

**Mutah University**

**Academic development and Quality Assurance Center**

**Course Plan Specification Form**

**Course: Molecular Biology**

**Faculty of Medicine**

**Department: Biochemistry and Molecular Biology**

**Academic Year: 2020-2021**

# A. Course specification and |General information:

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| University of Mutah | Course Title: Molecular Biology |
| Faculty of Medicine | Code: 1503102 |
| Department: Biochemistry and Molecular Biology | Credit Hours: 2 hours |
| Semester/Academic year: Second/2020-2021 | Instructors: Teaching staff |
| Office hours: Variable according to the staff members | Course level: First year |

**B. Objectives and Expected Learning Outcomes:**

# The overall objective is to enhance student understanding of Advanced Molecular Biology and Genetics-based Medical topics to be covered in later courses.

# 1. Knowledge:

# A. Lectures:

# - Understand the involvement of molecular biology in medicine

# - Understand the chemical structures of DNA and chromosomes

# - Understand the mechanism and regulation of DNA replication

# - Understand the mechanism and regulation of gene expression (transcription and

# translation)

# - Understand the types and causes of DNA mutations

# - Understand the mechanisms of DNA repair

# - Understand the mechanism of inheritance

# - Understand the mechanism of disease inheritance

# - Understand the mechanisms of signal transduction pathways and their regulation of

# gene expression

# - Keep up with advancement in the field of molecular biology

# B. Laboratory:

# - Be acquainted of laboratory safety, data collection and reporting

# - Be proficient in liquid handling and pipetting

# - Determination of DNA concentration

# - Extraction and measurement of plasmid DNA

# - Cleavage of DNA by restriction endonucleases

# - Performance of DNA fingerprinting

# - Performance of DNA electrophoresis

# - Performance of Polymerase Chain Reaction

# - Understand and apply bioinformatics

# 

# 2. Skills:

# - Understand the different functions of genes, their regulation and inheritance, and

# genetic association to health and disease

# - Be able to read and comprehend molecular biology and genetics textbooks

# - Using the laboratory instruments and understand the scientific basis of their usage

# - The use of the special instructions for the laboratory investigations

# - Analyzing the results of the experiments and establishing the scientific conclusions

# - The extraction and purification of DNA

# - How to perform DNA fingerprinting, Polymerase Chain Reaction, Cleavage of DNA

# by restriction endonucleases and nucleic acids electrophoresis

# C. Course Plan Distribution and Learning Resources

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|  | **Topics to be Covered** |
| **Lectures** | |
|  | **Introduction**  Significance of molecular biology and genetics in biology and medicine  Living systems and experimental models  History of molecular biology and genetics; genes are heritable entities  **DNA and RNA structures**  General characteristics of DNA and RNA structures Chemical nature of DNA  DNA-protein interaction and binding  **Structure of chromosomes**  Chromosomal structure and chromatin in prokaryotes (chromosomes and plasmids) and eukaryotes  Chromosomal karyotyping  **DNA replication**  DNA replication in prokaryotes and eukaryotes  **Concept of genes and genomes** Relationship between DNA and proteins The role of RNA  Major types of RNA molecules Prokaryotic vs. eukaryotic genes  **Concept of genes and genomes** Relationship between DNA and proteins The role of RNA  Major types of RNA molecules Prokaryotic vs. eukaryotic genes  **RNA and gene transcription**  Types of RNA in prokaryote and eukaryotes Transcription in prokaryote and eukaryotes **Translation**  Translation in prokaryote and eukaryotes Post-translational regulation  **DNA mutations and chromosomal anomalies**  Types of chromosomal anomalies Examples of genetic diseases Types of DNA mutation  Examples of genetic mutations in human cancer  **Mechanisms of DNA repair Gene testing**  **Signal transduction**  General principles  Examples of signaling pathways  **Cancer Stem Cells** |
| **Learning resources** | |

* Essential Molecular Biology. Malacinsk, George M. Jones and Bartlett, (Latest version).
* The Cell - A Molecular Approach. Cooper, Geoffrey M. Sunderland (MA): Sinauer Associates, Inc.; (Latest version).
* Molecular Biology of the Cel. Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter New York: Garland Publishing; (Latest version).
* Molecular Cell Biology. Lodish, Harvey; Berk, Arnold; Zipursky, S. Lawrence; Matsudaira, Paul; Baltimore, David; Darnell, James E.. New York: W. H. Freeman & Co.; (Latest version). (<http://bcs.whfreeman.com/lodish5e/>)
* Introduction to Genetic Analysis. Griffiths, Anthony J.F.; Miller, Jeffrey H.; Suzuki, David T.; Lewontin, Richard C.; Gelbart, William M. New York: W. H. Freeman & Co., (Latest version).

# D. Teaching Strategies

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| No. |  |
| 1 | Lectures |
| 2 | Laboratories |

**E. Methods of Assessment**

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| No. | Assessment Task | Proportion of Final Assessment |
| 1 | Midterm Exam | 40% out of the final mark (including 5% questions of the practical course) |
| 2 | Final Exam | 60% out of the final mark |
| Total | | 100% |

**F. General Instructions**

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| No. |  |
| 1 | All University rules are adopted strictly by the department |