



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade “A⁺⁺” Accredited by NAAC

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CHOICE BASED CREDIT SYSTEM (CBCS)

(Academic Year 2025-26)

Curriculum for

M.Sc. Allied Health Sciences

M.Sc. MOLECULAR BIOLOGY

DIRECTOR'S MESSAGE

Welcome Message from the Director

Dear Postgraduate Students,

Welcome to **MGM School of Biomedical Sciences (MGMSBS)**, **MGMIHS**, a premier institution dedicated to advancing allied and health sciences education. As you embark on this transformative academic journey, you are joining a community that fosters excellence in research, clinical expertise, and innovation.

MGMIHS, accredited with NAAC 'A⁺⁺' Grade (CGPA 3.55, 2022) and recognized as a **Category I Institution by UGC**, offers an ecosystem that nurtures both academic and professional growth. With **NIRF (151-200 rank band) recognition**, **NABH-accredited hospitals**, **NABL-accredited diagnostic labs**, and **JCI accreditation for MGM New Bombay Hospital**, we uphold global benchmarks in education and healthcare.

At MGMSBS, our **15 postgraduate programs** are meticulously designed to align with the National Commission for Allied and Healthcare Professionals (**NCAHP**) standards, National Education Policy (**NEP**) 2020, and the National Credit Framework (**NCrF**). We have implemented the **Choice-Based Credit System (CBCS)** to provide academic flexibility while ensuring rigorous training in clinical and technical skills. Our state-of-the-art research laboratories, digital classrooms, and the Central Research Laboratory (CRL) foster an environment that encourages innovation and evidence-based learning.

Postgraduate education at MGMSBS goes beyond theoretical learning—our curriculum integrates **hands-on clinical training, interdisciplinary collaboration, and exposure to real-world healthcare challenges**. We emphasize **research-driven education**, encouraging students to actively participate in **scientific discoveries, publications, and international collaborations**.

Beyond academics, we believe in **holistic development**, with initiatives such as the **AARAMBH Science and Wellness Club**, which promotes **mental well-being, leadership, and professional networking**.

As you step into this **next phase of academic and professional growth**, we encourage you to explore new ideas, engage in impactful research, and contribute meaningfully to the **healthcare ecosystem**. We are confident that your journey at MGMSBS will shape you into **skilled, compassionate, and visionary professionals**, ready to lead in the ever-evolving healthcare landscape.

We look forward to witnessing your achievements and contributions!

Dr. Mansee Thakur

Director, MGM School of Biomedical Sciences
MGM Institute of Health Sciences, Navi Mumbai

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences through meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGMIHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well-equipped labs. The school encompasses 24 courses each with its own distinct, specialized body of knowledge and skill. This includes 8 UG courses and 16 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately **800** at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, the School of Biomedical Sciences envisions continuously grow and reform. Reformatations are essential to any growing institution as they fulfill our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems

INTRODUCTION

To keep pace with the worldwide education and research scenario in the field of biological science, MGM Institute of Health Sciences has started M.Sc. Molecular Biology course which is designed to enrich the students with wide knowledge and understanding of the advance techniques in molecular biology and its applications. The primary objective of this program is to provide job oriented and research driven education.

VISION

- Academic excellence & development of an excellent intellectual system for rich technology talent pool
- Research & development driven education
- Student involvement in research projects
- Advance education and training

MISSION

- Generation of research& technology talent pool in the area of molecular biology

SALIENT FEATURES

- Very strong infrastructure e.g. classroom, conference and seminar room well equipped library, computer and internet facility, hostel, hospital, hygienic canteen etc.
- Excellent teaching staff - highly experienced faculty, expert and professionals from various organizations.
- Support from state-of-the-art MGMIHS OMICS Research Center: A highly equipped laboratory for advanced life sciences - proteomics, genomics computational biology etc. (This centers providing unique and exploratory platform for discovery research).
- Frequent guest lecturers (by external faculty)/seminar/symposium/ workshops.
- Opportunity for students for their involvement in major research projects of institute.
- Provision of project work on applied aspects of molecular biology and opportunity to implement their novel ideas in research.

