

PROGRAM OUTCOME (POs)	
Course Code	M.Sc. MEDICAL MOLECULAR BIOLOGY
PO1	Nurture the scientific and/or clinical knowledge and skills for development of industrial application, health care practices and entrepreneurship
PO2	Develop the ability of critical thinking to analyse, interpret problems and to find out systematic approach for solution
PO3	Impart decision making capability of handling various circumstances in their respective areas
PO4	Demonstrate research skills for planning, designing, implementation and effective utilization of research findings for community
PO5	Develop an ability to function as an efficient individual and team player in multidisciplinary sectors for effective outcomes
PO6	Demonstrate an effective written and oral communication skills to communicate effectively in health care sector, industries, academia and research.
PO 7	Inculcate code of ethics in professional and social circumstances to execute them in daily practices and research irrespective areas of specialization
PO8	Develop lifelong learning attitude and values for enhancement professional and social skills for an overall development
Course Outcomes (COs)	
Course Code	M.Sc. MEDICAL MOLECULAR BIOLOGY
SEMESTER I	
MMB 101 T	Cell Biology
CO1	Students will gain an understanding of cell origin.
CO2	Basic understanding of cell structure and its components.
CO3	Students will understand the cell function.
CO4	Understanding of cell regulations and physiology.
MMB 102 T	Molecular Immunology
CO1	Students will gain understanding of the immune system and immunity.
CO2	It highlights understanding of the molecular structure of immune cells.
CO3	Understanding of role and expression of immune system during infection and immunity
CO4	Understanding of the status of the immune system during disease system
CO5	Exploration of immune system concepts into design and development of new therapeutics.
MMB 103 T	Molecular Enzymology
CO1	Post graduate students will understand the basics of enzymes and their function in biological systems.
CO2	They will understand the enzyme modulation during specific situations.
CO3	Basic understanding of the applications of the enzyme in various industries
CO4	Students will learn the basics techniques of enzymology.
CC 001 T	Research Methodology & Biostatistics (Core Course)
CO1	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis, interpretation & reporting of results and use of statistical software.
MMB 107 CP	MBT Directed Clinical Education-I
CO1	Demonstrate proficiency in diagnostic and therapeutic techniques used in hospital laboratories.
CO2	Effectively communicate and collaborate with healthcare professionals and patients.
CO3	Develop decision-making skills for effective healthcare management and administration.
SEMESTER II	
MMB 108 T	Gene and Protein Science
CO1	Students will be able to understand the basis of inheritance, gene organization and structure of DNA.

CO2	They will be also understanding gene function and linkages with protein. Understanding of genome and proteome will be important learning outcome.
CO3	Understanding of basics of protein structure, purification and characterization will be major outcome of the section.
MMB 109 T	Bioinformatics and Computational Biology
CO1	The major outcome in this section will be basic knowledge of various data banks and datasets mainly for protein sequence and nucleic acid sequence.
CO2	Students will understand the basic skill data analysis including cluster analysis and sequence analysis.
MMB 110 T	DNA Recombinant technology
CO1	Student will be able to understand concept and process of DNA recombinant technology. It will also provide strategy and designs of experiment for product development. Course will also generate and teach as skills in molecular biology.
MMB 111 T	Metabolic Engineering
CO1	Students will understand the basics of metabolic pathways and network in cellular system.
CO2	Understanding different models of cellular reactions.
CO3	Students will understand the concept of metabolic flux analysis and metabolic control analysis.
CO4	Understanding of the concept of metabolic design in strain development
CO5	It will provide the understanding of the potential of metabolic engineering in industrial applications.
MMB 116 CP	MBT Directed Clinical Education-I
CO1	Demonstrate proficiency in diagnostic and therapeutic techniques used in hospital laboratories.
CO2	Effectively communicate and collaborate with healthcare professionals and patients.
CO3	Develop decision-making skills for effective healthcare management and administration.
Skill Enhancement Courses	
SEC 001 T	Innovation and Entrepreneurship
CO1	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.
CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary
CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures
SEC 002 T	Comprehensive Molecular Diagnostics and Advanced Gene Expression Analysis (NPTEL)
CO1	Explain the principles of molecular diagnostics and its role in modern healthcare.
CO2	Describe the significance of biomarkers in disease detection and prognosis.
CO3	Demonstrate proper methods for sample collection, storage, and processing in a diagnostic lab.
CO4	Perform molecular diagnostic techniques such as PCR, ELISA, and immunohistochemistry.
CO5	Analyze the applications of molecular diagnostics in infectious diseases and cancer.
CO6	Evaluate the role of emerging diagnostic technologies like NGS and CRISPR-based methods.
CO7	Apply biosafety and biomedical waste disposal protocols in a molecular diagnostics lab.

MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)
 (Deemed University u/s 3 of UGC Act 1956)
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CO PO Matrix
Programme - M.Sc. Molecular Biology
Sem I to IV

PO1.	Nurture the scientific and/or clinical knowledge and skills for development of industrial application, health care practices and entrepreneurship
PO2.	Develop the ability of critical thinking to analyse, interpret problems and to find out systematic approach for solution
PO3.	Impart decision making capability of handling various circumstances in their respective areas
PO4.	Demonstrate research skills for planning, designing, implementation and effective utilization of research findings for community
PO5.	Develop an ability to function as an efficient individual and team player in multidisciplinary sectors for effective outcomes
PO6.	Demonstrate an effective written and oral communication skills to communicate effectively in health care sector, industries, academia and research.
PO7.	Inculcate code of ethics in professional and social circumstances to execute them in daily practices and research irrespective areas of specialization
PO8.	Develop lifelong learning attitude and values for enhancement professional and social skills for an overall development

PO Mapping same with correlation level 3,2,1 The notation of 1 - low, 2 - moderate , 3 - high

				Knowledge and skill	Critical Thinking & problem solving	Decision making	Research skill	Individual and team work	Communication skills	Code of ethics	Lifelong learning	Average
Semester	Course / Course Code	Course Outcome	Course Outcome	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	
Semester 1	Cell Biology (MMB 101 T)	CO1	Students will gain an understanding of cell origin.	3	3	1	2	2	2	3	2	2.3
		CO2	Basic understanding of cell structure and its components.	3	3	3	2	1	2	3	2	2.4
		CO3	Students will understand the cell function.	2	3	1	2	3	2	2	2	2.1
		CO4	Understanding of cell regulations and physiology.	2	2	1	3	2	2	2	3	2.1
		Average		2.5	2.8	1.5	2.3	2.0	2.0	2.5	2.3	2.2
	Molecular Immunology (MMB 102 T)	CO1	Students will gain understanding of the immune system and immunity.	3	2	2	3	2	1	2	2	2.1
		CO2	It highlights understanding of the molecular structure of immune cells.	3	3	1	3	2	2	2	2	2.3
		CO3	Understanding of role and expression of immune system during infection and immunity	3	3	1	3	1	2	2	2	2.1
		CO4	Understanding of the status of the immune system during disease system	3	2	3	2	2	3	2	2	2.4
		CO5	Exploration of immune system concepts into design and development of new therapeutics.	3	3	1	3	1	1	2	2	2.0
		Average		3	2.6	1.6	2.8	1.6	1.8	2	2	2.2
	Molecular Enzymology (MMB 103 T)	CO1	Post graduate students will understand the basics of enzymes and their function in biological systems.	2	3	1	2	2	1	1	3	1.9
		CO2	They will understand the enzyme modulation during specific situations.	2	3	1	2	1	2	1	2	1.8
		CO3	Basic understanding of the applications of the enzyme in various industries	3	1	2	2	1	2	2	3	2.0
		CO4	Students will learn the basics techniques of enzymology.	3	2	1	3	1	1	2	3	2.0

