



**Department of veterinary medicine**

**College of Veterinary Medicine**

**University of Salahaddin-HAWLER**

**Subject: MOLECULAR BIOLOGY**

**Course Book – (1<sup>st</sup> Year Veterinary medicine Students)**

**Lecturer's name(s): M.Sc. Dr. MOUFAQ JAMAL DAWOOD  
(Practical Lecturer)**

**Academic Year: 2023-2024**

## Course Book

1. Course name	MOLECULAR BIOLOGY
2. Lecturer in charge	Dr. MOUFAQ JAMAL DAWOOD (Practical Lecturer)
3. Department/ College	VET MEDICINE DEPT. / COLLEGE OF VETERINARY MEDICINE
4. Contact	e-mail: <a href="mailto:moufaq.dawood@su.edu.krd">moufaq.dawood@su.edu.krd</a> Tel: (optional)
5. Time (in hours) per week	6 hrs. (3×2)
6. Office hours	To be Return to the schedule on the office door
7. Course code	
8. Teacher's academic profile	<ul style="list-style-type: none"> <li>• In 2013 I got my master (M.Sc.) degree in Molecular-Microbiology at GAZIANTEP University in Turkey. In 2022 From that time, as a Lecturer, I am in charge in teaching Molecular Techniques practical for 1<sup>st</sup> class students Veterinary Medicine College, Teaching Cell Biology practical for 1<sup>st</sup> class students Veterinary Medicine College.</li> <li>• In 2013 I got my master (M.Sc.) degree in Molecular-Microbiology at GAZIANTEP University in Turkey. From that time, as a Lecturer, I am in charge in teaching Molecular Techniques practical for 1<sup>st</sup> class students Agriculture Science College, Teaching Cell Biology practical for 1<sup>st</sup> class students Agriculture Science College.</li> <li>• I graduated from Mousl University in 1994 (Ranked Top 2<sup>nd</sup> in collage) for IRAQ, then from 2013 until getting my MSc degree worked as Laboratory Technician in Animal Science Resource Department.</li> </ul>

	<b>Practical Molecular Biology.</b>
<b>9. Keywords</b>	<b>DNA Structure, RNA Structure, Protein.</b>
<p><b>10. Course overview:</b></p> <ul style="list-style-type: none"> <li> <p>▪ <b>The importance of studying the subject:</b> Molecular Biology Practical(MBP) introduces students to the organization and function of biological organisms at the molecular, cellular, organismal, and ecological levels. In this major, students learn how to apply biological principles to understand how organisms function in their environment. Cells, and the structures they comprise, are too small to be directly seen, heard, or touched. In spite of this tremendous handicap, cells are the subject of hundreds of thousands of publications each year, with virtually every aspect of their minuscule structure coming under scrutiny. In many ways, the study of cell and molecular biology stands as a tribute to Animals curiosity for seeking to discover, and to human creative intelligence for devising the complex instruments and elaborate techniques by which these discoveries can be made. This is not to imply that cell and molecular biologists have a monopoly on these noble traits. At one end of the scientific spectrum, astronomers are utilizing an orbiting telescope to capture images of primordial galaxies that are so far from earth they appear to us today as they existed more than 13 billion years ago, only a few hundred million years after the Big Bang. At the other end of the spectrum, nuclear physicists have recently forced protons to collide with one another at velocities approaching the speed of light, confirming the existence of a hypothesized particle—the Higgs boson—that is proposed to endow all other subatomic particles with mass. Clearly, our universe consists of worlds within worlds, all aspects of which make for fascinating study.</p> </li> <li> <p>▪ <b>Understanding of the fundamental concepts of the course:</b> To provide a detailed discussion of each topic in the restricted time available means, it has been necessary to assume a very fast fresher review of students understanding of Basic Molecular Biology Practical, Basic Genetics, Chromosomal Structure and DNA replication, Transcription and Protein Synthesis. This course book is therefore intended to complement your knowledge in this area of Bio-sciences.</p> </li> <li> <p>▪ <b>Principles and theories of the course:</b> This course tries to address topics that enhance students understanding the importance of Molecular Biology and some Biochemistry via studying the Molecular and Genetic Revolution and a meaningful understanding of how living organisms functioning's including an appreciation of how cells operate at the molecular level from cell division to DNA doubling then to Protein Synthesis.</p> </li> <li> <p>▪ <b>A sound knowledge of the major areas of the subject:</b> In writing this course book, I have attempted to combat the frustration because I and many others have faced difficulties when reading papers, reviews and other books, in finding that essential points are often spread over many pages of text and embellished to such an extent that the salient</p> </li> </ul>	

information is difficult to extract. In accordance with these aims, I have presented the below inter-related Topics for Molecular Biology covering most recent discoveries including some cloning's and Molecular Methodologies applied in the field of Environmental sciences.

