

Republic of Yemen
Ministry of Higher Education & Scientific Research
21 SEPTEMBER UNIVERSITY of MEDICALS & APPLIED
SCIENCES



Faculty of Laboratory medicine.

Department of Biochemistry and Molecular biology
Course Specification of Advanced Molecular Genetics
Course No. (03.11.320)
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. Ebtessam Al-Zabedi

I. Course Identification and General Information:					
1	Course Title:	Advanced Molecular Genetics			
2	Course Code & Number:	03.11.320			
3	Credit Hours:	Theory Hours			
		Lecture	Exercise	Practical	Credit Hours
		2	0	0	2
4	Study Level/ Semester at which this Course is offered:	2 nd Level / 2 nd Semester			
5	Pre –Requisite (if any):	Molecular biology			
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			

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II. Course Description:

This course provides an advanced introduction to the principles and techniques of molecular genetics and genetic disorders. Topics covered include Genomics, Genetic disease types, pattern of genetic disease inheritance, prenatal diagnosis, genetics of cancer, and Genome analysis.

III. Alignment Course Intended Learning Outcomes with program outcomes

III. Course Intended Learning Outcomes (CILOs)		Referenced PILOs
A. Knowledge and Understanding: <i>Upon successful completion of the course, students will be able to:</i>		
a1	Understand the basic principles of molecular genetics and genetic disorders	A1
a2	Describe the different patterns of genetic disorders and different methods of molecular diagnostic	A2
B. Intellectual Skills: <i>Upon successful completion of the course, students will be able to:</i>		
b1	Design and carry out molecular genetic experiments	B1
C. Professional and Practical Skills: <i>Upon successful completion of the course, students will be able to:</i>		
c1	Critically evaluate the scientific literature in molecular genetics and the advantages and disadvantages of different molecular diagnostic techniques.	C1
D. Transferable Skills: <i>Upon successful completion of the course, students will be able to:</i>		
d1	Demonstrate oral and written effective communication skills	D1

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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	Critically evaluate the scientific literature in molecular genetics and the advantages and disadvantages of different molecular diagnostic techniques.	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

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NO.	Units/Topics List	Sub Topics List	Number of Weeks	contact hours	Learning Outcomes (CLOs)
1	Basic of Genetics and Genomics	<ul style="list-style-type: none"> - Genetics and Genomics in Medicine - Categories of Genetic Disease - The Human Genome and its Chromosomes - Cell Division - Human Gametogenesis and Fertilization - Medical Relevance of Mitosis and Meiosis 	2	4	a1,a2,b1, c1,d1
2	The Chromosomal and Genomic Basis of Disease: Disorders of the Autosomes and Sex Chromosomes	<ul style="list-style-type: none"> - Human Chromosomes - Characterizing Human Chromosomes - Chromosomes Abnormalities - Autosomal Disorders - The Sex Chromosomes and their Abnormalities 	2	4	a1,a2,b1, c1,d1
3	Patterns of Single-Gene Inheritance	<ul style="list-style-type: none"> - Overview and Concepts - Mendelian Inheritance - Factors Affecting Pedigree Patterns - Correlating Genotype and Phenotype - Autosomal Patterns of Mendelian Inheritance - X-linked Inheritance - Pseudoautosomal Inheritance - Mosaicism - Imprinting in Pedigrees - Maternal Inheritance of Disorders Caused by Mutations in the Mitochondrial Genome 	3	6	a1,a2,b1, c1,d1
4	Molecular Genetics of Common Disorders with Complex Inheritance	<ul style="list-style-type: none"> - Introduction - Qualitative and Quantitative Traits - Genetic and Environmental Modifiers of Single-Gene Disorders - Examples of Multifactorial Traits for Which Genetic and Environmental Factors 	1	2	a1,a2,b1, c1,d1
5	Genetic Variation in Populations	<ul style="list-style-type: none"> - Overview Mutations and their Consequences - Human genetic diversity - Inherited variation and polymorphism in DNA - Inherited variation and polymorphism in proteins - Genotypes and phenotypes in populations 	1	2	a1,a2,b1, c1,d1

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		<ul style="list-style-type: none"> - Factors that disturb Hardy Weinberg equilibrium - Ethnic differences in the frequency of various genetic diseases 			
6	The Molecular, Biochemical, and Cellular Basis of Genetic Disease	<ul style="list-style-type: none"> - Diseases due to mutations in different classes of proteins - Diseases involving enzymes - Defects in receptor proteins - Transport defects - Disorders of structural proteins - Neurodegenerative disorders 	1	2	a1,a2,b1,c1,d1
7	Prenatal Diagnosis	<ul style="list-style-type: none"> - Introduction - Indications for prenatal diagnosis by invasive testing - Methods of prenatal diagnosis - Laboratory studies - Emerging technologies for prenatal diagnosis - Prenatal prevention and management of genetic disease - Genetic counseling for prenatal diagnosis 	1	2	a1,a2,b1,c1,d1
8	Cancer Genetics and Genomics	<ul style="list-style-type: none"> - Genetic Basis of Cancer - Oncogenes - Tumor-suppressor genes - Tumor Progression - Applying Genomics to Individualize Cancer Therapy - Cancer and The Environment 	2	4	a1,a2,b1,c1,d1
9	Genome analysis	<ul style="list-style-type: none"> - DNA Typing - RFLP - DNA polymorphisms - Short tandem repeat analysis - Mitochondrial DNA analysis - Randomly amplified polymorphic DNA (RAPD) - Single nucleotide polymorphisms - Genomics - Proteomics 	2	4	a1,a2,b1,c1,d1
9	Final Exam		1	2	
	Number of Weeks /and Units Per Semester		16	32	

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V. Teaching Strategies of the Course:

1-	Lectures
2-	Practical session
3-	Self-learning
4-	Group research

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)
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		

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Learning Resources:
<ul style="list-style-type: none"> Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).
1- Required Textbook(s) (maximum two).
Robert L. Nussbaum - Thompson & Thompson Genetics in Medicine - 8th Edition.
2- Essential References.
1 - PETER D. TURNPENNY – EMERY; ELEMENTS OF MEDICAL GENETICS – 13 th EDITION. 2- WILLIAM B. COLEMAN and GREGORY J. TSONGALIS – 2010 - MOLECULAR DIAGNOSTICS – SECOND EDITION - SPRINGER NEW YORK DORDRECHT HEIDELBERG LONDON
3- Electronic Materials and Web Sites etc.
1- Learn Genetics; 2- The World Health Organization (WHO) website: https://www.who.int/ 3- American Society of Human Genetics;

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: 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

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