Obligatory courses:

6732	M_GMM 732	Foundations of Genomics	أساسيات علم الجينوم	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**2**	**0**	**2**
University: Bethlehem University BU						
Course description: This course introduces students to the foundational concepts of genomics, including DNA structure, genome organization, and gene expression regulation. Students explore genome sequencing technologies, from Sanger sequencing to next-generation sequencing (NGS) methods. Emphasis is placed on genome annotation and interpretation, as well as the applications of genomics in health diagnostics. By the end of the course, students will understand key genomic principles, the mechanics behind sequencing, and how genomic data can be applied to address health challenges.						
6733	M_GMM 733	Molecular Diagnostic Techniques	تقنيات التشخيص الجزيئي	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**2**	**1**	**3**
University: Bethlehem University BU						
Course description: This course introduces students to contemporary molecular techniques commonly used in molecular biology and genomic laboratories, with a strong focus on diagnostic applications. The first half of the course covers essential methods for molecular diagnostics, including PCR and primer design, fragment analysis, Sanger sequencing, and real-time PCR (qPCR), emphasizing both theoretical principles and practical implementation. The second half focuses on techniques related to next-generation sequencing (NGS), including data preprocessing steps and the conceptual understanding of standard NGS analysis workflows and pipelines. The course combines theoretical instruction with hands-on laboratory sessions to develop students' competence in applying molecular tools for research and clinical diagnostics. By the end of the course, students will be able to design, execute, and interpret key molecular assays used in modern genomics.						
6734	M_GMM 734	Statistical Genomics	علم الجينوم الإحصائي	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**2**	**0**	**2**
University: Bethlehem University (BU)						
Course description: This course introduces statistical concepts and methodologies essential for genomics and epidemiological research. Topics include probability, hypothesis testing, regression analysis, and survival analysis. Emphasis is on practical applications in genomics, including data interpretation and visualization. Students work on real-world data and case studies, enhancing their ability to make sound statistical inferences in health-related research.						

6735	M_GMM 735	Foundations of Research Methodology in Biosciences	أسس منهجية البحث في العلوم الحيوية	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**2**	**0**	**2**
University: Palestine Polytechnic University (PPU)						

Course description:

This course introduces key concepts in research methodology for the biosciences. Students will learn how to identify valuable research problems, formulate clear research questions, and select suitable resources and tools to investigate them. The course covers major research approaches (e.g., experimental, observational, in silico) and introduces common study designs such as case-control, cross-sectional, and longitudinal studies within both quantitative and qualitative frameworks. Students will also explore types of scientific literature, methods for conducting literature reviews, and the principles of scientific writing and reporting. By the end of the course, students will be able to design well-structured research projects grounded in sound methodology and relevant literature.

6736	M_GMM 736	Bioinformatics and Genomic Data Interpretation	المعلوماتية الحيوية وتفسير البيانات الجينومية	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**2**	**1**	**3**
University: Palestine Polytechnic University (PPU)						

Course description:

This course provides a comprehensive introduction to bioinformatics with a strong emphasis on the analysis and interpretation of large-scale genomic data. The first part of the course offers foundational knowledge of key bioinformatics concepts, tools, and databases—including sequence alignment, NCBI, Ensembl, and BLAST—essential for working with genomic data. The remainder of the course focuses on practical skills for processing and analyzing high-throughput genomic datasets using current bioinformatics pipelines. Topics include variant calling, functional annotation, gene ontology, pathway analysis, and data visualization. Through integrated theoretical sessions and a weekly hands-on lab, students will develop the ability to apply computational tools in clinical and research contexts, draw biologically meaningful insights from genomic data, and communicate their findings effectively.

6737	M_GMM 737	Ethical and Legal Issues in Genomics	القضايا الأخلاقية والقانونية في علم الجينوم	**CLASS**	**LAB**	**CREDITS**
Prerequisites: -				**1**	**0**	**1**
University: Palestine Polytechnic University (PPU)						

Course description:

This course addresses the ethical, legal, and social issues associated with genomics. Topics include genetic privacy, consent, and issues in genetic counseling. Students analyze real-world cases and explore the legal frameworks surrounding genomic data use. The course prepares students to navigate the ethical complexities of genomics in healthcare and research.

6738	M_GMM 738	Cancer Genomics and Diagnostics	علم جينوم السرطان وتشخيصه	**CLASS**	**LAB**	**CREDITS**
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				**3**	**0**	**3**
University: Bethlehem University BU						

Course description:

This course delves into the genetic basis of cancer, examining the mutations and genomic alterations that drive cancer development. Students learn about cancer diagnostic tools, including gene panels, liquid biopsies, and biomarker identification. Topics also cover the role of genomics in personalized oncology, where genomic data is used to tailor treatment plans. Through case studies, students will explore current applications of genomics in diagnosing and treating cancer, with an emphasis on translating research findings into clinical practice.

