



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)

(with effect from 2025-26 Batches)

Curriculum for
M.Sc. Medical
Laboratory Technology

Amended as per AC-52/2025, Dated 28/11/2025

Amended History

1. Amended as per AC-51/2025, [Resolution No.3.6(Annexure-8A)], [Resolution No.3.5, (Annexure-7)]; Dated 29/04/2025.
2. Amended as per AC-52/2025, [Resolution No. 5.1(Annexure-17O)]; [Resolution No. 5.8, (Annexure-24M)]; Dated 28/11/2025.

Resolution No. 3.6 of Academic Council (AC-51/2025):

Resolved to approve the initiation of the proposed new postgraduate program in **Medical Laboratory Sciences (M.Sc. MLT)**, including the CBCS syllabus, Program Outcomes (POs), and Course Outcomes (COs) for Semesters I and II, commencing from the Academic Year 2025-26. The program will follow a two-year CBCS semester structure, with an intake capacity of 2 students per batch and an annual tuition fee of INR 1,25,000 for the batch admitted from the Academic Year 2025-26 onwards [ANNEXURE-8A & 8B].

Annexure-8A of AC-51/2025



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

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.:022-2743763, 27437632, 27432890

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CHOICE BASED CREDIT SYSTEM (CBCS)

(Academic Year 2025 - 26)

Curriculum for

M.Sc. Allied Health Sciences

M.Sc. Medical Laboratory Technology

Semester I & II

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 the 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 MGM IHS 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 23 courses each with its own distinct, specialized body of knowledge and skill. This includes 8 UG courses and 15 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, School of Biomedical Sciences envisions to continuously grow and reform. Reforms are essential to any growing institution as it fulfills 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.

Name of the Degree: M. Sc. Medical Laboratory Technology

Duration of Study: The duration of the study for M.Sc. Medical Laboratory Technology will be of 2 years

Program pattern:

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

Eligibility Criteria:

B.Sc. in Medical Laboratory Technology with a minimum 50% mark.

Selection of eligible candidates: Selection to the M.Sc. MLT course shall be on the performance in interview conducted by MGM School of Biomedical Sciences, Navi Mumbai.

Attendance and Monitoring Progress of Study:

A candidate shall study in concerned department of the institute for the entire period as a full time student. No candidate is permitted to work in any other laboratory/college/hospital etc while studying. No candidate should join any other course of study or appear for any other degree examination conducted by this university or any university in India or Abroad during the period of registration.

A candidate who has put in a minimum of 75% of attendance in theory and practical separately and who has fulfilled other requirements of the course shall be permitted to appear for University Examination.

Clinical Training Evaluation:

Students shall be deputed to Pathology, Biochemistry, Microbiology & Blood Bank department wherein they shall undergo practical training of handling patients, processing of different types of samples.

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

For any query visit the website: www.mgmsbsnm.edu.in

Program Outcome

Program Outcome	M.Sc. Medical Laboratory Technology
PO1	Advanced Knowledge in Medical Laboratory Science: Acquire thorough knowledge of pathology, microbiology, biochemistry, hematology, immunology, and molecular biology with its applications to demonstrate expertise in clinical laboratory techniques, diagnostic methodologies, and biomedical sciences.
PO2	Proficiency in Laboratory Techniques and Instrumentation: Expertise to perform, utilize and troubleshoot modern diagnostic instruments and technologies in medical laboratory with accuracy and precision.
PO3	Integration of Laboratory Science in Healthcare: Collaborate with healthcare teams for accurate diagnosis and evidence-based laboratory practices for clinical decision-making in real-world situations.
PO4	Quality Assurance and Laboratory Management: Implement quality control and quality assurance measures in laboratory settings. Gain knowledge about application of laboratory accreditation, biosafety, and bioethics in clinical practice.
PO5	Data Analysis and Interpretation: Develop skills for analysis of laboratory data using statistical tools and their interpretation for clinical conditions.
PO6	Professional Ethics and Compliance: Establish an in-depth understanding of professionalism, ethics, legal regulations and safety in laboratory procedures to guarantee compliance with medical laws, patient privacy, and integrity of test results.
PO 7	Research and Innovation: Develop research-oriented thought process by learning about research methodology, innovation incubation and conducting independent / collaborative research in medical laboratory sciences.
PO8	Leadership and Communication Skills: Demonstrate effective leadership, teamwork, and interpersonal communication in laboratory settings with students, laboratory personnel, and healthcare professionals
PO9	Lifelong Learning and Professional Development: Engage in continuous education, professional training and scientific contributions, to stay updated with advancements in the field of diagnosis and healthcare.

SEMESTER – I				
MMLT 101 T	Introduction to Medical Laboratory Technology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Comprehend the importance of medical laboratory technology in diagnosing, monitoring, and treating diseases.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos	Internal Assessment, Theory exam, Seminar,
CO2	Learn the ethical and legal responsibilities of a medical laboratory professional, including patient confidentiality, consent, and reporting of results.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos	Internal Assessment, Theory exam, Seminar,
CO3	Understand and demonstrate fundamental laboratory techniques, such as sample collection, preparation, and analysis.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos	Internal Assessment, Theory exam, Seminar,
CO4	Explain the different branches of medical laboratory technology, such as clinical chemistry, microbiology, hematology, immunology, blood banking, and molecular diagnostics.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos	Internal Assessment, Theory exam, Seminar,
MMLT 102 T	Haematology and Clinical Pathology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Student should be know the basic concepts in hematology and clinical pathology	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Understand importance of tests like Blood Clotting Factor & Bone marrow	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Should understand clinical	PO1, PO2,	Lecture, Practical,	Internal Assessment,

	significance urine, Semen, different body fluid analysis	PO3, PO4, PO5, PO6, PO7, PO8, PO9	Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 103 T	Basics of Microbiology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Provide the student with the study of normal flora and pathogenic microorganisms. Methods for recovery, identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Should understand Molecular identification of bacterial pathogens.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 104 T	Essentials of Biochemistry and Laboratory Techniques	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Understand the Classification, Functions and Metabolism of Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic acids with their significance in homeostasis and related disorders	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO2	Understand the role of Enzymes and biochemical processes of Cellular Respiration involved in energy production	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE

			postings, Industrial visits/Camps, Problem-Based Learning	
CO3	In depth knowledge of Principle and applications of Good Laboratory Practices.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO4	Proficiency in handling Instruments used in Biochemistry laboratory and their applications in clinical diagnosis.	PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO5	Competent knowledge of collection and analysis of various body fluid used for diagnostics	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO6	Comprehension of applications of Basic Biochemical Laboratory Techniques with accuracy	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
MMLT 105 P	Hematology and Clinical Pathology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Perform and analyze tests like all hematology & Blood Clotting Factor	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Should perform urine, Semen, different body fluid analysis	PO1, PO2, PO3, PO4,	Practical, Demonstration, Clinical	Internal Assessment, Practical exam, Viva-

	experiments under guidance	PO5, PO6, PO7, PO8, PO9	postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Perform lab test for bone marrow	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 106 P	Basics of Microbiology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Should perform test for identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Should perform Molecular identification of bacterial pathogenes.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 107 P	Essentials of Biochemistry and Laboratory Techniques	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Demonstration and analysis of various Body fluids in diagnosis	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Proficiency in calibration and application of Basic Instruments used in the Biochemistry laboratory	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CC 001 T	Research Methodology & Biostatistics (Core Course)	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Describe types of research (qualitative, quantitative, experimental, observational).	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO2	Understand sampling methods	PO1, PO2,	Lecture, Group	Internal Assessment,

