

COURSE DESCRIPTIONS

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| Faculty | Allied Medical Sciences | | | | |
| Department | Medical Laboratory Science | | | NQF level | 6 |
| Course Title | Molecular Biology | Code | 902228 | Prerequisite | 891108 |
| Credit Hours | 3 | Theory | 2 | Practical | 3 |
| Course Leader | Ibrahim Odat | Email: | Ibrahim.odat@jadara.edu.jo | | |
| Lecturers | Ibrahim Odat | Email: | Ibrahim.odat@jadara.edu.jo | | |
| Lecture time | Sunday, Tuesday @ 11:30-13:00 | Classroom | D008 | | |
| Semester | Spring Semester 2022/2023 | Production | 2019 | Updated | 2023 |

Short Description

This course provides the student with the basics, fundamentals and concepts the of molecular biology. It discusses nucleic acids and chromosomes structures and packaging, DNA topology, RNA secondary and tertiary structure, events of DNA replication, mechanisms of DNA proofreading and mismatch repair, events of DNA transcription and RNA synthesis as well as post-translational modifications and finally RNA translation and proteins synthesis cellular processes.

Course Objectives

At the end of the semester, students are expected to develop an understanding of certain core concepts of molecular biology including DNA, RNA and chromosomal structure and DNA packaging as well as information flow processes and gene expression and regulation.

Course Intended Learning Outcomes (CILOs)

A. Knowledge - Theoretical Understanding

- a1. Show the structure of the genetic material in different types of cells. **(K1)**
- a2. Explain the process of DNA replication/synthesis in the cells and the regulatory elements. **(K1)**
- a3. Explain the process of genetic information flow and gene expression including events of DNA transcription, RNA translation as well as the regulatory elements of these processes. **(K1)**

B. Knowledge - Practical Application

- a4. Identify the principles of the different molecular biology techniques. **(K1)**

C. Skills - Generic Problem Solving and Analytical Skills

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| b1. List the differences between DNA replication, DNA transcription and RNA translation. (S1) |
| D. Skills - Communication, ICT, and Numeracy |
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| E. Competence: Autonomy, Responsibility, and Context |
| c1. Compile the process of gene expression in prokaryotic and eukaryotic types of cells. (C1) |
| Teaching and Learning Methods |
| The teaching method utilizes PowerPoint presentation and animated simulations of topics under discussion. Questions and answers approach centered on enhancing student critical thinking and problem-solving skills is used. Practical session emphasis is placed on individual and teamwork, which designed to enhance and promote the practical skills and handling nucleic acids in the laboratory. |

| Theoretical Course Content | | | | | |
|-----------------------------------|--------------|--------------|---|--|---------------------------|
| Week | Hours | CILOs | Topics | Teaching & Learning Methods | Assessment Methods |
| 1 + 2 | 4 | a1 | The Structure of DNA | Lecture and Group Discussion | Quizzes + MidExams |
| 3 | 2 | a1 | The Structure of RNA | Lecture and Group Discussion | Quizzes + MidExams |
| 4 | 2 | a1 | Genome Structure, Chromatin and the Nucleosome | Lecture and Group Discussion | Quizzes + MidExams |
| 5 + 6 | 4 | a2, c1 | The Replication of DNA | Lecture and Group Discussion | Quizzes + MidExams |
| 7 | 1 | - | Midterm exam | | |
| 7 | 1 | a2 | The Mutability and Repair of DNA | Lecture and Group Discussion | Quizzes + MidExams |
| 8 | 2 | a3, c1 | Mechanisms of DNA Transcription and RNA synthesis | Lecture and Group Discussion | Quizzes + Final Exams |
| 9 | 2 | a3, c1 | Posttranscriptional modifications | Lecture and Group Discussion | Quizzes + Final Exams |
| 10 | 2 | a3, c1 | Regularity mechanisms of DNA transcription in prokaryotes | Lecture and Group Discussion | Quizzes + Final Exams |
| 11 | 2 | a3, c1 | Regularity mechanisms of DNA transcription in eukaryotes | Lecture and Group Discussion | Quizzes + Final Exams |
| 12 | 2 | a3, c1 | Translation and polypeptide synthesis | Lecture and Group Discussion | Quizzes + Final Exams |
| 13 | 2 | a3, c1 | Posttranslational modifications | Lecture and Group Discussion | Quizzes + Final Exams |
| 14 | 2 | | Revision | Group Discussion | |

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| 15 & 16 | 2 | | Final exams | | |
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| Practical Course Content | | | | | |
|---------------------------------|--------------|--------------|---|--|---------------------------|
| Week | Hours | CILOs | Topics | Teaching & Learning Methods | Assessment Methods |
| 2 | 3 | a4, b1 | Nucleic acids extraction from animal cells | Group practical session | Lab report + Final Exams |
| 3 | 3 | a4, b1 | Nucleic acids extraction from bacterial cells | Group practical session | Lab report + Final Exams |
| 4 | 3 | a4, b1 | Nucleic acids extraction from blood | Group practical session | Lab report + Final Exams |
| 5 | 3 | a4, b1 | Agarose gel preparation | Group practical session | Lab report + Final Exams |
| 6 | 3 | a4, b1 | DNA digestion with restriction enzymes | Group practical session | Lab report + Final Exams |
| 7 | 1 | - | Midterm exam | | |
| 8 | 3 | a4, b1 | Agarose gel electrophoresis | Group practical session | Lab report + Final Exams |
| 9 | 3 | a4, b1 | Agarose gel staining and visualization | Group practical session | Lab report + Final Exams |
| 10 | 3 | a4, b1 | PCR | Group practical session | Lab report + Final Exams |
| 11 | 3 | a4, b1 | Southern blot | Group practical session | Lab report + Final Exams |
| 12 | | | Practical Final exams | | |

| Infrastructure | |
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| Textbook | 1. Diagnostic Molecular Biology, Chang-Hui Shen, 1 st edition, 2019. |
| References | Molecular Diagnostics: Fundamentals, Methods and Clinical Applications, Lela Buckingham and Maribeth Flaws, 2007. |
| Required reading | Handout |
| Electronic materials | Powerpoint slides are uploaded into the Jadara University e-learning system. |
| Others | |

| Course Assessment Plan | | | | | | | |
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| Assessment Method | Grade | CILOs | | | | | |
| | | a1 | a2 | a3 | a4 | b1 | c1 |
| First (Midterm) | 30% | 5 | 5 | | 5 | 5 | 10 |
| Second (if applicable) | | | | | | | |
| Final Exam | 50% | 10 | 10 | 10 | 5 | 5 | 10 |
| Coursework | 20% | | | | | | |
| Coursework assessment methods | Assignments | | | | | | |
| | Case study | | | | | | |
| | Discussion and interaction | | | | | | |
| | Group work activities | | | | | | |
| | Lab tests and assignments | 10% | | | | 5 | 5 |
| | Presentations | | | | | | |
| | Quizzes | 10% | 2 | 2 | 2 | | |
| Total | 100% | 17 | 17 | 12 | 15 | 15 | 24 |

| Plagiarism |
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| <p>Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code).</p> <p>Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.</p> |