6739	M_GMM 739	Human Genetic Disorders	الأمراض الوراثية لدى الإنسان	**CLASS**	**LAB**	**CREDITS**
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				**3**	**0**	**3**
University: Palestine Polytechnic University (PPU)						

Course description:

This course covers the genomic basis of genetic diseases, their major categories, diagnostic approaches, and implications for patient care. Students learn about chromosomal, single-gene, and complex genetic disorders, diagnostic tools, and gene therapy applications. Ethical considerations, such as genetic counseling and patient consent, are also discussed. The course prepares students to apply genomic knowledge in diagnosing and managing inherited disorders.

6740	M_GMM 740	QA and Regulatory Practices in Molecular Diagnostics	ممارسات الجودة والتنظيم في التشخيص الجزيئي	**CLASS**	**LAB**	**CREDITS**
Prerequisites: تقنيات التشخيص الجزيئي				**1**	**0**	**1**
University: Palestine Polytechnic University (PPU)						

Course description:

This course provides a comprehensive overview of quality assurance (QA), quality control (QC), and regulatory frameworks governing molecular diagnostic laboratories. Students will gain knowledge of international best practices, lab accreditation requirements, and quality systems essential for ensuring the reliability and integrity of diagnostic testing in clinical and research settings. The course emphasizes the implementation of standard operating procedures (SOPs), documentation practices, risk management, proficiency testing, and compliance with local and global regulatory bodies such as ISO 15189, CLIA, and CAP. It also introduces quality indicators specific to genomics and molecular technologies, such as PCR and NGS.

Elective courses:

6741	M_GMM 741	Microbial Genomics	علم جينوم الميكروبي	**CLASS**	**LAB**	**CREDITS**
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2
University: -						

Course description:

This course focuses on microbial genomes and their implications for health, including pathogen evolution, antibiotic resistance, and the role of microbiota in human health. Topics cover sequencing technologies for microbial genomics and bioinformatic approaches for analyzing microbial communities. Students gain skills relevant to diagnostics and public health, including outbreak tracking and resistance monitoring.

6742	M_GMM 742	Molecular and Cellular Mechanisms of Human Disease	الآليات الجزيئية والخلوية للأمراض البشرية	**CLASS**	**LAB**	**CREDITS**
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

This course explores the molecular and cellular mechanisms that underlie the development and progression of human diseases. Emphasis is placed on key cellular processes—such as signaling pathways, apoptosis, immune responses, and metabolic regulation—and how their dysregulation contributes to pathogenesis. The course integrates concepts from molecular biology, cell biology, and genomics to examine how genetic and genomic variations influence cellular behavior and drive disease states. By bridging fundamental cellular functions with molecular and metabolic alterations, students gain a comprehensive foundation for understanding complex disease mechanisms from an integrated biological perspective.

6743	M_GMM 743	Reproductive Genomics	علم الجينوم الإنجابي	**CLASS**	**LAB**	**CREDITS**
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

In this course, the students will learn the genetic factors influencing human reproduction. The course will cover the genetic causes of infertility and pregnancy loss, prenatal genetic testing, preimplantation genetic diagnosis, and genetic counseling. The course students will learn about the different prenatal genetic testing techniques. The students will discuss how to develop personalized reproductive health strategies. Gain insights into the latest advancements in reproductive genomics and their impact on clinical practice.

6744	M_GMM 744	Personalized and Precision Medicine	الطب الشخصي والدقيق	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

This course focuses on tailoring medical treatment to individual genetic profiles. Topics include molecular profiling, biomarkers, and clinical applications of precision medicine such as pharmacogenomics, nutrigenomics, and immunogenomics. Students explore case studies on personalized approaches in oncology, cardiology, and other fields. By the end, students understand the benefits and challenges of precision medicine in clinical settings.

6745	M_GMM 745	Environmental Genomics and Health	علم الجينوم البيئي والصحة	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

Environmental Genomics and Health examines the influence of environmental factors—such as pollutants, diet, and lifestyle—on human health, epigenetics and cancer. Topics include epigenetics, gene-environment interactions, and the impact of the exposome on disease susceptibility. Students analyze case studies on environmental risks and health outcomes, learning to apply genomic data to assess and address environmental health challenges. By the course's end, students will understand how environmental factors shape health.