NAME OF THE DEGREE

Master of Science in Molecular Biology: M.Sc. (Molecular Biology)

OBJECTIVES

The students of M.Sc. Molecular Biology course (2 years) should be able to

- Deep knowledge and understanding of molecular biology and its applications
- Understand key implications of proteomics, Genomics and related aspects.

- Research driven education
- Read and analyze the primary research literature, critically assess scientific experiments and evaluate the impact of a scientific discovery.
- Be primed and able to conduct quality research in latest molecular biology based research topics.

ADMISSION REQUIREMENTS

- Citizenship: Indian nationals can apply under the General category. Foreign nationals or NRI or Indian nationals supported by NRI relatives can apply under the Foreign/NRI category.
- Qualification: Candidates with 50% marks in B.Sc. Molecular Biology/ Biotechnology/ Microbiology/ / Biochemistry/Genetics /Botany/Zoology /B.Sc. Nursing/MBBS/BDS) or any equivalent degree in life sciences of any recognized university.
- Total Seats=10

DURATION OF STUDY

The duration of the study for M.Sc. Molecular Biology will be of four semesters spread over two years.

Program pattern

- First Semester: July
- Second Semester: January
- Third Semester: July
- Fourth Semester: January

*(a) **Dissertation / Project Course** commences in III Semester

(b) **Educational Tours / Field Works/Hospital Visit/Industrial Visit** Course may be carried out in any Semester or all Semesters but evaluated and Grade Points are to be added in 4th Semester.

(Elective): Any one subject is to be chosen from the following (Subjects offered may change from time to time depending on the availability of expertise)

****Elective courses may or may not have practical and/or field work.**

Multidisciplinary / Interdisciplinary

EDUCATIONAL/INDUSTRIAL TOUR:

Industrial visit has its own importance in building a career of a student which is pursuing a professional degree. Objectives of industrial visit are to provide students with an insight regarding internal working of reputed hospitals and labs. Industrial visits provide students with an opportunity to learn practically thought interactions, working methods and employment practices as theoretical knowledge is not enough for making competent and skillful professionals

M.Sc. MOLECULAR BIOLOGY**PROGRAM OUTCOME**

Program Code	Program Objective
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 analyze, 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 the community.
PO5	Develop an ability to function as an efficient individual and team player in multidisciplinary sectors for effective outcomes.
PO6	Demonstrate effective written and oral communication skills to communicate effectively in the 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 in respective areas of specialization
PO8	Develop lifelong learning attitude and values for enhancement professional and social skills for an overall development

Course Outcomes

Semester I

MMB 101 T & MMB 104 P	Cell Biology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Students will gain an understanding of cell origin.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO2	Basic understanding of cell structure and its components.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
O3	Students will understand the cell function.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO4	Understanding of cell and regulations physiology.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
MMB 102 T & MMB 105 P	Molecular Immunology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Students will gain understanding of the immune system and immunity.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO2	It highlights understanding of the molecular structure of immune cells.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO3	Understanding of role and expression of immune system during infection and immunity	PO1, PO2	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO4	Understanding of the status of the immune system during disease system	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment

CO5	Exploration of immune system concepts into design and development of new therapeutics.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
MMB 103 T & MMB 106 P	Molecular Enzymology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Post graduate students will understand the basics of enzymes and their function in biological systems.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO2	They will understand the enzyme modulation during specific situations.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO3	Basic understanding of the applications of the enzyme in various industries.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO4	Students will learn the basics techniques of enzymology.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CC 001 T CC 001 P	Research Methodology & Biostatistics (Core Course)	Mapped PO	Teaching-Learning Methodology	Assessment Tools
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.	PO1, PO2, PO3	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment

Semester II

MMB 108 T & MMB 112 P	Gene and Protein Science	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Students will be able to understand the basis of inheritance, gene organization and structure of DNA.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO2	They will be also understanding gene function and linkages with protein. Understanding of genome and proteome will be important learning outcome.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO3	Understanding of basics of protein structure, purification and characterization will be major outcome of the section.	PO1, PO2	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
MMB 109 T & MMB 113 P	Bioinformatics & Computational Biology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
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.	PO1, PO5	Lecture, Practical, Assignment, Seminar, group discussion, e-learning	Theory exam, Practical exam, Viva-voce, Seminar, Journal club, skill assessment
CO2	Students will understand the basic skill data analysis including cluster analysis and sequence analysis.	PO1, PO5	Lecture, Practical, Assignment, Seminar, group discussion, e-learning	Theory exam, Practical exam, Viva-voce, Seminar, Journal club, skill assessment
MMB 110 T & MMB 114 P	DNA Recombinant Technology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
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.	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
MMB 111 T & MMB 115 P	Metabolic Engineering	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Students will understand the basics of metabolic pathways and network in cellular system.	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment

CO2	Understanding different models of cellular reactions.	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO3	Students will understand the concept of metabolic flux analysis and metabolic control analysis.	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO4	Understanding of the concept of metabolic design in strain development	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
CO5	It will provide the understanding of the potential of metabolic engineering in industrial applications.	PO1, PO2, PO5	Lecture, Practical, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Internal Assessment
SEC 001 T	Innovation and Entrepreneurship	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.	PO1, PO3, PO4	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Seminar, Journal club, case study presentation, station exercise
CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures.	PO1, PO3, PO4	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Seminar, Journal club, case study presentation, station exercise
CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures	PO1, PO3, PO4	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Seminar, Journal club, case study presentation, station exercise
SEC 002 T	One Health (NPTEL)	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	A comprehensive understanding of One Health's role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health.	PO1, PO4, PO5	Lecture, Practical, Quiz, Assignment, Seminar, group discussion,	Theory exam, Practical exam, Viva-voce, Seminar, Journal club, journal club
CO2	Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases.	PO7, PO8	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Journal club, journal club
CO3	Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.	PO1, PO2, PO4	Lecture, Practical, Quiz, Assignment, Seminar, group discussion	Theory exam, Practical exam, Viva-voce, Seminar, Journal club, journal club

OUTLINE OF COURSE CURRICULUM														
M.Sc. MOLECULAR BIOLOGY														
Semester I														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMB 101 T	Cell Biology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMB 102 T	Molecular Immunology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMB 103 T	Molecular Enzymology	3	-	-	-	3	45	-	-	-	45	20	80	100
CC 001 T	Research Methodology & Biostatistics (Core Course)	3	-	-	-	3	45	-	-	-	45	-	50	50
Discipline Specific Core Practical														
MMB 104 P	Cell Biology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 105 P	Molecular Immunology			2		1			30		30	10	40	50
MMB 106 P	Molecular Enzymology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 107 CP	MMB Directed Clinical Education - I	-	-	-	12	4	-	-	-	180	180	-	50	50
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	-	50	50
Total		12	0	10	12	21	180	0	150	180	510	90	510	600

OUTLINE OF COURSE CURRICULUM														
M.Sc. MOLECULAR BIOLOGY														
Semester II														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posting/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMB 108 T	Gene and Protien Science	3	-	-	-	3	45	-	-	-	45	20	80	100
MMB 109 T	Bioinformatics and Computational Biology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMB 110 T	DNA Recombinant Technology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMB 111 T	Metabolic Engineering	3	-	-	-	3	45	-	-	-	45	20	80	100
Discipline Specific Core Practical														
MMB 112 P	Gene and Protien Science	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 113 P	Bioinformatics and Computational Biology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 114 P	DNA Recombinant Technology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 115 P	Metabolic Engineering	-	-	2	-	1	-	-	30	-	30	10	40	50
MMB 116 CP	MMB Directed Clinical Education - II	-	-	-	12	4	-	-	-	180	180	-	50	50
Skill Enhancement Course														
SEC 001 T	Innovation and Enterpreneurship	3	-	-	-	3	45	-	-	-	45	-	50	50
SEC 002 T	Molecular Diagnostics													
Total		15	0	8	12	23	225	0	120	180	525	120	580	700