



# Course Specifications

<b>Course Title:</b>	<b>Diagnostic Molecular Biology</b>
<b>Course Code:</b>	<b>373314-3</b>
<b>Program:</b>	<b>Bachelor's in Clinical Laboratory Sciences (Level-7)</b>
<b>Department:</b>	<b>Clinical Laboratory Sciences</b>
<b>College:</b>	<b>Applied Medical Sciences</b>
<b>Institution:</b>	<b>Taif University</b>



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## A. Course Identification

<b>1. Credit hours: 3 hours</b>	
<b>2. Course type</b>	
a. University <input type="checkbox"/>	College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered: Level 5/Third Year</b>	
<b>4. Pre-requisites for this course (if any): Medical Genetics (373216-3)</b>	
<b>5. Co-requisites for this course (if any): None</b>	

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 hours /week= 60 hours/semester	100%
2	Blended	None	0%
3	E-learning	None	0%
4	Correspondence	None	0%
5	Other	None	0%

### 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	None
4	Others (specify)	None
	<b>Total</b>	<b>60</b>
<b>Other Learning Hours*</b>		
1	Study	26
2	Assignments	8
3	Library	None
4	Projects/Research Essays/Theses	None
5	Others(lab report)	6
	<b>Total</b>	<b>40</b>

\*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course focus on the DNA and gene expressions, understanding the Molecular Biology and its role in diseases and forensic, and focus on the Laboratory techniques that are used in the molecular lab for both diagnosis and research.

### 2. Course Main Objective

The student should be able to understand the role of molecular biology in the diagnosis of infectious diseases, cancer and other genetic disorders and cover the basic molecular Biology techniques such as DNA extractions, PCR, mutagenesis, diagnostic DNA cloning that are important in molecular research labs. They should be able to apply the knowledge of diagnostic molecular biology principles which are used in research and diagnostic laboratories, and perform quality assurance in the molecular diagnostic laboratory.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge:</b>	
1.1	Explain role of molecular biology in the clinical and research laboratory and recognize basic molecular diagnostic techniques.	K1
1.2	Describe application of molecular biology in forensic medicine, genetic fingerprinting, genetic engineering and diagnosis of various diseases	K1
2	<b>Skills :</b>	
2.1	Critically evaluate and integrate information and develop ideas on methodologies and techniques within the context of molecular biology.	S1
2.2	Explain the importance of molecular diagnostic techniques in diagnosing genetic disorders, human cancer and infectious diseases.	S2
3	<b>Competence:</b>	
3.1	Work effectively in a group in lab and complete tasks within deadlines in professional manner	C3
3.2	Be able to work with chemicals, dyes and know the potential hazards associated with it and to act promptly on exposure to any of these hazards, also handling with laboratory wares and instruments used in Molecular biology laboratory.	C1

### C (a) Course Content(Theory)

No	List of Topics	Contact Hours
1	Introduction	2
2	Tools for Molecular Diagnosis :Recombinant DNA technology • Restriction enzymes (Definition, types and its properties) o Gel electrophoresis (principle, types of gel and its applications) o Cloning vectors (plasmid, phage, cosmid, BAC and YAC) o Transformation and selection o	4

	Application of cloning Genomic and cDNA libraries Expression vector and its applications	
3	<b>PCR</b> Definition, its components and steps Thermal cycler RT-PCR (definition, its dyes and applications) Other types of PCR (colony, allele specific, multiplex and In situ) <b>:DNA sequencing</b> Maxam and Gilbert`s method Sangar`s method Automated sequencing	4
4	<b>Nucleic Acid Hybridizations</b> Principle Applications <b>Blotting:</b> Southern blot (procedure and its applications) Northern blot (procedure and its applications) Western blot (procedure and its applications)	2
5	<b>Bioinformatics and proteomics</b>	2
6	<b>DNA Mapping, Mutagenesis and DNA fingerprinting</b>	2
7	<b>Molecular Diagnostic Applications</b> <b>Genetic Testing: Principles and Practice</b>	4
8	Trangensis and knockout	2
9	<b>Human genome project</b>	2
10	<b>Cancer Genetics</b>	2
11	<b>Genetic testing in individual and populations</b>	4
<b>Total</b>		<b>30</b>

