

Philadelphia University	 PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	Approval date:
Faculty of Science		Issue:
Department of Biotechnology and Genetic Engineering		Credit hours: 1
Academic year 2022/2023		Bachelor

Course information

Course#	Course title	Prerequisite
0240485	Applied Molecular Biology Laboratory	0240482
Course type ☐ University Requirement ☐ Faculty Requirement ☒ Major Requirement ☐ Elective ☒ Compulsory		Class time Tue, Wed (13:10-16:00)
		Room # 2911

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Ahmad Ghuneim	s823	2491	Sun,Tue, Thr (09:30-10:30) Sun,Mon) (13:10-16:00)	aghuneim@philadelphia.edu.jo

Course Delivery Method

Course Delivery Method			
☒ Physical ☐ Online ☐ Blended			
Learning Model			
Percentage	Synchronous	Asynchronous	Physical
			☒

Course Description

This module is a major (Mandatory) Departmental course for the Fourth Year. It is taught by lectures, lab and Technology-based. The module focuses on selected basic methods in the purification of biological macromolecules: Protein and RNA. The course deals with horizontal and vertical electrophoresis using polyacrylamides and agarose gels, centrifugation, detection techniques such as immunoblotting and other essential techniques in modern gene technology i.e cDNA synthesis, RT-PCR and qPCR.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes
Knowledge		
K1	Demonstrate theoretical and practical knowledge and experience of basic methods and techniques that used to isolate, quantify, separate and detect proteins including protein extraction methods, Bradford assay, SDS-PAGE, Western blotting.	Kp3
K2	Demonstrate theoretical and practical knowledge and experience of basic methods and techniques in applied molecular biology including RNA Extraction, RNA Extraction Assessment, RT-PCR, Real Time PCR.	Kp3
Skills		
S1	Demonstrate ability and responsibility in using, preserving and maintaining laboratory equipment's necessary in the applications of biotechnology and related fields.	Sp1
S2	Investigate and analyze the role of heredity and molecular genetics in a wide range of application.	Sp2
Competencies		
C1	Recognize the use of biotechnology to study, monitor and treat diseases and alter food and environment.	Cp1
C2	Demonstrate critical thinking skills utilize a wide range of information sources and communicate through oral presentations and written reports.	Cp2
C3	Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.	Cp3
C4	Demonstrate professional and ethical conduct in compliance with biorisk and biosafety regulations.	Cp4

Learning Resources

Course textbook	There is no lab manual for this course. handouts, protocols and accompanying papers will be provided for every student.
Supporting References	
Supporting websites	
Teaching Environment	☐ Classroom ☒ laboratory ☐ Learning platform ☐ Other

Meetings and subjects timetable

Week	Topic	Learning Methods	Tasks	Learning Material
1	Understanding and application of Material Safety	Lecture		Handouts
2	Protein Extraction	Lecture and practical work	Isolate nuclear and cytoplasmic proteins from mouse liver and kidney	Handouts
3	Determination of protein concentration (Bradford Assay)	Lecturer and practical work	Estimate the quantity of nuclear and cytoplasmic proteins	Handouts
4	SDS-PAGE Part I	Lecture	Preparing vertical gel	Handouts
5	SDS-PAGE Part II	Lecture and practical work	Run samples by the electrophoresis	Handouts
6	SDS-PAGE Part III	Lecture and practical work	Staining and de-staining procedure	Handouts
7	Western Blot Analysis Part 1	Collaborative	Perform blotting step	Handouts
8	Western Blot Analysis Part II	Problem solving	Continuing with procedure steps	Handouts
9	Midterm Exam			Handouts
10	Total RNA isolation	Lecture and practical work	Extract the total RNA from whole blood.	Handouts
11	RNA Quantity and Quality Detection	Flipped Class	Estimate the quantity and quality of RNA.	Video
12	Reverse Transcription PCR	Lecture and practical work	Preparing the RT-PCR reactions	Handouts
13	Real Time PCR	Lecture and practical work	Preparing the real time pcr reaction	Handouts
14	Real Time PCR Application	Collaborative learning	Analysis the results	Handouts
15	Final Exam			

* includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

Course Contributing to Learner Skill Development

Using Technology
Recognize legitimate and scientific information
Communication skills
Creating a safe ambiance, motivate students to initiate and engage in conversation, encouraging them to participate in teamwork and sharing opinions.
Application of concepts learnt
Inspiring students to set challenging goals and transferring the knowledge to new problems and situations by engaging them in cooperative learning and simulation.

