Philadelphia University
Faculty of Science
Department of Biotechnology and Genetic Engineering
1st semester, 2014/2015

Course Syllabus

Course Title: Molecular Biology	**Course code: 240386**
Course Level: 3rd Year	**Course prerequisite (s) and/or corequisite (s):** Cell Biology 240233
Lecture Time: 9:10-10.00am STT	**Credit hours:** 3

Academic Staff

Name	Rank	Location	Office Hours	E-mail Address
Dr. Raida Khalil	**Associate Professor**	**914**	**M&W: 11:00 am -13.00pm Thu: 13-15pm**	**R_khalil@Philadelphia.edu.jo**

Course module description:

This module is a major (Mandatory) Departmental course for the third Year. The course covers the central dogma of molecular biology including gene replication, transcription, translation, gene expression regulation in both prokaryotes and eukaryotes and the future practical application for each process.

Course module objectives:

This course aims at introducing the student to the basic concepts in molecular Biology. It begins by considering the molecular nature of genes and organization of the prokaryotic and eukaryotic genomes. This is followed by DNA replication, repair, gene expression and regulation of gene expression. Techniques used to study these processes will be covered in brief.

Course/ module components

Text Book

Title: Molecular Cell Biology Author(s): Lodish, A.
Berk etal Year: 2012
Publisher: W. H. Freeman and Company
ISBN:978-07167-7601-7

Teaching methods:

Lectures (power points, White Board, Discussion)and assignments.

Learning outcomes:

Knowledge and understanding

Student will learn the essential concepts of molecular biology which include the structure and function of nucleic acids and the molecular mechanisms of DNA replication and gene expression.

Cognitive skills (thinking and analysis).

Students should be able to:

Deduce the structure of DNA and the mechanism of its replication.

Correlate the DNA structure to its function

Correlate the protein-DNA interaction to DNA replication and gene expression

Predict the consequences of various types of mutations on gene expression and organism's viability.

Communication skills (personal and academic).

The instruction medium is English

For every lecture the last five minutes will be open for discussion. For further discussion, the students are welcome at the lecturer's office hour.

Practical and subject specific skills (Transferable Skills).

This course provides the student with a good background in molecular biology which enables him to practice some molecular biology techniques in the practical part of this course (240387).

Assessment instruments

Quizzes. Home works Exams

Allocation of Marks

Assessment Instruments	Mark
First examination	**20%**
Second examination	**20%**
Final examination: 50 marks	**40%**
Reports, Quizzes, Home works	**20%**
Total	**100**

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Course/module academic calendar

Week	Topic	Chapter #	Pages
1	**The nature of genetic material**		
	The chemical nature of polynucleotides	**3**	**33-36**
	The DNA structure (double helix and A,B, Z-forms	**2**	**40-41**
	(revision)	**4**	**101-108**
	DNAs of various sizes and shapes	**10**	**438-443**
	RNA as genes.		
	RNA secondary and tertiary structures		
	Physical chemistry of nucleic acids		
	Organell DNA (assignment)		
2	**Chromatin structure**	**10**	**420-421**
	Histones		
	Nucleosomes		
	Condensation of chromatin		
	Euchromatin and heterochromatin		
3	**Molecular structure of genes**	**4**	**111-115**

	Bacterial operons and the production of polycistronic mRNAs Eukaryotic genes and the production of monocistronic mRNAs Simple and complex transcription units in eukaryotic genome Alternative splicing and skipping RNA processing of the complex transcription units.	**10**	**405-408**
4-5	**The complexity of the eukaryotic genome** Protein-coding genes solitary genes, duplicated and gene families. Repitious DNA: simple and highly repeated DNA sequences: satellite, minisatellite, microsatellite. Moderately repeated DNA sequences: transposons, viral and nonviral retrotransposons (LINES and SINES). mechanisms of transpositions. processed pseudogenes Unclassified spacer DNA.	**10**	**408-424**
6 &7	**Enzymology of DNA replication** DNA polymerases Helicase DNA ligase Primase Telomerases Topoisomerase **<u>First Hour Exam in week No. 6</u>** **DNA replication machinery** General features of DNA replication Replication in prokaryotes Replication in eukaryotes	**7** **4**	**119-145** **106-107**
	DNA damage and repair Nucleotide excision repair. Base excision repair. Mismatch repair. Double strand breakage repair.	**10**	**193-216**
9-11	**Transcription** RNA polymerase structure in prokaryotes and eukaryotes. Transcription initiation by RNA polymerase I, II, III and organell-specific RNA polymerases. Regulatory sequences in prokaryotes and eukaryotes Activators, repressors and general transcription factors	**4** **4** **11** **11**	**108-114** **115-118** **447-463** **468-491**

	Molecular mechanisms of transcription activation and repression: Modulation of chromatin structure Gene expression silencing Histone deacetylation and hyperacetylation Mediators Activators and co-activators control assembly of the preinitiation complex. Stages of transcription in prokaryotes and eukaryotes: Initiation, Elongation and Termination **Second Hour Exam in week No. 11**		
12	**Nuclear mechanisms of post-transcriptional control** Pre-mRNA processing: Splicing Capping Cleavage/Polyadenylation Pre-rRNA processing: Splicing Cleavage Exonucleolytic digestion Base modification Pre-tRNA processing: Splicing	**12**	**493-504** **525-531**
13	**Export of mRNPs from the Nucleus**	**12**	**514-517**
14	**Cytoplasmic mechanisms of post-transcriptional control** Mechanisms of mRNA degradation in the Cytoplasm Surveillance mechanisms prevent translation of improperly processed mRNAs Localization of mRNAs permits production of proteins at specific regions within the cytoplasm Micro RNAs (miRNAs) RNA interference (RNAi)	**9** **12**	**393** **518-524**
15	**Translation** The genetic code **(**revision) The structure of: t-RNA (revision) Prokaryotic and eukaryotic ribosomes Aminoacylation of tRNA (revision) Stages of translation in prokaryotes and eukaryotes	**4**	**119-131**

	(initiation, elongation and termination) Post-translational modifications.			
16	**Final Exam**			

Module references

Books

Title:Essential Molecular iology

Author(s): Malacinsk G. M.

Publisher: Jones and Bartlett Publishers
Year: 2003
ISBN:0-7637-4011-X

Title:'Instant notes Molecular Biology,2001 Author(s) 'Turner et al.
Publisher: BIOS Scientific Publishers Limited.
ISBN:
Title:'Molecular Biology-Understanding the Genetic revolution'2005
Author(s): Clark, D.P.
Publisher; Elsevier Academic Press. ISBN: 0-12-175551-7.
Title:'Cell and Molecular Biology' 2002 Author(s): Karp,
Publisher: John Wiley and Sons,. ISBN: 0-471-38913-7

Journals

Biotechnology
The Asian Network for Scientific Information
http://www.ansinet.org/c4p.php?j_id=biotech

Genetics & Molecular Biology Brazilian Society for Genetics
http://www.scielo.br/cgi-bin/fbpe/fbsite?got=site &pid=1415-4757&lng=en

American Journal of Biochemistry & Biotechnology
The Asian Network for Scientific Information
http://ansinet.org/sciencepub/c4p.php?j_id=ajbb

Bioscience - Journal of College Biology Teaching
The Association of College & University Biology Educators.
http://papa.indstate.edu/amcbt/bioscene.html

International Journal of Biological Sciences Ivyspring International Publisher http://www.biolsci.org/index.htm

Websites http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/Promoter.html#Transcription_s tart_site.

http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/T/Translation.html.