	(random, stratified, systematic) and their applications in lab-based studies.	PO3, PO4, PO5, PO6, PO7, PO8, PO9	Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Theory exam, Seminar
CO3	Learn hypothesis testing methods (t-tests, chi-square tests, ANOVA) in medical research.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO4	Understand the structure of scientific reports, theses, and research papers.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CC 001 P	Research Methodology & Biostatistics (Core Course)	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Identify research problems related to medical laboratory technology. Develop appropriate research questions, objectives, and hypotheses.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce
CO2	Conduct a systematic literature review using databases like PubMed, Google Scholar, and Scopus.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce
CO3	Use Excel, SPSS, or R for data entry, statistical calculations, and analysis	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce
CO4	Create tables, graphs, and charts to summarize research findings.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce
MMLT 108 CP	MMLT Clinical Directed Education I	Mapped PO	Teaching-Learning Methodology	Assessment Tools

CO1	Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department	Clinical postings, Viva-voce, Seminar, Log Book,
CO2	Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department	Clinical postings, Viva-voce, Seminar, Log Book,
CO3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department	Clinical postings, Viva-voce, Seminar, Log Book,

SEMESTER – II				
MMLT 109 T	Immunohematology & Blood Transfusion	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Understand antigen-antibody reactions and their role in blood group identification.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Understand ABO and Rh blood group systems, their genetics, and clinical significance, Cell separation and components.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Should Know blood donation procedures, donor selection criteria, and screening tests.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 110 T	Immunology and Serology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Understand the structure and function of the immune system, including primary and secondary lymphoid organs	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters /	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station

			Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	exercise / OSCE
CO2	Understand antigen-antibody reactions and their significance in immunity and disease diagnosis, hypersensitivity reactions (Type I-IV), their mechanisms, and clinical implications.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Understand the principles of graft rejection, HLA typing, and immunosuppressive therapy. applications of immunotherapy, CRISPR gene editing, and emerging trends in immunology	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Practical, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 111 T	Advances in Clinical Biochemistry and Quality Control	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Comprehensive knowledge of Principle and applications of Quality Control and Automation in Biochemistry Laboratory	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Analyse the Role of Vitamins, Minerals and Electrolytes in Human Health with respect to biochemical functions and deficiency manifestations	PO1, PO2, PO3, PO4, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE

			Postings, Case-study, Workshops	
CO3	Understand the different types of plasma proteins and its related disorders specifically Jaundice and Hemoglobinopathies	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical Postings, Case-study, Workshops	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO4	Explore Biochemistry of Hormones and their mechanism of action.	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical Postings, Case-study, Workshops	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO5	Mastery to Analyse and Interpret Biochemical Laboratory Tests to assess organ dysfunction and disease progression.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO6	Insightful knowledge of advanced Biochemistry Techniques with their applications in Diagnosis	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Demonstration, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Theory exam, Practical exam, Viva-voce, Seminar, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 112 P	Immunohematology & Blood Transfusion	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Demonstrate ABO and Rh blood grouping using forward	PO1, PO2, PO3, PO4,	Practical, Demonstration,	Internal Assessment, Practical exam, Viva-

	and reverse typing.	PO5, PO6, PO7, PO8, PO9	Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Perform major and minor crossmatching using saline, enzyme, and AHG methods, Conduct Direct and Indirect Antiglobulin Tests (DAT & IAT).	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Demonstrate proper phlebotomy techniques for blood donation, basic steps in blood component separation	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 113 P	Immunology and Serology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Demonstrate agglutination and precipitation techniques for detecting antigen-antibody interactions	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Maintain biosafety measures and quality control standards in immunology testing.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Able to perform Analyze Hypersensitivity Reactions	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE

MMLT 114 P	Advances in Clinical Biochemistry	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Proficiency in estimation and interpretation of various Biochemical tests for diagnosis	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning, Case-study	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Demonstration of principle, working and applications of advanced Biochemical techniques	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 115 CP	MMLT Clinical Directed Education II	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8	Practical, Clinical Posting, Demonstration, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce, Case- Study
CO2	Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8	Practical, Clinical Posting, Demonstration, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce, Case- Study
CO3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8	Practical, Clinical Posting, Demonstration, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce, Case- Study

	interdisciplinary healthcare teams.			
SEC 001 T	Innovation and Entrepreneurship	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Define the role of innovation and entrepreneurship in the medical laboratory and healthcare industry.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO2	Analyze current challenges in laboratory diagnostics and identify areas for innovation.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO3	Explore opportunities in point-of-care testing (POCT), AI-driven diagnostics, and personalized medicine.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO4	Learn how to take calculated risks and adapt to the evolving medical diagnostics field.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar
CO5	Understand funding options, including venture capital, angel investors, and government grants for healthcare innovations.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Problem-Based Learning	Internal Assessment, Theory exam, Seminar

OUTLINE OF COURSE CURRICULUM														
M.Sc Medical Laboratory Technology (MMLT)														
Semester I														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMLT 101 T	Introduction to Medical Laboratory Technology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 102 T	Haematology and Clinical Pathology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 103 T	Basics of Microbiology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 104 T	Essentials of Biochemistry and Laboratory Techniques	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														
MMLT 105 P	Haematology and Clinical Pathology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 106 P	Basics of Microbiology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 107 P	Essentials of Biochemistry and Laboratory Techniques	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 108 CP	MMLT Clinical Directed Education 1	-	-	-	9	3	-	-	-	135	-	50	50	
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	-	50	50
Total		15	0	10	9	23	225	0	150	135	510	110	590	700

Resolution No. 5.8 of Academic Council (AC-52/2025):

The Academic Council resolved to approve the continuation of SWAYAM/NPTEL elective courses for postgraduate students, wherever applicable to their respective programmes. Accordingly, students admitted from the Academic Year 2025-26 onwards shall be permitted to choose any one approved elective course. The Council further approved the inclusion of 2 and 3 credit courses in the index. This approach is in alignment with the current NCAHP curriculum guidelines, which recommend flexibility for open electives through recognized national platforms.

Accordingly, the names of individual elective courses shall be removed from the existing syllabi. The links of SWAYAM/NPTEL courses (https://swayam.gov.in/nc_details/NPTEL) shall be incorporated in the syllabus index under the existing course code SEC-002 T, titled: “NPTEL/SWAYAM (Name of the Course Chosen by the Student)”

In alignment with Resolution No. 3.1 of the Academic Council (AC-51/2025), the detailed syllabi of individual courses shall be removed and replaced with the approved links of SWAYAM/NPTEL or common reference pool courses. The complete course content shall remain accessible on the official SWAYAM/NPTEL portals. Students may select any one course from the provided links, in alignment with the credit requirements mentioned in their respective syllabi, as per Annexures 24A, 24B, 24C, 24D, 24E, 24F, 24G, 24H, 24I, 24J, 24K, 24L, 24M, 24N, and 24O.