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	% 30	8	K1, S1,S2
Various Assessments *	% 30	3,5,6,8,11,14	K,S,C
Final Exam	% 40	15	K2, S1,S2
Total	%100		

* includes: quiz, in class and out of class assignment, presentations , reports, videotaped assignment, group or individual projects.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Learning Method*	Assessment Method**
Knowledge			
K1	Demonstrate theoretical and practical knowledge and experience of basic methods and techniques that used to isolate, quantify, separate and detect proteins including protein extraction methods, Bradford assay, SDS-PAGE, Western blotting.	- Lecture - Problem solving - Flipped classes.	- Exam - Report - Videotaped assignment
K2	Demonstrate theoretical and practical knowledge and experience of basic methods and techniques in applied molecular biology including RNA Extraction, RNA Extraction Assessment, RT-PCR, Real Time PCR.	- Collaborative learning - Practical work.	- In class assignment
Skills			
S1	Demonstrate ability and responsibility in using, preserving and maintaining laboratory equipment's necessary in the applications of biotechnology and related fields.	Practical work.	Report Observation
S2	Investigate and analyze the role of heredity and molecular genetics in a wide range of application.	Practical work	Exam In class assignment
Competencies			
C1	Recognize the use of biotechnology to study, monitor and treat diseases and alter food and environment.	Lecture Problem solving	Exam In class assignment
C2	Demonstrate critical thinking skills utilize a wide range of information sources and communicate through oral presentations and written reports.	Collaborative learning	Assignment and Reports
C3	Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.	Flipped class	Videotaped assignments
C4	Demonstrate professional and ethical conduct in compliance with biorisk and biosafety regulations.	Practical Work	Observation

* includes: Lecture, flipped Class, project- based learning , problem solving based learning, collaborative learning

** includes: quiz, in class and out of class assignment , presentations , reports, videotaped assignment, group or individual projects.

Course Policies

Policy	Policy Requirements
Passing Grade	The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%).
Missing Exams	• Missing an exam without a valid excuse will result in a zero grade to be assigned to the exam or assessment. • A Student who misses an exam or scheduled assessment, for a legitimate reason, must submit an official written excuse within a week from the an exam or assessment due date. • A student who has an excuse for missing a final exam should submit the excuse to the dean within three days of the missed exam date.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lectures days (M, W) and seven lectures (S,T,R). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory excuse accepted by the dean of the faculty, s/he will be prohibited from taking the final exam and the grade in that course is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college, then withdrawal grade will be recorded.
Academic Honesty	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as: cheating, plagiarism (academic theft), collusion, and violating intellectual property rights.

Program Learning Outcomes to be Assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Target Performance level
Kp3	Understand the molecular techniques including: immunological techniques, gene cloning, polymerase chain reaction, DNA sequencing, gene editing, blotting and nucleic acids hybridizations along with the basic skills of laboratory organization and management.	Applied Molecular Biology Laboratory	- Exam - Report - Videotaped assignment - In class assignment	75%
Sp1	Demonstrate ability and responsibility in using, preserving and maintaining laboratory equipment's necessary in the applications of biotechnology and related fields.	Applied Molecular Biology Laboratory	Observation Report Exams	75%
Sp2	Investigate and analyze the role of heredity and molecular genetics in a wide range of application.	Molecular Biology Laboratory	Exam Assignment	75%
Cp1	Recognize the use of biotechnology to study, monitor and treat diseases and alter food and environment.	Applied Molecular Biology Laboratory	Exam Assignment	75%
Cp2	Demonstrate critical thinking skills utilize a wide range of information sources and communicate through oral presentations and written reports.	Applied Molecular Biology Laboratory	Assignment and report	75%
Cp3	Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.	Applied Molecular Biology Laboratory	Videotaped assignment and Report	80%
Cp4	Demonstrate professional and ethical conduct in compliance with biorisk and biosafety regulations.	Applied Molecular Biology Laboratory	Observation	80%

