. Specialized genomic resources. DNA sequence analysis, cDNA libraries and EST, EST analysis, pairwise alignment techniques, database searching, multiple sequence alignment. Secondary database searching, building search protocol, computer aided drug design – basic principles, docking, QSAR. Analysis packages – commercial databases and packages, GPL software for Bioinformatics, web-based analysis tools.	**2**	**4**	**A1,b1,c1**
10	**Biostatics and Computers**	Basic principles, organization and operational aspects of computers, operating systems. Introduction to MS-Office, MS-Word, MS-Excel. Statistical Data analysis based on above topics through MS-Excel.	**1**	**2**	**A1,b1,c1**
	Final Exam		**1**	**2**	**A1,b1,c1**
	FINAL THEORTICAL		**16**	**32**	

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V. Teaching Strategies of the Course:	
1-	Lectures
2-	Practical session
3-	Seminars
5-	**Discussion**

VI. Assessment Methods of the Course:

No	Assignment
1	**Written Exams (Short Essays) and Quizzes**
2	Written Exams(MCQ)
3	Structured Oral Exams
4	Objective Structured Practical Exams (OSPE)
5	Student presentation

VII. Assignments:

No.	Assignments	Week Due	Mark	Proportion of Final Assessment	Aligned CILOs (symbols)
1	**Midterm Exam**	7	15	15%	a1,b1,c1
2	**Activity**	Throughout the semester	5	5%	a1,b1,c1
3	Practical Report	Throughout the semester	10	10 %	a1,b1,c1
4	**Practical exam**	12	20	20%	a1,b1,c1
5	**Final Exam**	14	50	50%	a1,b1,c1
Total					

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X. Learning Resources:	
· *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*	
1- Required Textbook(s) (maximum two).	
1- Analytical Biochemistry, 5th Edition, by David E. Garfinkel	
2- Principles and Techniques of Biochemistry and Molecular Biology, 5th Edition, by Keith Wilson and John Walker	
2- Essential References.	
1- Bioanalytical Chemistry, 2nd Edition, by Andreas Manz, Norbert Pamme, and Dimitrios Lossifidis	
2- Electrophoresis in Practice, 3rd Edition, by Rainer Westermeier	
3- Electronic Materials and Web Sites *etc.*	
1- https://pubmed.ncbi.nlm.nih.gov/advanced/	
2- https://www.ncbi.nlm.nih.gov/	
3- https://biotech.dpu.edu.in/	
4- https://biotech.dpu.edu.in/	

XI. ***Course Policies:***	
1	**Class Attendance:**
	-If the student dose not attend for more than 6 times, the student will be obligated to withdrew from the course
2	**Tardy:**
	- If the student is late for the lectures for the 2nd time, he will not be allowed to attend this lecture
3	Exam Attendance/Punctuality:
	- If any student does not attend the exam in the scheduled day, it will consider as a fail for him
4	**Assignments & Projects:**
	- Any student dose not submithis assignment,he will lose its grade.
5	**Cheating:-** ANY STUDENT TRY TO CHEAT IN ANY QUIZ OR EXAM, HE WILL NOT BE ALLOWED TO CONTINUE THE EXAM AND IT WILL CONSIDER AS A FAIL FOR HIM

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6	**Plagiarism:**
	- If any student try to plagiarism another student identity, both of them will be convertedto investigation and they might be expelled from the program
7	**Other policies:**
	- Undelivered requirement will not be marked
	- You should leave your dental Chair as clean as possible