OUTLINE OF COURSE CURRICULUM**M.Sc. Medical Laboratory Technology (MMLT)****Semester II**

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMLT 109 T	Immunohematology & Blood Transfusion	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 110 T	Immunology and Serology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 111 T	Advances in Clinical Biochemistry	4	-	-	-	4	60	-	-	-	60	20	80	100
Discipline Specific Core Practical														
MMLT 112 P	Immunohematology & Blood Transfusion	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 113 P	Immunology and Serology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 114 P	Advances in Clinical Biochemistry	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 115 CP	MMLT Directed Clinical Education - II	-	-	-	15	5	-	-	-	225	225	-	50	50
Skill Enhancement Course														
SEC 001 T	Innovation and Enterprenuarship	3	-	-	-	3	45	-	-	-	45	-	100	100
SEC 002 T	NPTEL Swayam (Course Selected as per Below List)													
Total		13	0	6	15	21	195	0	90	225	510	90	510	600

Common Pool of Swayam/NPTEL Courses offered as elective option (SEC 002)

Course ID	Discipline	Course Name	Institute	Duration	Start date	End date	Exam date	Enrollment End date	Exam Registration End date	UG/PG	Click here to Join the course	NPTEL URL	NPTEL ID
noc25-bt06	Biotechnology and Bioengineering	BioInformatics: Algorithms and Applications	IIT Madras	12 Weeks	20-01-2025	11-04-2025	26-04-2025	27-01-2025	28-02-2025	UG/PG	https://onlinecourses.nptel.ac.in/noc25_bt06/preview	https://nptel.ac.in/courses/102106065	https://nptel.ac.in/courses/102106065
noc25-bt13	Biotechnology and Bioengineering	Computational Genomics	IISER Bhopal	12 Weeks	20-01-2025	11-04-2025	27-04-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_bt13/preview	https://nptel.ac.in/courses/102106339	https://nptel.ac.in/courses/102106339
noc25-bt29	Biotechnology and Bioengineering	Maternal Infant Young Child Nutrition	IIT Bombay	12 Weeks	20-01-2025	11-04-2025	26-04-2025	27-01-2025	28-02-2025	UG/PG	https://onlinecourses.nptel.ac.in/noc25_bt29/preview	https://nptel.ac.in/courses/102101091	https://nptel.ac.in/courses/102101091
noc25-ge05	Multidisciplinary	Biophotonics	IIT Kharagpur	12 Weeks	20-01-2025	11-04-2025	03-05-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_ge05/preview	https://nptel.ac.in/courses/127105225	https://nptel.ac.in/courses/127105225
noc25-ge07	Multidisciplinary	Comprehensive Molecular Diagnostics and Advanced Gene Expression Analysis	IIT Kharagpur	12 Weeks	20-01-2025	11-04-2025	03-05-2025	27-01-2025	28-02-2025	UG/PG	https://onlinecourses.nptel.ac.in/noc25_ge07/preview	https://nptel.ac.in/courses/127105391	https://nptel.ac.in/courses/127105391
noc25-ge25	Multidisciplinary	One Health	ICMR - Regional Medical Research Centre, Bhubaneswar	12 Weeks	20-01-2025	11-04-2025	03-05-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_ge25/preview	https://nptel.ac.in/courses/127106233	https://nptel.ac.in/courses/127106233
noc25-ge27	Multidisciplinary	Qualitative Research Methods and Research Writing	IIT Kharagpur	12 Weeks	20-01-2025	11-04-2025	27-04-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_ge27/preview	https://nptel.ac.in/courses/109105115	https://nptel.ac.in/courses/109105115
noc25-bt21	Biotechnology and Bioengineering	Host-Pathogen Interaction (Immunology)	IISER Bhopal	12 Weeks	20-01-2025	11-04-2025	04-05-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_bt21/preview	https://onlinecourses.nptel.ac.in/noc24_bt24/preview	https://onlinecourses.nptel.ac.in/noc24_bt24/preview
noc25-bt22	Biotechnology and Bioengineering	Human Physiology	IISER Pune	12 Weeks	20-01-2025	11-04-2025	26-04-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_bt22/preview	https://onlinecourses.nptel.ac.in/noc24_bt05/preview	https://onlinecourses.nptel.ac.in/noc24_bt05/preview
noc25-hs61	Humanities and Social Sciences	Patent Law for Engineers and Scientists	IIT Madras	12 Weeks	20-01-2025	11-04-2025	03-05-2025	27-01-2025	28-02-2025	UG/PG	https://onlinecourses.nptel.ac.in/noc25_hs61/preview	https://onlinecourses.nptel.ac.in/noc24_hs155/preview	https://onlinecourses.nptel.ac.in/noc24_hs155/preview
noc25-mg05	Management	AI in Human Resource Management	IIT Guwahati	12 Weeks	20-01-2025	11-04-2025	04-05-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_mg05/preview	https://nptel.ac.in/courses/110103626	https://nptel.ac.in/courses/110103626
noc25-hs70	Humanities and Social Sciences	Science Communication: Research Productivity and Data Analytics using Open Source Software	IIT Delhi	12 Weeks	20-01-2025	11-04-2025	03-05-2025	27-01-2025	28-02-2025	PG	https://onlinecourses.nptel.ac.in/noc25_hs70/preview	https://nptel.ac.in/courses/109102392	https://nptel.ac.in/courses/109102392
noc25-ag04	Agricultural and Food Engineering	Food Science and Technology	IIT Kharagpur	12 Weeks	20-01-2025	11-04-2025	26-04-2025	27-01-2025	28-02-2025	UG/PG	https://onlinecourses.nptel.ac.in/noc25_ag04/preview		

FIRST YEAR

M.Sc. Medical Laboratory Technology

SEMESTER-I

Code No.	Core Subjects
Discipline Specific Core Theory	
MMLT 101 T	Introduction to Medical Laboratory Technology
MMLT 102 T	Haematology and Clinical Pathology
MMLT 103 T	Basics of Microbiology
MMLT 104 T	Essentials of Biochemistry and Laboratory Techniques
CC 001 T	Research Methodology & Biostatistics (Core Course)
Discipline Specific Core Practical	
MMLT 105 P	Haematology and Clinical Pathology
MMLT 106 P	Basics of Microbiology
MMLT 107 P	Essentials of Biochemistry and Laboratory Techniques
MMLT 108 CP	MMLT Clinical Directed Education I
CC 001 P	Research Methodology & Biostatistics (Core Course)

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester I
Name of the Subject	Introduction to Medical Laboratory Technology
Subject Code	MMLT 101 T

Teaching Objective	<ul style="list-style-type: none"> • Basics of Medical Lab Technology, Definitions • Rules & Regulations while working in Labs.
Learning Outcomes	<ul style="list-style-type: none"> • Students should be aware of Code of Conduct related to Laboratory working • Should be well known about professionalism, ethics and confidentiality of patients

Sr. No.	Topics	No. of Hrs.
1	Historical evolution of medical diagnostics, Importance of MLT in healthcare, Role and responsibilities of medical laboratory technologists	10
2	Code of ethics and professionalism in medical diagnostics, Introduction to Pathological Conditions and Diseases.	12
3	Fundamental laboratory techniques, such as sample collection, preparation, and analysis.	10
4	<ul style="list-style-type: none"> • Diagnosis and Monitoring: MLT plays a crucial role in diagnosing various medical conditions, monitoring disease progression, and assessing the effectiveness of treatments. • Preventive Healthcare: Through screening tests and early detection, laboratory tests help in identifying diseases before they manifest or worsen, enabling timely interventions. • Research and Development: MLT professionals contribute to research, helping to develop new diagnostic tests, improve existing technologies, and advance the field of medicine. 	13
Total		45 hrs

Reference book:

1. *A Handbook of Medical Laboratory (Lab) Technology: Editor) Second Edition. V.H. Talib (Ed.)*
2. *Medical Laboratory Technology. Methods and Interpretations – RamnikSood (volume 1&2)*

