



Course Specification

— (Bachelor)

Course Title: Molecular Diagnostics
Course Code: 2053202-3
Program: Bachelor in Biotechnology
Department: Biotechnology Department
College: College of Science
Institution: Taif University
Version: V4
Last Revision Date: 3/1445 – 9/2023



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A. General information about the course:

1. Course Identification

1. Credit hours:

3 (2 Lecture, 1 Lab)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (6th Level / 3rd Year)

4. Course general Description:

This course will introduce students to the theory of molecular techniques commonly used in molecular diagnostics laboratory and the underlying principles and applications. Topics to be covered include: the basic principles used in molecular diagnosis process, classification and characteristics of diagnostic tests, genotyping of microbes (virus, bacteria, and fungi), detection of genetic diseases, diagnostic application of polymerase chain reaction, genetic fingerprinting, PCR based assays for disease diagnosis, molecular cytogenetic techniques and forensic identification.

5. Pre-requirements for this course (if any):

Genomics and Proteomics, 2053102-3

6. Pre-requirements for this course (if any):

None

7. Course Main Objective(s):

Describing the basic principles of molecular diagnostics and explaining different examples of applications of molecular diagnostics technique in many fields.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30





2.	Laboratory/Studio	15
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	State the basics of molecular diagnostics techniques	K1	Lecture	Written Exams
1.2	Describe Immunodiagnostics and Production of monoclonal antibodies.	K1	Project	Report
1.3	Explain the principles of mutation analysis as tools of molecular diagnostics	K5	Lecture	Written Exams
2.0	Skills			
2.1	Evaluate the various approaches to study molecular diagnostics	S3	Project	Written Exams (practical)
2.2	Practice methods of molecular diagnostics	S3	Discussion	Report
3.0	Values, autonomy, and responsibility			
3.1	Adopt the academic and professional morals	V1	Brainstorming	Presentation

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction in Molecular Diagnostic	2
2.	Specimen types and uses	2
3.	Tools for Molecular Diagnosis <ul style="list-style-type: none"> ➤ Recombinant DNA technology ➤ Restriction enzymes (Definition, types and its properties) ➤ Gel electrophoresis (principle, types of gel and its applications) ➤ Cloning vectors (plasmid, phage, cosmid, BAC and YAC) 	4
4.	PCR <ul style="list-style-type: none"> ➤ Definition, its components and steps ➤ Thermal cycler o RT-PCR (definition, its dyes and applications) 	4





	<ul style="list-style-type: none"> ➤ Other types of PCR (colony, allele specific, multiplex and In situ) DNA sequencing: <ul style="list-style-type: none"> ➤ Maxam and Gilbert's method ➤ Sangar's method ➤ Automated sequencing 	
5.	Autosomal and sex chromosomal disorders: <ul style="list-style-type: none"> ➤ Down's syndrome, Klinefelter and Turner's syndromes, etc 	2
6.	Fragile-X syndrome; SRY in sex chromosomal anomalies	2
7.	Trinucleotide expansions in fragile-X syndrome, SCA	2
8.	Polymorphisms and mutations: <ul style="list-style-type: none"> ➤ Types and Identification. 	4
9.	Immunogenetics of mice-fusion of myeloma cells.	2
10.	Avidin biotin technique	2
11.	Molecular diagnosis using ELISA Technique	2
12.	Molecular diagnostic of AIDS viruses	2
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam	Week 7	20%
2.	Periodical exam (Quiz)	Week 9	10%
3.	Presentation	Week 11	10%
4.	Practical Exam, Report	Week 14	20%
5.	Final Exam	Week 15	40%

*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	<ul style="list-style-type: none"> • Molecular Diagnostics, edited by George P. Patrinos, Wilhelm Ansoerge, Phillip B. Danielson, 2016 • Molecular Diagnostics: Current Technology and Applications, edited by Juluri R. Rao, Colin Craig Fleming, John E. Moore, 2006.
Supportive References	Selected articles of general interest will be posted on the blackboard. These reading materials are intended to provide the students with background information on the topics under discussion.
Electronic Materials	<ul style="list-style-type: none"> • Web Sites: http://phthisisdiagnostics.com/about/ Twitter: MolecularDiagnostics (@Diagnostics_LR) • https://www.sciencedirect.com/book/9780128028230/diagnostic-molecular-biology





Other Learning Materials

Other learning material such as computer-based programs/CD, professional standards or regulations and software.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One classroom for 2 hours a week and one laboratory for 3 hours a week with internet facility.
Technology equipment (projector, smart board, software)	Data show, Software for Cell Illustrator 4.0: A Computational Platform for Systems Biology, internet connection.
Other equipment (depending on the nature of the specialty)	1. Laboratory for 3 hours per week 2. inverted Microscopes for cell lines investigation 3. Thermal cycler, Gel documentation system and Wister Blot

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Peer Review, Students	Direct (Independent Reviewer), Indirect (survey)
Effectiveness of Students assessment	Faculty members	Direct (Random Correction)
Quality of learning resources	Students	Indirect (survey)
The extent to which CLOs have been achieved	Faculty members	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	6
DATE	5/11/2023