		Average		2.5	2.25	1.25	2.25	1.25	1.5	1.5	2.75	1.9
	Research Methodology & Biostatistics (Core Course) (CC 001 T)	CO1	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis, interpretation & reporting of results and use of statistical software.	3	3	2	3	1	1	2	2	2.1
	MMB Directed Clinical Education-I (MMB 107 CP)	CO1	Demonstrate proficiency in diagnostic and therapeutic techniques used in hospital laboratories.	3	2	1	2	2	3	1	3	2.1
		CO2	Effectively communicate and collaborate with healthcare professionals and patients.	2	2	1	2	2	3	1	3	2.0
		CO3	Develop decision-making skills for effective healthcare management and administration.	2	3	3	2	2	2	1	3	2.3
		Average		3	3	2	2	2	2	1	3	2.1
Semester 2	Gene and Protien Science (MMB 108 T)	CO1	Students will be able to understand the basis of inheritance, gene organization and structure of DNA.	3	1	1	2	2	1	1	3	1.8
		CO2	They will be also understanding gene function and linkages with protein. Understanding of genome and proteome will be important learning outcome.	2	3	2	2	1	2	1	2	1.9
		CO3	Understanding of basics of protein structure, purification and characterization will be major outcome of the section.	3	3	1	3	1	1	2	2	2.0
		Average		3	2	1	2	1	2	1	2	2
	Bioinformatics and Computational Biology (MMB 109 T)	CO1	The major outcome in this section will be basic knowledge of various data banks and datasets mainly for protein sequence and nucleic acid sequence.	2	1	1	2	2	1	2	2	1.6
		CO2	Students will understand the basic skill data analysis including cluster analysis and sequence analysis.	3	2	1	2	1	2	2	3	2.0
		Average		3	2	1	2	2	2	2	3	2
	DNA Recombinant technology (MMB 110 T)	CO1	Student will be able to understand concept and process of DNA recombinant technology. It will also provide strategy and designs of experiment for product development. Course will also generate and teach as skills in molecular biology.	3	3	1	3	1	2	1	2	2.0
		Average		3	3	1	3	1	2	1	2	2.0
	Metabolic Engineering (MMB 111 T)	CO1	Students will understand the basics of metabolic pathways and network in cellular system.	2	2	3	2	2	1	2	2	2.0
		CO2	Understanding different models of cellular reactions.	3	2	1	2	2	1	1	2	1.8

		CO3	Students will understandthe concept of metabolic flux analysis and metabolic control analysis.	2	3	2	2	2	2	2	3	2.3
		CO4	Understandingof the concept of metabolic design in strain development It will provide the understanding of the potential of metabolic engineering in industrial applications.	3	3	1	2	2	1	2	3	2.1
		Average		3	3	2	2	2	1	2	3	2.0
	MMB Directed Clinical Education-II (MMB 116 CP)	CO1	Demonstrate proficiency in diagnostic and therapeutic techniques used in hospital laboratories.	3	2	1	2	2	3	1	3	2.1
		CO2	Effectively communicate and collaborate with healthcare professionals and patients.	2	2	1	2	2	3	1	3	2.0
		CO3	Develop decision-making skills for effective healthcare management and administration.	2	3	3	2	2	2	1	3	2.3
		Average		3	2	2	3	2	2	1	3	2.3
	Innovation and Enterprenuarship (SEC 001 T)	CO1	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.	3	3	3	2	1	1	1	2	2.0
		CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary	3	1	1	3	1	2	1	2	1.8
		CO3	understanding the intersection of technology and innovation and leveraging emerging technologies for entreeneurial ventures	2	1	1	3	3	1	1	2	1.8
		Average		3	2	2	3	2	1	1	2	1.8
	Comprehensive Molecular Diagnostics and Advanced Gene Expression Analysis (NPTEL) (SEC 002 T)	CO1	Explain the principles of molecular diagnostics and its role in modern healthcare.	3	2	1	3	3	3	1	3	2.4
		CO2	Describe the significance of biomarkers in disease detection and prognosis.	3	2	2	2	2	2	1	3	2.1
		CO3	Demonstrate proper methods for sample collection, storage, and processing in a diagnostic lab.	3	3	2	3	2	2	1	3	2.4
		CO4	Perform molecular diagnostic techniques such as PCR, ELISA, and immunohistochemistry.	3	2	2	3	3	2	1	3	2.4
		CO5	Analyze the applications of molecular diagnostics in infectious diseases and cancer.	3	2	2	3	2	2	1	3	2.3
		CO6	Evaluate the role of emerging diagnostic technologies like NGS and CRISPR-based methods.	3	3	2	3	1	2	1	2	2.1
		CO7	Apply biosafety and biomedical waste disposal protocols in a molecular diagnostics lab.	3	2	1	3	2	2	1	3	2.1
		Average		3.0	2.3	1.7	2.9	2.1	2.1	1.0	2.9	2.3