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester I
Name of the Subject	Hematology & Clinical Pathology
Subject Code	MMLT 102 T

Teaching Objective	<ul style="list-style-type: none"> • The student should be aware basic principles of hematology like anticoagulants, constituents of blood and acquire skills of blood collection. • The student should be able to perform, stain smears in Hematology.
Learning Outcomes	<ul style="list-style-type: none"> • The B.Sc. graduate should have sound knowledge and basic skills of working in a pathology lab

Sr. No.	Topics	No. of Hrs.
1	<ul style="list-style-type: none"> • Blood Cell Morphology and Classification, Erythrocytes (Red Blood Cells- Morphology, Lifespan, Functions, Anemias: Classification and Morphological Changes, Leukocytes (White Blood Cells), Granulocytes: Neutrophils, Eosinophils, Basophils, Agranulocytes: Lymphocytes, Monocytes. Leukemias and Lymphomas: Classification and Morphological Changes. Platelets (Thrombocytes), Structure, Lifespan, Functions Disorders: Thrombocytopenia, Thrombocytopenia. • Hemostasis and Coagulation Disorders, Hemostasis: Overview of the Process- Vascular Phase, Platelet Plug Formation, Coagulation Phase, Clot Retraction, Fibrinolysis, Coagulation Factors and Pathways, Intrinsic, Extrinsic, Common Pathways. • Disorders of Hemostasis, Hemophilia, Von Willebrand Disease, Disseminated Intravascular Coagulation (DIC) 	15
2	<ul style="list-style-type: none"> • Hemoglobinopathies and Thalassemias, Hemoglobin Structure and Function, Normal Hemoglobin (HbA), Hemoglobin Variants, Hemoglobinopathies, Sickle Cell Disease, Hemoglobin C Disease, Thalassemias, Thalassemias, Alpha and Beta Thalassemias: Genetics and Clinical Presentation. • Flow Cytometry in Hematological Analysis, Principles of Flow Cytometry, Cell Sorting, Cell Surface Antigens, Fluorescence Detection, Applications in Hematological Analysis, Immunophenotyping of Leukemias and Lymphomas, Interpretation of Flow Cytometry Results. 	10
3	<ul style="list-style-type: none"> • Hematological Malignancies and Leukemia, Introduction to Hematological Malignancies, Leukemias, Lymphomas, Myelomas. • Types of Leukemia, Acute Lymphoblastic Leukemia (ALL), Acute Myeloid Leukemia (AML), Chronic Lymphocytic Leukemia (CLL), and Chronic Myeloid Leukemia (CML), Pathophysiology, Diagnosis, and Classification. • Bone Marrow Examination and Interpretation, Indications for Bone Marrow Examination, Diagnosis and Staging of Hematological Disorders, Bone Marrow Aspiration and Biopsy Procedures, Collection, Processing, Staining, Interpretation of Bone Marrow Smears and Biopsy Sections 	10

4	<ul style="list-style-type: none"> • Urine Analysis: Physical, Chemical & Microscopic examination. • Universal safety precaution, Biomedical wastes management • Semen processing (Fructose, Dilution & Neubauer chamber loading) • Stool sample processing – Smear preparation for microscopy, occult blood testing, along with Benedict's test for reducing substances. • Special procedures like hanging drop preparation, H Pylori detection. 	10
Total		45 hrs

MMLT 105 P – Hematology & Clinical Pathology

Sr. No.	Topics	No. of Hrs.
1	General principles of Haematology techniques, blood collection, anticoagulants, fixation, processing, routine staining, Haemoglobin, Automation in Hematology	10
2	TLC, DLC, Peripheral smear (CBC report), platelet counts, cell counter working	5
3	Smear preparation for microscopy, occult blood testing, along with Benedict's test for reducing substances. Special procedures like hanging drop preparation, H Pylori detection.	10
4	Reticulocyte staining and identification, Differential count-staining and identification of cell	5
Total		30 hrs

Reference Books:-

1. *A Handbook of Medical Laboratory (Lab) Technology: Editor) Second Edition. V.H. Talib (Ed.)*
2. *Medical Laboratory Technology. Methods and Interpretations – RamnikSood (volume 1&2)*
3. *Practical Pathology P. Chakraborty Gargi Chakraborty New Central Book Agency, Kolkata.*
4. *Theory & Practice of Histological Techniques John D. Bancroft et.al. Churchill Livingstone Printed in China.*

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester I
Name of the Course	Basic of Microbiology
Course Code	MMLT 103 T

Teaching Outcomes	<ul style="list-style-type: none"> • Introduce students to the basic concepts of microbiology, including the types and characteristics of microorganisms (bacteria, viruses, fungi, protozoa, etc.). • Teach students about the structure, function, and classification of microorganisms • Provide knowledge about how microorganisms cause infections, their virulence factors, and the process of pathogenesis.
Learning Outcomes	<ul style="list-style-type: none"> • Theory and Lab courses provide the student with the study of normal flora and pathogenic microorganisms. • Methods for recovery, identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques. • Get an idea of universal safety precautions.

Sr. No.	Topics	No. of Hrs.
1	<ul style="list-style-type: none"> • Microbial Classification and Diversity, Types of Microorganisms: Bacteria, Viruses, Fungi, Protozoa, The Three-Domain System: Bacteria, Archaea, Eukaryota, • Microbial Growth and Cultivation Methods, Factors Affecting Microbial Growth: Temperature, pH, Nutrients, • Types of Media: Selective, Differential, Enriched, Cultivation Techniques: Streak Plate, Liquid Culture, Serial Dilution. • Sterilization and Disinfection Techniques, Physical Methods: Autoclaving, Dry Heat, Filtration, Chemical Methods: Alcohol, Formaldehyde, Bleach, Radiation: UV, Gamma, X-rays. • Introduction to Bacterial Identification and Classification, Basic Shapes and Arrangements: Cocci, Bacilli, Spirilla 	15
2	<ul style="list-style-type: none"> • Identification of Bacteria, Gram Staining, Biochemical Tests, Morphological Characteristics, • Common Bacterial Pathogens: Staphylococcus, Streptococcus, Escherichia coli, etc. Gram Staining: Positive and Negative, Diagnostic Tests: Catalase Test, Oxidase Test, Coagulase Test, • Antibiotic Susceptibility Testing, Importance of Antibiotic Susceptibility Testing, Disk Diffusion (Kirby-Bauer) Method, Zones of Inhibition and Interpretation, MIC (Minimum Inhibitory Concentration) Determination, Broth Dilution, E-Test. 	10
3	<ul style="list-style-type: none"> • Molecular Methods: Polymerase Chain Reaction (PCR), DNA Amplification for Specific Pathogen Detection, Real-time PCR and Quantitative PCR. • DNA Sequencing and Phylogenetic Analysis, Genomic Approaches for Accurate Identification and Evolutionary Relationships among Microorganisms 	10

4	<ul style="list-style-type: none"> • Infection Control and Hospital Epidemiology: Principles of Infection Control, Hand Hygiene, Isolation Precautions, Sterilization, Disinfection, Preventing Healthcare-Associated Infections (HAIs). • Hospital Epidemiology, Surveillance, Outbreak Investigation, Epidemiological Studies, Role of Infection Prevention and Control Committees. 	10
Total		45 hrs