▪ **Sufficient knowledge and understanding to secure employment:**

In order to get a comprehensible understanding of the course topics and objectives, students must have a basic knowledge about Cell Biology, Molecular Biology, Genetics and Biochemistry.

**11. Course objective:**

This course will give students hands-on experience in modern molecular biology for obtaining and analysing data in population genetics and systematic biology. Molecular approaches are expected to play an increasing role in environmental problem-solving in the near future, and their success will depend upon a sound understanding of biological principles from molecular through ecological levels. Offered by the Environmental Science, Policy, and Management (ESPM) Department, the Molecular Biology Practical(MBP) major is designed to train students in the organization and function of biological organisms and their integration into the environment. Following completion of this course the successful student will have theoretical experience in modern molecular biology and evolutionary genetics including molecular systematics, genomics, molecular microbiology, molecular diagnostic tools, and population/landscape genetics.

MBP graduates acquire a broad foundation across a breadth of biological core areas, which gives them especially valuable scientific training. The Molecular Environmental Biology degree prepares students well for graduate education in a biological area, or for careers related to biology and the environment, such as:

- scientific research in government, industry, or academia
- biological assessment for various governmental agencies
- environmental consulting firms

**12. Student's obligation**

**\*Exam policy:** Student should engage in 2 exams during the course. From the 3 exams, one will be collected from the weekly quizzes and assignments. Students will have to decide which one to be chosen for correction by the teacher before. There will be no make-up exams for absences students without medical report. By the end of the 2<sup>nd</sup> semester, students must do a final examination regarding this Material.

**\*Classroom polices:**

- 1- Attendance:** You are strongly encouraged to attend class on a regular basis, as participation is important to your understanding of the material. This is your opportunity to ask questions. **You are responsible for obtaining any information you miss due to absence.**
- 2- Lateness:** Lateness to class is disruptive.
- 3- Electronic devices:** All cell phones are to be turned **silent** at the beginning of class and put away **(NOT USED)** during the entire class.
- 4-Talking:** During class please refrain from side conversations. These can be disruptive to your fellow students and your professor
- 5- No Disrespectful to both the professor and to your fellow students.**
- 6- Every week Quizzes for previous lectures are obligatory.**

### 13. Forms of teaching

As in the Course book Text and Power Point Lectures. Different forms of teaching will be used to reach the objectives of the course: real-time teaching via white board, student integrations strategy, power point presentations for titles, sub- titles, figures, flow charts and summarizing the lecture main topic. Daily quizzes, Laboratory Technique Practical, students tutorials (15 minutes at least) and assignments will be established and will have their impact on the students final Marks.

### 14. Assessment scheme

Component	Date	Percent
Exam 1 <sup>st</sup> attempt	7/12/2022	15 %
Exam 2 <sup>nd</sup> attempt	20/01/2023	15 %
Exam 3 <sup>rd</sup> attempt	Weekly quizzes	2 %
Respecting Classroom Policy		3%
<b>Total (average of the 3 collective exams)</b>		<b>35%</b>

### **15. Student learning outcome:**

The importance and goals behind this course program is to provide the students a clear overview about important subject areas in Molecular Biology and related Genetics, but at a level that is suitable for undergraduate students. By the end of this course, students will be able to understand many arguments in the field of Molecular genetics, biochemistry and cell biology. They will have an advanced knowledge to study many clinical problems and genetically disorders. Therefore, they will find a good chance to work in many Governmental and Private sector laboratories. Following completion of this course the successful student will have practical experience in modern molecular techniques used for evolutionary genetics including molecular systematics, genomics, molecular microbiology, separation method for nucleic acids, separation methods for proteins and other bio- molecules, Melting peak characters and hyper-chromic character of DNA, and population/landscape genetics. Lecture will focus on experimental design, data collection and analysis.

