



FACULTY OF HEALTH SCIENCES AND SPORTS
BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY (MEDICAL LABORATORY TECHNOLOGY)
LEARNING MODULE OUTLINE

Academic Year	2024-2025	Semester	1
Module Code	BSMB3101		
Learning Module	Molecular biology		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese & English		
Credits	6	Contact Hours	90
Instructor	Lei Iun Fan, Miriam	Email	iflei@mpu.edu.mo
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MODULE DESCRIPTION

The aim of this course is to provide theoretical and practical knowledge in molecular biology. Key concepts and procedures underlying nucleic acid and protein manipulation methods in the molecular biology laboratory, including the isolation of nucleic acids, molecular cloning, selection and analysis of recombinant DNA, sequencing, microarray and the application of molecular biology in various fields.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Describe the basic structure and biochemistry of nucleic acids and proteins.
M2.	Understand the principle and key techniques in modern molecular biology, such as DNA extraction, cloning, nucleic acid amplification, DNA sequencing, microarray, etc. and analyse their applications.
M3.	Understand and master the research frontiers of molecular biology, and its important role and application in life sciences.
M4.	Describe and discuss applications of molecular biology, including the use of bioinformatics and genomics.
M5.	Able to apply their knowledge and skills to solve molecular biology problems.
M6.	Able to work effectively, responsibly, both as individuals and in groups.



These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5	M6
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to medical laboratory technology	✓	✓	✓	✓	✓	
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin medical laboratory operations and management			✓	✓	✓	✓
P3. To demonstrate understanding of major trends and issues related to medical laboratory technology		✓	✓	✓		
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in medical laboratory practice		✓	✓	✓	✓	✓
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice		✓	✓	✓		✓
P6. To acquire and apply research skills in medical laboratory technology	✓	✓	✓	✓	✓	✓
P7. To demonstrate effective communication and teamwork skills					✓	✓
P8. To maintain professional and ethical standards in medical laboratory practice and research		✓	✓			✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
0	MBio 00 - Module outline (1hr)	1
0, 1	MBio 01 - Introduction (3hr)	3
2	MBio 02 - Technique 1 NA (6hr)	6
2	MBio 03 - Technique 2 Protein (2hr)	2
3	MBio 04 - Technique 3 enzyme (3hr)	3
3, 4	MBio 05 - Technique 4 Electrophoresis (8hr)	8
5	MBio 06 - Technique 5 Centrifuge chrom (2hr)	2
9	MBio 07 - Probe (3hr)	3
10	MBio 08 - Hybridization (3hr)	3
11	MBio 09 - Vector and cloning (6hr)	6
12	MBio 10 - DNA libraries (1 hr)	1
12	MBio 11 - DNA Sequencing and mapping (7hr)	6
13	MBio 12 - Nucleic acid amplification (12 hr)	11



13	MBio 13 - DNA synthesis (1 hr)	1
14	MBio 14 – Microarray (3 hr)	3
	Biotechnology explorer series (6 class hours)	6
	Cloning and sequencing explorer series (20 class hours)	20
10	Mid-term exam (2 hr)	2
	Final exam (3 hr)	3

TEACING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5	M6
T1. Lectures	✓	✓	✓	✓		
T2. Video and animation	✓	✓	✓	✓		✓
T3. Classroom activities and assignments	✓	✓	✓	✓	✓	
T4. Prelab quiz and lab practices					✓	✓
T5. Mid and Final exam	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Classroom activities and assignments	10	M1, M2, M3, M4, M5
A2. Prelab quiz and lab practices	20	M5, M6
A3. Midterm exam	30	M1, M2, M3, M4, M5, M6
A4. Final exam	40	M1, M2, M3, M4, M5, M6



This learning module is graded on a 100-point scale, with 100 being the highest possible score and 50 being the passing score.

Any students scoring less than 35% of the total mark in the final examination will be given an “F” grade for the module even if the overall grade is 50% or higher.

Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

Assessment Activities	Assessment Criteria	Mark Ranges				
		88-100	73-87	58-72	50-57	<50
A1. Classroom learning activities	Demonstrate the understanding of the subjects covered in classes and show active learning attitude.	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A2. Assignments	Demonstrate the ability to answer questions on topics covered in the outline	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A3. Prelab quiz	Demonstrate the ability to understand the principles and procedures of experiments	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A4. Lab practices	Master relevant experimental skills or operations, data handling and lab report etc.	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A5. Midterm and final examination	Demonstrate the ability to identify and apply appropriate concepts, methods and techniques	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels

REQUIRED READINGS

Terry Brown (2020) Gene Cloning and DNA Analysis: An Introduction, 8th Edition, Wiley

REFERENCES

- DeVita, V.T., et al. (2021). DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology Primer of Molecular Biology in Cancer (3rd Ed.). Philadelphia: Wolters Kluwer Health.
- Buckingham, Lela. (2019). Molecular Diagnostics: Fundamentals, Methods, & Clinical Applications (3rd ed.). Philadelphia: F.A. Davis Company.
- Krebs, J.E. et al. (2018) Lewin's Genes XII (12th ed.). Burlington, MA: Jones & Bartlett Publishers.
- Rifai, N., et al. (2018). Principles and Applications of Molecular Diagnostics (1st ed.). Elsevier Inc
- Nussbaum, R.L. et al. (2016). Thompson and Thompson Genetics in Medicine (8th ed.). Philadelphia, PA: Elsevier, Inc.
- Persing, D.H. et al. (Eds.). (2016). Molecular Microbiology: Diagnostic Principles and Practice (3rd ed.). Washington D.C.: ASM Press.
- Kulkarni, S. and Pfeifer, J. (Eds.). (2015). Clinical Genomics: A Guide to Clinical Next Generation Sequencing. Elsevier, Inc.



STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.