MMRIT 106 P – Basic of Microbiology

Sr. No.	Topics	No. of Hrs.
1	Types of Microscopes Morphology of Bacteria Gram's Stain ZN Stain Special Stain- Albert's, Capsule Stain Collection of samples, transport, Processing Antibiotic Sensitivity Test Serological Tests Precipitation, Agglutination Immunochromatographic Tests	10
2	Sterilization Dry heat Sterilization Moist Heat Disinfection Culture Media Culture Methods Biochemical Tests	10
4	Gel Electrophoresis, Polymerase Chain Reaction, ELISA Test	10
Total		30 hrs

Reference Books:

1. Microbiology for Nursing and Allied Sciences. Dr. Arora 2nd Edition
2. Textbook of Microbiology for Nurses Anantnarayan 1st Edition
3. Practical and Applied Microbiology Anuradha De 4th Edition
4. Text Book of Microbiology Anantnarayan 10th Edition

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester I
Name of the Course	Essentials of Biochemistry and Laboratory Techniques
Course Code	MMLT 104 T

Teaching Objective	<ul style="list-style-type: none"> Elaborate and Demonstrate the Classification, Functions and Metabolism of Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic acids with their clinical significance, analysis in clinical samples and disorders. Understand the role of Enzymes in diagnosis and biochemical processes of Cellular Respiration involved in energy production. Elucidate the clinical significance of Acid-Base balance in homeostasis and related disorders. In-depth knowledge of Principle and applications of Good Laboratory Practices Demonstrate comprehensive knowledge for the calibration, handling and applications of Biochemical Laboratory Instruments and Techniques with accuracy in clinical diagnosis. Competent knowledge of collection and analysis of various body fluid used for diagnostics.
Course Outcomes	<ul style="list-style-type: none"> Understand the Classification, Functions and Metabolism of Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic acids with their significance in homeostasis and related disorders Understand the role of Enzymes and biochemical processes of Cellular Respiration involved in energy production In depth knowledge of Principle and applications of Good Laboratory Practices. Apprehend the clinical significance of Acid-Base balance in homeostasis and related disorders. Competent knowledge of collection and analysis of various body fluid used for diagnostics Comprehension of calibration and applications of Basic Biochemical Laboratory Techniques with accuracy and their applications in clinical diagnosis.

Sr. No.	Topic	No. of Hrs.
1	Metabolism of Carbohydrates and disorders: <ul style="list-style-type: none"> Classification and Functions Overview of Glycolysis, Glycogenesis, Glycogenolysis, Gluconeogenesis Glycogen Storage Disorders Regulation of Blood Glucose Diabetes Mellitus, Diabetic Profile: Fasting, Post-prandial and Random Glucose, GTT, HbA1c and Glycosuria 	6
2	Metabolism of Proteins and disorders: <ul style="list-style-type: none"> Classification and Functions of Proteins Structural Organization of Proteins, Chaperones 	5

	<ul style="list-style-type: none"> • Catabolism of Amino acids, Transamination, Urea cycle, Oxidative deamination • Aminoaciduria and Proteinuria 	
3	<p>Metabolism of Lipids and disorders:</p> <ul style="list-style-type: none"> • Classification and Functions, Essential fatty acids • Cholesterol & its clinical significance • Beta oxidation of fatty acids • Fatty liver, Ketone body metabolism, Atherosclerosis 	5
4	<p>Metabolism of Nucleic Acids:</p> <ul style="list-style-type: none"> • Purines, pyrimidines and nucleotides • Catabolism of Purines • Structure of DNA and RNA • Replication, Transcription and Translation 	5
5	<p>Enzymes</p> <ul style="list-style-type: none"> • Classification of enzymes • Mechanism of enzyme action • Factors affecting enzyme activity • Enzyme Inhibition • Diagnostic uses of Enzymes and Isoenzymes 	4
6	<p>Cellular Respiration</p> <ul style="list-style-type: none"> • Oxidative Phosphorylation • Electron Transport Chain and ATP synthesis • Inhibitors and Uncouplers 	2
7	<p>Acid Base Balance and disorders</p> <ul style="list-style-type: none"> • Osmosis, Henderson-Hasselback equation • Regulation of Acid base balance • Disorders of Acid-Base balance 	4
8	<p>Good Clinical Practices</p> <ul style="list-style-type: none"> • Universal Precautions • Biosafety and Biohazards • Biomedical Waste Management • Lab Ethics and Rights of Patient • Standard Operating Protocol (SOP) 	4
9	<p>Body Fluids</p> <ul style="list-style-type: none"> • Phlebotomy and Anticoagulants • Cerebrospinal Fluid analysis • Ascitic Fluid analysis • Pleural Fluid analysis • Urine analysis 	4
10	<p>Basic Biochemical Laboratory Techniques: Principle, Working, Types and Applications</p> <ul style="list-style-type: none"> • Colorimeter and Spectrophotometer • Semi Autoanalyzer • pH Meter • Blood Gas Analyzer • Electrolyte analyser • High Performance Liquid Chromatography 	6

	<ul style="list-style-type: none"> • Nephelometer • Water Distillation and Deionization plants 	
Total		45 hrs

MMLT 107 P: Essentials of Biochemistry and Quality Control

Sr. No.	Topic	No. of Hrs.
1	Estimation and Interpretation of Plasma Glucose	2
2	Qualitative Estimations for Proteins.	2
3	Determination of Beer-Lambert's Law	2
4	Calibration of pH Meter and Estimation of pH	2
5	Estimation of Abnormal Urine components	2
6	Calibration of test on Semi-Autoanalyzer	2
7	HbA1C (Demonstration)	2
8	CSF analysis and interpretation	2
9	Pleural and Ascitic fluid analysis and interpretation	2
10	Paper Chromatography	2
11	Electrophoresis	2
12	PAGE (Demonstration)	2
13	Blood Gas Analyzer (Demonstration)	2
14	Electrolyte Analyzer (Demonstration)	2
15	Water Distillation Plant (Demonstration)	2
Total		30 hrs

Reference Books:

1. Clinical Biochemistry, An Illustrated Colour Text, Michael Murphy, Rajeev Srivastava, Kevin Deans, Latest Edition
2. Textbook of Medical Biochemistry, MN Chatterjea and Rana Shinde, Latest Edition
3. Textbook of Medical Biochemistry for Medical Students, DM Vasudevan, Latest Edition
4. Harper's Illustrated Biochemistry, Latest Edition
5. Manual of Practical Biochemistry, Rafi MD, Latest Edition
6. Textbook of Medical Laboratory Technology - Vol 1 and 2, B. Godkar, Darshan P. Godkar, Latest Edition
7. Harper's Illustrated Biochemistry, Latest Edition
8. Fundamentals Biochemistry, Donald Voet, Judith G. Voet, Charlotte W. Pratt., Latest Edition
9. Biochemistry, Dr. U. Satyanarayana and Dr. U. Chakrapani, Latest Edition
10. Biochemistry for Medical Laboratory Technology, Harbans Lal, Latest Edition

MMLT 108 CP: MLT Directed Clinical Education – I

Course Outcomes	<ul style="list-style-type: none">• Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.• Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.• Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.
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Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students will apply knowledge from clinical learning experience under the supervision of senior technologist. Students are tested on intermediate clinical Laboratory skills. **(Total -135 hrs.)**

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester I
Name of the Subject	Research Methodology & Biostatistics (Core Course)
Subject Code	CC 001 T

Teaching Objective	<ul style="list-style-type: none"> The course is intended to give an overview of research and statistical models commonly used in medical and bio-medical sciences. The goal is to impart an intuitive, understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyze the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Course Outcomes	<ul style="list-style-type: none"> 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.

