

## Planning and Quality Assurance Affairs

Form (A)

### Course Specifications

#### General Information

<b>Course name</b>	Molecular Biology & Genetics
<b>Course number</b>	MDCN2416
<b>Faculty</b>	
<b>Department</b>	
<b>Course type</b>	College Needs
<b>Course level</b>	2
<b>Credit hours (theoretical)</b>	4
<b>Credit hours (practical)</b>	0
<b>Course Prerequisites</b>	

#### Course Objectives

- 1 - Understand the fundamental concepts of molecular biology and genetics
- 2 - Gain knowledge of genetic inheritance patterns and genetic disorders.
- 3 - Understand the impact of genetic variation on human health and disease.
- 4 - Explore the role of genetics in personalized medicine and pharmacogenomics.
- 5 - Familiarize students with the ethical, legal, and social implications of genetics.
- 6 - Explore the structure and function of DNA, RNA, and proteins.
- 7 - Comprehend the principles of gene expression and regulation.
- 8 - Learn about the techniques and tools used in molecular biology and genetic research.

## Intended Learning Outcomes

<b>Knowledge and Understanding</b>	<ul style="list-style-type: none"><li>* Demonstrate a thorough understanding of the fundamental principles and concepts of molecular biology and genetics.</li><li>* Recognize and explain the relationship between genetic variations and the development of human diseases, including genetic disorders and cancer</li><li>* Demonstrate competence in laboratory techniques commonly used in molecular biology and genetics research.</li><li>* Understand the principles of genetic inheritance, including Mendelian and non-Mendelian patterns, and apply them to solve genetic problems.</li></ul>
<b>Intellectual Skills</b>	<ul style="list-style-type: none"><li>* Critically analyze scientific literature in the field of molecular biology and genetics, and effectively communicate findings and concepts through oral and written presentations.</li><li>* Evaluate the ethical, legal, and social implications of advances in molecular biology and genetics, including genetic testing and gene editing technologies.</li></ul>
<b>Professional Skills</b>	<ul style="list-style-type: none"><li>* Explain the mechanisms of gene expression and regulation and their role in cellular processes and development.</li><li>* Analyze and interpret genetic data using appropriate tools and techniques, such as PCR, DNA sequencing, and gene expression analysis.</li></ul>
<b>General Skill</b>	<ul style="list-style-type: none"><li>* Apply knowledge of DNA, RNA, and protein structure and function to explain molecular processes and their significance in biological systems.</li><li>* Encourage students to consider ethical issues and dilemmas related to molecular biology and genetics research, such as privacy concerns, informed consent, and the responsible use of genetic information.</li></ul>

## Course Contents

1 - Introduction to Molecular Biology and Genetics:
2 - Gene Expression and Regulation:
3 - Molecular Techniques and Tools:
4 - Genetic Inheritance:
5 - Human Genetics and Genetic Disorders:
6 - Molecular Basis of Disease:
7 - Genetic Variation and Population Genetics:
8 - Genetic Testing and Genomic Medicine:
9 - Ethical, Legal, and Social Implications (ELSI) of Genetics:
10 - Emerging Topics in Molecular Genetics:

## Teaching and Learning Methods

1 - Lectures: Use lectures to provide foundational knowledge and explanations of key concepts. Incorporate visual aids, such as slides or diagrams, to enhance understanding. Consider using active learning techniques within lectures, such as think-pair-share or concept mapping, to promote student engagement.
2 - Case Studies: Present real-life case studies that require students to apply their knowledge of molecular biology and genetics to analyze and solve problems. This approach helps students connect theoretical concepts to practical situations and enhances critical thinking skills.
3 - Laboratory Work: Organize laboratory sessions where students can apply theoretical knowledge to practical experiments. This hands-on approach allows students to gain familiarity with molecular biology and genetic techniques, such as DNA extraction, PCR, gel electrophoresis, and gene expression analysis.
4 - Group Discussions: Encourage group discussions where students can engage in peer-to-peer learning and collaborative problem-solving. Assign specific topics or research papers for students to review and discuss in groups, promoting active participation and the exchange of ideas.
5 - Guest Speakers: Invite guest speakers, such as researchers or clinicians, to share their experiences and expertise in the field of medical molecular and genetics. This provides students with insights into real-world applications and career paths.

## Teaching and Learning Methods for the Disabled Students

- 1 - Universal Design for Learning (UDL): Implement UDL principles, which aim to provide multiple means of representation, engagement, and expression. This involves offering content in various formats (e.g., visual, auditory), providing multiple ways for students to engage with the material, and offering flexible options for students to demonstrate their understanding.
- 2 - Accommodations and Modifications: Work with disability support services at your institution to identify appropriate accommodations or modifications for students with disabilities. This could include providing extra time for exams, offering assistive technology, providing captioning or transcripts for audiovisual materials, or providing note-taking assistance.
- 3 - Visual Aids and Captioning: Use visual aids such as diagrams, charts, and images to enhance understanding. Ensure that visual materials are clear and accessible to all students. When using videos or multimedia resources, provide captioning or transcripts to support students with hearing impairments.
- 4 - Lecture Materials and Handouts: Provide lecture materials, including slides, handouts, or lecture notes, in advance to give students the opportunity to review and familiarize themselves with the content. This allows students with learning disabilities or attention-related challenges to engage with the material at their own pace.
- 5 - Assistive Technology: Familiarize yourself with assistive technology tools that can support students with disabilities. For example, screen readers can assist visually impaired students, while speech-to-text software can support students with motor disabilities. Collaborate with disability support services to identify and implement appropriate assistive technology solutions.

## Students Assessment

<u>Assessment Method</u>	<u>TIME</u>	<u>MARKS</u>
Quizzes		30
midterm		30
final		40

## Books and References

Essential books	"Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, et al. This comprehensive textbook provides a thorough understanding of molecular biology concepts, including genetics, gene expression, and cellular processes.  "Principles of Genetics" by Peter Snustad and Michael Simmons. This book covers the principles of genetics, including Mendelian and molecular genetics, population genetics, and genetic analysis techniques.
Recommended books	"Human Molecular Genetics" by Tom Strachan and Andrew Read. This textbook focuses on the principles of human genetics, including genetic diseases, inheritance patterns, and genomic medicine.  "Introduction to Genetic Analysis" by Anthony J.F. Griffiths, Susan R. Wessler, Sean B. Carroll, et al. This widely used textbook introduces the principles and techniques of genetic analysis, including molecular genetics and genetic engineering.
Other References (Periodical, web sites, .... etc.)	<a href="http://www.ncbi.nlm.nih.gov">www.ncbi.nlm.nih.gov</a>  <a href="https://www.genome.gov/">https://www.genome.gov/</a>  <a href="http://www.omim.org">www.omim.org</a>

## Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Ethical, Legal, and Social Implications (ELSI) of Genetics: Gene Expression and Regulation: Molecular Basis of Disease: Introduction to Molecular Biology and Genetics: Molecular Techniques and Tools: Genetic Inheritance: Human Genetics and Genetic Disorders: Genetic Variation and Population Genetics: Emerging Topics in Molecular Genetics	14				