### (b) Course Content (Practical)

No	List of Topics	Contact Hours
1	DNA extraction from strawberry	3
2	DNA extraction from blood	4
3	Determining the Concentration and Purity of DNA	3
4	Polymerase Chain Reaction (PCR)	4
5	Restriction Enzymes (digestion)	3
6	Gel Electrophoresis	4
7	Gel documentation system	3
8	RFLP	3
9	Theoretical Background	3
<b>Total</b>		<b>30</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Explain role of molecular biology in the clinical and research laboratory and recognize basic molecular diagnostic techniques.	- Lectures	- Exams
1.2	Describe application of molecular biology in forensic medicine, genetic fingerprinting, genetic engineering and diagnosis of various diseases.	- Lectures - Practical sessions	- Exams
<b>2.0</b>	<b>Skills</b>		
2.1	Critically evaluate and integrate information and develop ideas on methodologies and techniques within the context of molecular biology.	- Lectures - Practical sessions	- Assignments - Assignments
2.2	- Explain the importance of molecular diagnostic techniques in diagnosing genetic disorders, human cancer and infectious diseases.	- Lectures - Practical sessions - Problem based learning	- Exams - OSPE
<b>3.0</b>	<b>Competence</b>		
3.1	Work effectively in a group in lab and complete tasks within deadlines in professional manner	- Lecture - Group discussions	- Exams - Assessment of scientific activity
3.2	Be able to work with chemicals, dyes and know the potential hazards associated with it and to act promptly on exposure to any of these hazards, also handling with laboratory wares and instruments used in Molecular biology laboratory	- Lecture - Practical sessions	- Exams - Lab report

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid-Term Exam	8 <sup>th</sup> Week	15%
2	Activity	Throughout the semester	5%
3	Practical Report	Throughout the semester	10%
4	Final Practical Exam	16 <sup>th</sup> Week	20%
5	Final Exam	17 <sup>th</sup> /18 <sup>th</sup> Week	50%
6	<b>Total</b>		<b>100%</b>

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Course instructors are available for individual consultation in their free time. They are usually full-time permanent members present on-campus from 8:00 am to 2:30 pm on all working days. Appointments can be made in person with the instructor through email etc. Days and time availability of each instructor are posted on their doors. Course instructors provide a range of academic and course management advice including course planning and its progression.
- Each student at the department of Clinical Laboratory Sciences has an academic adviser who is available for individual consultation and guidance. Appointments can be made in person with the instructor through email etc. Days and time availability of each adviser are posted on their doors. The academic adviser can provide support with time management, exam preparation, clarification of subject requirements, feedback on performance and dealing with personal issues as well.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>- Principles of Gene Manipulation and Genomics, 7th Edition by Sandy Primrose and Richard Twyman (2006)</li> <li>- Genomes 3 by Brown, T.A.(2006)</li> <li>- Introduction to Biotechnology 3rd edition by William Thieman and Micheal Palladino (2013)</li> </ul>
<b>Essential References Materials</b>	None
<b>Electronic Materials</b>	Websites, Search engines (Saudi Digital Library, PubMed, Google Scholar) None
<b>Other Learning Materials</b>	Journals, Scientific Magazines and Articles. <a href="https://www.journals.elsevier.com/journal-of-molecular-biology/">https://www.journals.elsevier.com/journal-of-molecular-biology/</a>

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms and Laboratories
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Data show, Blackboard and A/V
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or	Kits for extraction of DNA and RNA PCR machine

Item	Resources
attach a list)	Agarose electrophoresis, PAGE Gel documentation system UV transilluminator Set up for Southern and Western Blotting

### G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student's feedback on effectiveness of teaching and quality of courses.	Students	Indirect: Questionnaire Survey at the end of each semester.
Alignment map of course ILOs with that of program ILOs.	Development and accreditation committee	Direct: Student's Performance
Availability of learning resources, facilities and equipments related to each course.	Students and faculty	Indirect: Questionnaire Survey at the end of each semester.
Evaluation of teaching	Peer evaluators	Direct: Peer evaluation
Standard of student achievement	Examination Committee	Direct: Students grades
Periodical review of course effectiveness and planning for its improvement.	Teaching staff/ Development and accreditation committee	Indirect: Review by Department Committee

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

### H. Specification Approval Data

Council / Committee	Department Meeting
Reference No.	Meeting No.10
Date	10-9-1440