Sr. No	Topic	No. of Hrs.
A	Research Methodology:	23
1	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research, Research Methods versus Methodology	4
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case – Control Studies, Cross-sectional studies, Intervention studies.	5
3	Sampling Designs: Census and Sample Survey, Need and importance for Sampling, Implications of a Sample Design, Different Types of Sample Designs (Probability sampling and non-probability sampling), Systematic sampling, Stratified sampling, Cluster sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	Measurement in Research: Measurement Scales, Sources of Error in Measurement,	3
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method	4
6	Research Ethics and plagiarism	2
B	Biostatistics	22
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, scatter plots, line graphs	3
8	Measures of Central Tendency and Dispersion: Mean, Median, Mode, Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3

9	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, power of test, Normal distribution, Parametric Tests including Z-test, t-test, and ANOVA	4
10	Chi-square Test: Chi-square as a Non-parametric Test, Applications.	2
11	Measures of Relationship: Correlation and Simple Regression Analysis	3
12	Non-parametric test: Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test, Kruskal Walli's test, Friedman's test, and Spearman Rank correlation test.	3
13	Vital Health Statistics: rate, crude rate, age specific rate, Measurement of fertility, Rate, Measures of mortality.	4
Total		45 hrs

CC 001 P–Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs
A	Research Methodology	
1	Research Article Presentation (Seminar)	5
B	Biostatistics	
2	Data Presentation	4
3	Measures of Central Tendency and Dispersion	6
4	Testing of Hypotheses	16
5	Chi-square Test	4
6	Measures of Relationship	6
7	Analysis of Variance	5
8	Non parametric or Distribution-free Tests	8
9	Computer Application Using Statistical Software including SPSS	6
Total		60 hrs

Reference Books:

1. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. 10th ed. Wiley; 2013.
2. Gupta SC, Kapoor VK. Fundamentals of mathematical statistics. Sultan Chand & Sons; 2020 Sep.
3. Kothari CR, Garg G. Research methodology: Methods and techniques. 2019.
4. Mahajan BK. Methods in biostatistics for medical students and research workers. 7th ed. Jaypee Brothers Medical Publishers; 2010.
5. Murthy MN. Sampling theory and methods. Statistical Publishing Society; 1967.
6. Singh YK. Fundamental of research methodology and statistics. New Age International; 2006.

Resolution No. 3.5 of Academic Council (AC-51/2025):

Resolved to approve the submitted list of recommended books for M.Sc. Clinical Nutrition and the course on **Biostatistics and Research Methodology** [ANNEXURE-7].

Annexure-7 of AC-51/2025

Biostatistics & Research Methodology Books List

Subject	Book Name	Author
Biostatistics & Research Methodology	Biostatistics: A Foundation for Analysis in the Health Sciences (10th ed.)	Daniel WW.
	Biostatistical Analysis (5th ed.)	Zar JH.
	Research Methodology: Methods and Techniques	Kothari CR, Garg G.
	Methods in Biostatistics for Medical Students and Research Workers (7th ed.)	Mahajan BK.
	Sampling Theory and Methods	Murthy MN.
	Fundamentals of Research Methodology and Statistics	Singh YK.
	Fundamentals of Biostatistics (8th ed.)	Rosner B.
	An Introduction to Medical Statistics (4th ed.)	Bland M.

FIRST YEAR**M.Sc. Medical Laboratory Technology****SEMESTER- II**

Code No.	Core Subjects
Discipline Specific Core Theory	
MMLT 109 T	Immunohematology & Blood Transfusion
MMLT 110 T	Immunology and Serology
MMLT 111 T	Advances in Clinical Biochemistry and Quality Control
Discipline Specific Core Practical	
MMLT 112 P	Immunohematology & Blood Transfusion
MMLT 113 P	Immunology and Serology
MMLT 114 P	Advances in Clinical Biochemistry and Quality Control
MMLT 115 CP	MMLT Directed Clinical Education – II
Skill Enhancement Course	
SEC 001 T	Innovation and Entrepreneurship
SEC 002 T	NPTEL Swayam

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester II
Name of the Course	Immunohematology & Blood Transfusion
Course Code	MLT 109 T

Teaching Outcomes	<ul style="list-style-type: none"> • Introduce students to the basic concepts of microbiology, including the types and characteristics of microorganisms (bacteria, viruses, fungi, protozoa, etc.). • Teach students about the structure, function, and classification of microorganisms • Provide knowledge about how microorganisms cause infections, their virulence factors, and the process of pathogenesis.
Learning Outcomes	<ul style="list-style-type: none"> • Theory and Lab courses provide the student with the study of normal flora and pathogenic microorganisms. • Methods for recovery, identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques. • Get an idea of universal safety precautions.

Sr. No.	Topics	No. of Hrs.
1	<p>Introduction to Immunohematology</p> <ul style="list-style-type: none"> • Basics of blood groups and their clinical significance • Historical development of blood transfusion • Structure and function of antigens and antibodies in blood <p>Blood Group Systems</p> <ul style="list-style-type: none"> • ABO Blood Group System: Genetics, inheritance, and clinical importance • Rh Blood Group System: Rh antigen, Rh incompatibility, and hemolytic disease of the newborn (HDN) • Other blood group systems: Kell, Kidd, Duffy, Lewis, and MNS systems 	5
2	<p>Blood Typing & Crossmatching</p> <ul style="list-style-type: none"> • Principle and techniques of forward and reverse blood grouping • Crossmatching methods: Major and minor crossmatch • Interpretation of discrepancies in blood grouping <p>Antibody Screening & Identification</p> <ul style="list-style-type: none"> • Methods for detecting irregular antibodies • Techniques for antibody identification (Direct & Indirect Antiglobulin Test) • Clinical significance of unexpected antibodies 	10
3	<p>Blood Collection & Processing</p> <ul style="list-style-type: none"> • Donor selection criteria and screening tests • Blood collection procedures, anticoagulants, and storage • Component separation (Packed RBCs, Platelets, Plasma, Cryoprecipitate) <p>Blood Transfusion Practices</p> <ul style="list-style-type: none"> • Indications for blood transfusion • Transfusion reactions: Hemolytic & non-hemolytic reactions • Prevention and management of transfusion reactions 	10
4	<p>Hemolytic Disease of the Newborn (HDN)</p> <ul style="list-style-type: none"> • Causes, diagnosis, and treatment of HDN • Role of Rh immune globulin (RhIg) in prevention 	10

	Apheresis & Blood Component Therapy <ul style="list-style-type: none"> Principles and types of apheresis (plasmapheresis, plateletpheresis) Therapeutic applications of apheresis 	
5	Quality Control & Regulatory Aspects <ul style="list-style-type: none"> Blood bank quality assurance and standard operating procedures Regulatory guidelines (FDA, AABB, WHO) Ethical and legal considerations in blood donation and transfusion Recent Advances in Blood Transfusion & Immunohematology <ul style="list-style-type: none"> Automation in blood banking Molecular techniques in blood grouping Stem cell transplantation and cord blood banking 	10
Total		45 hrs

