



SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
BIO	232	Molecular Biology	3	2	2	0	3-5	BIO 231	4	English

A. Course Description

This course covers a detailed analysis of the biochemical mechanisms that control the maintenance, expression, and evolution of prokaryotic and eukaryotic genomes. The topics covered in lectures and readings of relevant literature include gene regulation, DNA replication, genetic recombination, and mRNA translation. In particular, the logic of experimental design and data analysis is emphasized.

B. Course Outcomes

At the end of this course the student will be able:

1. To explain and give examples of how ionic, hydrophobic, and hydrogen bonding interactions determine the structure of nucleic acids and proteins and modulate the specificity of binding between them.
2. To describe the molecular structure of genetic material and function.
3. To distinguish between different molecular biology techniques that are used to isolate, separate, and probe for specific proteins, nucleic acids, and their interactions. Identify limitations of these techniques.
4. To compare and contrast the mechanisms of bacterial and eukaryotic DNA replication, DNA repair, transcription, and translation.
5. To explain how DNA topology and chromatin structure affects the processes of DNA replication, repair, and transcription.
6. To give examples of DNA and histone modifications and predict how they will affect gene expression.
7. To provide examples of how homologous recombination is used to ensure genome stability and promote genetic diversity.

C. References:

Required Textbook

- Bruce Alberts , Alexander Johnson et al. Molecular Biology of the Cell, 6th Ed.(2014) , ISBN-13: 978-081534432.
- Harvey Lodish et al., Molecular Cell Biology 7th (2012). ISBN-13: 978-1429234139..

Other references:

- Journals Ranked by Impact: Biochemistry & Molecular Biology".2014 Journal Citation Reports. Web of Science (Sciences ed.) (Thomson Reuters). 2015
- -American Journal of Molecular Biology, ISSN Print: 2161-6620 , ISSN Online: 2161-6663

Course Website: Google Classroom Webpage: <http://www.imamm.org/>



D. Topics Outline

D1. Lectures topics

1. *How do nucleic acids and proteins interact in a genomic context.*
2. *The molecular structure of genetic material and function.*
3. *Structure of chromosome and recombination.*
4. *Nucleic acids and tools for analysis.*
5. *Genome sequencing and analysis.*
6. *DNA topology and chromatin.*
7. *Proteins and tools for analysis.*
8. *Interactions between nucleic acids and proteins.*
9. *Cell cycle and DNA replication.*
10. *DNA damage and repair I.*
11. *DNA damage and repair II – group work.*
12. *Regulation of Gene expression in eukaryotic and prokaryotic*
13. *Mechanisms of transcription in bacteria.*
14. *Chromatin and transcription in eukaryotes.*
15. *RNA splicing and processing.*
16. *The genetic code and translation initiation.*
17. *Mechanisms and regulation of translation.*
18. *Regulation of gene expression I.*
19. *Regulation of gene expression II.*
20. *Regulation of gene expression by small RNAs.*
21. *Tools for genome editing.*
22. *Work of the map the genome and its applications.*

D2. Laboratories topics

1. *Isolation of plasmids*
2. *Isolation of Plasmid DNA / agarose gel electrophoresis*
3. *Enzymatically digest the DNA.) Extraction of protein,*
4. *Preparation of solutions and installation of the gel, separation process and running*
5. *Induction of Stress Protein Synthesis in E. coli*
6. *Cloning: Genomic DNA prep*
7. *Gene transfer.*
8. *Ligation, transformation, digest, gel*
9. *Polymerase chain reaction.*
10. *General revision*



E. Office hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final lab. Exam :** 14th or 15th week.
- **Final Exam :** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 15 %	Midterm 2: 15 %	Final lab. Exam: 20%	Final Exam: 40 %
Quizzes, Homework, Attendance & Participation: 10 %			

The grading distribution:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95]	[85, 90]	[80, 85]	[75, 80]	[70, 75]	[65, 70]	[60, 65]	[0, 60]

A. Student Workload

#	Teaching/Learning activities	Contact hours	Frequency	Total contact hours	Self-study hours	Total self-study hours	Student learning time
5	Lecture	2	15	30	2	30	60
2	Tutorial	0	0	0	0	0	0
0	Lab\practical	2	15	30	1	15	45
5	Homework	0	4	0	2	8	8
4	Quiz	0.5	2	1	1	2	3
6	Midterm	1.5	2	3	5	10	13
7	Final Exam	2	1	2	12	12	14
Total				66		77	143

The independent self-study is approximately 5 hours per week.



G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](#)

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