### **16. Course Reading List and References:**

1. Gerald Karp. 2013. Cell And Molecular Biology, Concepts And Experiments. 7th Edition-
2. Nalini Chandar. 2010. Ippincott's Illustrated Reviews: Cell And Molecular Biology.
3. David Clark. 2015. MOLECULAR BIOLOGY. *Southern Illinois University*. Elsevier Academic Press
4. John M. Walker. 2008. Molecular Biomethods, Handbook . Second Edition
5. Eberhard Passarge. 2007. Color Atlas Of Genetics.
6. Andreas D. Baxevanis. 2001. BIOINFORMATICS, A Practical Guide To The Analysis Of Genes And Proteins. SECOND EDITION

### **Useful websites (electronic sites):**

1. U.S. National Center for Biotechnology Information Pub-Med  
(<http://www.ncbi.nlm.nih.gov/pubmed/>)
2. University of California (<http://mcb.berkeley.edu/>)
3. Biomedical Centre: (<http://www.biomedcentral.com/bmcmolbiol>).

**17. The Topics:****18. Practical Topics**

<b>Weeks / Lecturer's Name:</b>	<b>Practical Topics</b>
Week 1	Introduction, Basic Practical Molecular Biology
Week 2	BIOSAFETY
Week 3	BIOSECURETY
Week 4	Laboratory Equipment's
Week 5	Veterinary Laboratory Equipment's
Week 6	EXAMINATION 1
Week 7	DNA EXTRACTION IN LEMON STRAWBERRY
Week 8	RNA EXTRACTION IN SPLEEN OF COW
Week 9	REPORT Prepare by Students
Week 10	MICROSCOPES
Week 11	SAMPLES Prepare and Analysis in Laboratory
Week 12	Visit of RESEARCHES CENTERS
Week 13	Reports of Students
Week 14	CENTRIFUGES
Week 15	Type of microscope
Week 16	Amoeba under Microscope
Week 17	Tissue culture
Week 18	2 <sup>nd</sup> Examination

## 19. Examinations-

### Examinations- Practical:

#### 1. Compositional:

Q: A- explain with figure the tRNA structure. (5 Marks)

B- Count and Describe different types of ribosomes in prokaryotes and Eukaryotes. (5 Marks)

Q: Explain the reasons behind the followings (answer only 3): (3 Marks each)

- The mutation rate of Human Genome is reduces from theoretical one mutation every  $10^6$  to about one mutation every  $10^9$  Nucleotide Replication.
- Replication in Eukaryotes occur in multiple loci while in Prokaryotes are single location? Why?

#### 2. True or false type of exams:

Q: Indicate the True-False statements. Students MUST correct the false statements. (7.5 Marks)

- The human haploid cell contains about  $3 \times 10^9$  nucleotides. T
- The genome of human being can harbour about 1.5 M genes but actually it has only 25000 genes.
- Short tandem repeats (STR) are repetitive sequences of DNA ranging from 7-9 nucleotides. F (2-6 nt)

#### 3. Multiple choices: Chose the correct answer and then fill in the gaps(s). (1.5 Marks each)

Q: Fill in the Gaps with suitable word(s). (7.5 Marks)

- A gene  is a complete sequence region of the genome necessary for generating a functional products.
  - The process which the DNA of an ancestral cell is transformed to RNA is called by   Transcription  .
  - The proteins required for the stability of the separated single stranded of DNA during replication process are called by   SSBP  .
  - Methylation  of the Cytosine's.
- One of the important processes through which the genes become regulated is the

## 20. Extra notes:

Over the last few years, increased importance has been placed on rules for Molecular Biology in animal welfare, due to the convergence of several factors, Regulations: World organisation for animal health, Increased production, Intensive animal farming with more productive, but less rural animals. The condition of litter is a determining factor in animal health. It is essential to maintain high levels of hygiene in these areas, and to prevent pathogenic germs from entering by any means of contact. This prevents: infection via the umbilical cord, neo-natal, septicaemia, meningitis, arthritis, vaginitis, mastitis, dermatitis, lameness, atmospheres, laden with ammonia and moisture.



**21. Peer review**