MMLT 112 P - Immunohematology & Blood Transfusion

Sr. No.	Topics	No. of Hrs.
1	<ul style="list-style-type: none"> Forward and reverse ABO blood grouping Rh (D) typing and weak D testing Interpretation of blood grouping discrepancies 	5
2	<ul style="list-style-type: none"> Major and minor crossmatch Immediate spin, saline, and anti-human globulin (AHG) crossmatching 	5
3	<ul style="list-style-type: none"> Direct Antiglobulin Test (DAT) Indirect Antiglobulin Test (IAT) Screening and identification of irregular antibodies 	5
4	<ul style="list-style-type: none"> Blood donor selection and screening Phlebotomy techniques for blood donation Blood component separation (Packed RBCs, Platelets, Plasma, Cryoprecipitate) 	5
5	<ul style="list-style-type: none"> Direct and indirect Coombs test Detection of maternal-fetal incompatibility Rh antibody titration Pre-transfusion compatibility testing Identification and management of transfusion reactions (hemolytic, febrile, allergic) 	5
6	<ul style="list-style-type: none"> Plateletpheresis and plasmapheresis principles Molecular techniques in blood group typing (if available) Automation in blood banking 	5
Total		30 hrs

Reference Books:

1. A Handbook of Medical Technology-second edition, BY V.H. Talib,CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester II
Name of the Course	Immunology & Serology
Course Code	MMLT 110 T

Course Outcomes	<ul style="list-style-type: none"> • This subject gives a general insight into the history, basics of microbiology; bacterial genetics, immunology and serology. • To imparts knowledge about equipment used in microbiology, safety precautions • To imparts knowledge about equipment used in microbiology, safety precautions • This paper will provide knowledge of serological techniques, and Vaccines
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Sr. No.	Topics	No. of Hrs.
1	<ul style="list-style-type: none"> • Immune System Components and Functions, Innate Immunity, Physical Barriers, Phagocytosis, Inflammation, Complement System, Adaptive Immunity, B Cells: Antibody Production and Functions, T Cells: Cell-Mediated Immunity, Helper T Cells, Cytotoxic T Cells, Major Histocompatibility Complex (MHC) and Antigen Presentation, Immune Responses: Humoral and Cellular Immunity 	10
2	<ul style="list-style-type: none"> • Antigen-Antibody Interactions, Antigens: Types and Characteristics, • Antibodies (Immunoglobulins): Structure and Classes, Antibody-Antigen Binding: Affinity, Avidity, Epitopes, Immunological Memory and Secondary Immune Response. • Diagnostic Immunological Techniques, Enzyme-Linked Immunosorbent Assay (ELISA), Western Blotting: Principles and Applications, Immunofluorescence and Flow Cytometry, Immunohistochemistry: Tissue Staining. • Hypersensitivity Reactions and Allergies, Types of Hypersensitivity Reactions, Type I (Immediate) to Type IV (Delayed) Hypersensitivity, Mechanisms, Mediators, and Clinical Manifestations, Allergic Diseases, Allergic Rhinitis, Asthma, Anaphylaxis. Treatment Approaches: Antihistamines, Epinephrine. 	15
3	<ul style="list-style-type: none"> • Immunological Disorders (Autoimmune Diseases and Immunodeficiencies), Autoimmune Diseases, Rheumatoid Arthritis, Lupus, Type 1 Diabetes, Multiple Sclerosis, • Mechanisms of Autoimmunity: Loss of Tolerance, Molecular Mimicry. Immunodeficiencies, Primary (Congenital). Immunodeficiencies, Secondary (Acquired) Immunodeficiencies: HIV/AIDS. • Flow Cytometry and Immunophenotyping, Advanced Principles of Flow Cytometry, Multiparameter Analysis, Compensation, and Quality Control. Immunophenotyping in Clinical Immunology, Identifying Immune Cell Populations, Subset Analysis 	15
4	<ul style="list-style-type: none"> • Immunotherapies and Monoclonal Antibodies, Immunotherapy Approaches, Immune Checkpoint Inhibitors, Adoptive T-cell Therapy, Vaccines as Immunotherapeutic Agents. Monoclonal Antibodies (mAbs), Production, Mechanisms of Action, Therapeutic Uses: Cancer Treatment, Autoimmune Diseases. 	5
Total		45 hrs

MMLT 113 P - Immunology & Serology

Sr. No.	Topics	No. of Hrs.
1	Demonstrate & Interpret agglutination and precipitation techniques for detecting antigen-antibody interactions.	5
2	Widal test for typhoid fever. VDRL/RPR test for syphilis screening. ASO test for streptococcal infections.	10
3	Conduct Enzyme-Linked Immunosorbent Assay (ELISA) for detecting infections (e.g., HIV, Hepatitis B). Perform Radioimmunoassay (RIA) Perform skin prick tests for allergy detection.	10
4	Perform Rheumatoid Factor (RF) test for rheumatoid arthritis. Conduct C-Reactive Protein (CRP) test to detect inflammation.	5
Total		30 hrs

Reference Books:

1. Microbiology for Nursing and Allied Sciences. Dr. Arora 2nd Edition
2. Textbook of Microbiology for Nurses Anantnarayan 1st Edition
3. Practical and Applied Microbiology Anuradha De 4th Edition
4. Text Book of Microbiology Anantnarayan 10th Edition

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester II
Name of the Course	Advances in Clinical Biochemistry and Quality Control
Course Code	MMLT 111 T

Teaching Objective	<ul style="list-style-type: none"> • In depth knowledge of Quality Control and Automation in Biochemistry Laboratory • Describe the Role of Vitamins and Minerals in Human Health with respect to biochemical functions and deficiency manifestations. • Explain Hormonal Regulation and plasma proteins specifically with metabolism and related disorders. • Demonstrate the Analysis and Interpretation of various Biochemical Laboratory Tests for organ dysfunction and disease progression. • Give Insights on Advanced Biochemistry Techniques with their applications.
Course Outcomes	<ul style="list-style-type: none"> • Comprehensive knowledge of Principle and applications of Quality Control and Automation in Biochemistry Laboratory • Analyze the Role of Vitamins, Minerals and Electrolytes in Human Health with respect to biochemical functions and deficiency manifestations • Understand the different types of plasma proteins and its related disorders specifically Jaundice and Hemoglobinopathies. • Explore Biochemistry of Hormones and their mechanism of action. • Mastery to Analyze and Interpret Biochemical Laboratory Tests to assess organ dysfunction and disease progression. • Insightful knowledge of advanced Biochemistry Techniques with their applications in Diagnosis

Sr. No.	Topic	No. of Hrs.
1	Quality Control and Automation: <ul style="list-style-type: none"> • Principle, Calibration and Maintenance of Auto Analysers • Automation in Laboratory and POCT • Internal and External Quality Control • Levey–Jennings chart, Westgard Rules, Gaussian Distribution Curve 	7
2	Vitamins, Minerals and Electrolytes. <ul style="list-style-type: none"> • Vitamins: Sources, Functions and Deficiency manifestations • Minerals: Sources, Functions and Deficiency manifestations of Sodium, Potassium, Chloride, Calcium; Phosphorus, Iodine • Iron - Absorption, Transport, Storage and Regulation of Iron 	12
3	Plasma Proteins <ul style="list-style-type: none"> • Albumin, Globulin, Fibrinogen, Prothrombin • Synthesis and Breakdown of Heme • Jaundice types, causes and laboratory diagnosis • Hemoglobinopathies (Sickle Cell Anemia and Thalassemia) and Myoglobinuria 	7