6746	M_GMM 746	Emerging Infectious Diseases	الأمراض المعدية الناشئة	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

This course explores the genomics of emerging pathogens, focusing on diagnostic techniques, surveillance, and public health response strategies. Topics include zoonotic transmission, antimicrobial resistance, and genomic epidemiology. The course equips students with the knowledge to apply genomics in controlling infectious disease outbreaks and designing preventive measures.

6747	M_GMM 747	Genomics of Immune Response	جينوم الاستجابة المناعية	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

This course investigates the genomic factors that shape immune responses to infections, vaccines, and autoimmunity. Topics cover immune system genomics, pathogen-host interactions, and the diverse landscape of immune cell plasticity and ontogeny. Students learn to apply genomic data to understand immune responses and disease susceptibility, with implications for vaccine development and immunotherapy.

6748	M_GMM 748	Population Genetics	علم الوراثة السكانية	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

Population Genetics covers genetic diversity within populations, exploring concepts like genetic drift, natural selection, and genetic epidemiology. Students learn how population-level analyses inform public health and disease risk assessments. This course is essential for understanding genetic variation and its implications in the context of public health genomics.

6749	M_GMM 749	Genomic Applications in Public Health	تطبيقات الجينوم في الصحة العامة	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

This course explores how genomics can inform public health practices, from tracking disease outbreaks to developing preventive strategies. Students learn about public health genomics tools and how genomic data can support health policy and population health initiatives. The course prepares students to integrate genomics into public health interventions.

6750	M_GMM 750	Computational Biology	البيولوجيا الحاسوبية	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

Computational Biology provides an introduction to algorithm development and machine learning techniques for biological data analysis. Topics include sequence alignment, gene prediction, and data mining. Students learn to develop computational models to address complex problems in genomics, equipping them with skills for bioinformatics and genomic research.

6751	M_GMM 751	Health Informatics	المعلوماتية الصحية	CLASS	LAB	CREDITS
Prerequisites: أساسيات علم الجينوم + المعلوماتية الحيوية وتفسير البيانات الجينومية				2	0	2

Course description:

Health informatics explores the integration of genomics with healthcare technologies, focusing on electronic health records, clinical decision support systems, and data management tools. Topics include data security, privacy, and interoperability in healthcare. This course provides students with a comprehensive understanding of how health informatics can enhance diagnostics and patient care.

6752	M_GMM 752	Advanced Cell Biology	علم الأحياء الخلوي المتقدم	CLASS	LAB	CREDITS
Prerequisites: -				**2**	**0**	**2**

Course description:

This course will examine molecular and mechanistic aspects of cell biology. Potential topics will include protein targeting and trafficking, receptors and endocytic pathways, cell signaling, mechanisms of cell differentiation, cell cycle and growth regulation, programmed cell death, nuclear and cytoplamic skeleton and its role in cellular polarity, viral and nuclear targeting. Emphasis will be placed on contemporary research in cell biology as presented in review journal articles.

6753	M_GMM 753	Advanced Biochemistry	الكيمياء الحيوية المتقدمة	CLASS	LAB	CREDITS
Prerequisites: -				**2**	**0**	**2**

Course description:

This is an advanced graduate course that will discuss selected topics in Biochemistry and industrial biotechnology with a special focus on its applications and recent advances. Topics will include enzymes kinetics, industrial enzymes, industrial microbes, bio-processing, fermentation and bioreactors.

Obligatory practical training & Research Thesis

6799	MBT799	Research Thesis	رسالة الماجستير	CLASS	LAB	CREDITS
Prerequisites: -				**0**	**0**	**0**

Course description:

Students should identify a health-related problem or scientific question to address using genomic or molecular analyses or techniques. Students are expected to demonstrate understanding of the thesis background and state-of-the art of knowledge, sound methodological practices including identification of limitations in their own thesis, objective analysis and comprehensible presentation of results. Meaningful discussion of how their thesis work impacts upon the field of their thesis. Sound referencing and ethical work should be evident.

6796	M_GMM 796	Practical Training	التدريب العملي	CLASS	LAB	CREDITS
Prerequisites: -				**0**	2	2
University: -						

Course description:

This course provides hands-on, supervised training in a functional molecular diagnostics environment, offering students the opportunity to apply theoretical knowledge and laboratory skills in real-world settings. Students will complete a minimum of 48 hours of practical training in a certified academic, hospital, or private diagnostic laboratory, either within the hosting universities or through external institutional partners.

The aim is to expose students to the day-to-day workflow of molecular diagnostics, from sample collection and processing to result interpretation and reporting. Students will be placed in laboratories that conduct testing for genetic disorders, infectious diseases, cancer, or other applications of genomic and molecular technologies.