4	Hormones <ul style="list-style-type: none"> • Definition and Classification of Hormones • Mechanism of Hormone action 	4
5	Organ Function Tests - I: Clinical Significance, Normal Ranges and Interpretation <ul style="list-style-type: none"> • Liver Function Tests: Total, Direct and Indirect Bilirubin, SGPT, SGOT, ALP, Total Protein and A/G ratio • Renal Function Tests: Urea, Creatinine, GFT, Clearance tests (Urea, Creatinine and Inulin) • Pancreatic Function tests: Amylase and Lipase 	10
6	Organ Function Tests - II: Clinical Significance, Normal Ranges and Interpretations <ul style="list-style-type: none"> • Cardiac Profile: Cardiac Proteins and Cardiac Enzymes • Reproductive Profile: LH, FSH, Prolactin, Estrogen, Progesterone, Testosterone, AMH • Thyroid Profile: Free T3, Free T4, Total T3, Total T4, TSH and Anti TPO antibodies 	10
7	Advanced Biochemical Laboratory Techniques: Principle, Working and Applications <ul style="list-style-type: none"> • Dry Chemistry • Enzyme Linked Immunosorbent Assay (ELISA) • Chemiluminescence Immunoassay (CLIA) • Polymerase Chain Reaction (PCR) • Microarray • Flow Cytometry 	10
Total		60 hrs

MMLT 114 P: Advances in Clinical Biochemistry and Quality Control

Sr. No.	Topic	No. of Hrs.
1	Estimation and Interpretation of Total Cholesterol	2
2	Estimation and Interpretation of Serum HDL	2
3	Estimation and Interpretation of Serum Triglyceride	2
4	Estimation and Interpretation of Total Bilirubin, Direct Bilirubin and Indirect Bilirubin	2
5	Estimation and Interpretation of Total Protein, Albumin and A/G Ratio	2
6	Estimation and Interpretation of AST & ALT	2
7	Estimation and Interpretation of Alkaline Phosphatase	2
8	Estimation and Interpretation of Amylase	2
9	Estimation and Interpretation of Lipase	2
10	Estimation and Interpretation of Blood Urea and BUN	2
11	Estimation and Interpretation of Serum Creatinine, Urine Creatinine and Creatinine clearance.	2
12	Estimation and Interpretation of Uric acid	2
13	Estimation and Interpretation of serum Calcium and Phosphorus	2
14	Estimation and Interpretation of Hormones using ELISA	2
15	Estimation and Interpretation of Vitamin D, Vitamin B 12 and Folic acid (Demonstration)	2
Total		30 hrs

Reference Books:

1. Clinical Biochemistry, An Illustrated Colour Text, Michael Murphy, Rajeev Srivastava, Kevin Deans, Latest Edition
2. Textbook of Medical Biochemistry, MN Chatterjea and Rana Shinde, Latest Edition
3. Textbook of Medical Biochemistry for Medical Students, DM Vasudevan, Latest Edition
4. Harper's Illustrated Biochemistry, Latest Edition
5. Manual of Practical Biochemistry, Rafi MD, Latest Edition
6. Textbook of Medical Laboratory Technology - Vol 1 and 2, B. Godkar, Darshan P. Godkar, Latest Edition
7. Harper's Illustrated Biochemistry, Latest Edition
8. Fundamentals Biochemistry, Donald Voet, Judith G. Voet, Charlotte W. Pratt., Latest Edition
9. Biochemistry, Dr. U. Satyanarayana and Dr. U. Chakrapani, Latest Edition
10. Biochemistry for Medical Laboratory Technology, Harbans Lal, Latest Edition

MMLT 115 CP: MMLT Directed Clinical Education – II

Course Outcomes	<ul style="list-style-type: none">• Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.• Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.• Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.
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Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate clinical Lab diagnosis skills. **(Total –225 hrs.)**

SKILL ENHANCEMENT COURSES

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester II
Name of the Subject	Innovation and Entrepreneurship
Subject Code	SEC 001 T

Course Outcome	<ul style="list-style-type: none"> • Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs. • Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures. • Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.
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Sr. No.	Topics	No. of Hrs.
1	Innovation and Innovation Eco-System, The Policy Framework, Startup Landscape and Innovation Hubs, - Digital India and Make in India, - Linking Innovation with Intellectual Property Rights, Raising Finance for Startups in India, Innovation in Indian Context, Writing a business plan	15
2	Creativity and Research, Converting Researches to Innovation: Innovation Types and Models, Product Development, IPR and its Commercialization, Support System to Develop Culture of Research and Innovation, Commercialization of research and innovation, Fund raising – Research and Innovation, Envisioning Innovation and Scenario Building	15
3	Introduction to Innovation in Entrepreneurship, Idea Generation and Validation, Design Thinking in Entrepreneurship, Business Model Innovation, Technology and Innovation, Funding Innovation, Entrepreneurial Mindset, Leadership & Intellectual Property, Scaling and Growth Strategies, sustainability & Social Innovation	15
Total		45 hrs

Name of the Program	M.Sc Medical Laboratory Technology
Semester	Semester II
Name of the Course	NPTEL Swayam
Course Code	SEC 002 T

Note: The links of SWAYAM/NPTEL courses (https://swayam.gov.in/nc_details/NPTEL)

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		Marks distribution	Marks allotted per section	Marks
Sec: A	MCQ	10 x 1 M = 10	10	10
Sec: B	SAQ	3/4 x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4 x 5 M = 15	15	35
Sec: C	LAQ	2/3 x 10 M = 10	20	
Total				80 Marks

Marks Scheme for the University Examination (50 Marks)

Final theory marks will be 50 marks University Theory exam pattern Research Methodology & Biostatistics (Core course)

Question	Question No.	Question Type	Marks Distribution	Marks
Sec: A	1.	LAQ (2 out of 3)	2 X 10 Marks = 20	20
Sec: B	2.	SAQ (6 out of 8)	6 X 05 Marks = 30	30
Total				50 Marks

Marks Scheme for the University Examination (100 Marks)

Final theory marks will be 100 marks University Theory exam pattern Elective Course

Question	Question No.	Question Type	Marks Distribution	Marks
Sec: A	1.	LAQ (10 out of 12)	10 X 10 Marks = 100	100
Total				100 Marks

Practical exam pattern: Total 40 marks with following breakup:

Exercise	Description	Marks
Q No 1	Practical exercise - 1	1 x 15=15 M
Q No 2	Station exercise	2 x 5M=10 M
Q No 3	Viva	10M
Q No 4	Journal/ Logbook	5M
Total		40 Marks

Practical exam pattern for Research Methodology & Biostatistics (Core course)**Total 50-marks distribution:**

Exercise	Description	Marks
Q No 1	Practical/Problem-Solving: These questions can assess statistical analysis, research design, hypothesis testing, or interpretation of data etc	2 × 10 marks each) = 20 marks
Q No 2	Identification of study designs, Critical appraisal of research papers, Application of biostatistical tools, Sampling techniques etc	(4 × 5 marks each) = 20 marks
Q No 3	Viva Voce (Oral Examination) Assessing conceptual clarity, application of research methodology, and statistical reasoning.	10 marks
Total		50 Marks

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	20 Marks

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal/ Logbook	5 marks
Total	20 Marks

Note –20 marks of practical to be converted to 10 marks weightage for submission to the university.

Model Checklist for Evaluation of the Clinical Directed Posting (PG)

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the Internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Core Competencies	Marks allotted	Marks obtained
	Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.	
Clinical Teaching		
a. Demonstrate beginning competency in technical skills.	10	
Independent Work by Student guided by faculty		
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	2.5	
b. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	2.5	
Hands on practical work by students		
a. Protect confidentiality of electronic/manual health records data, information, and knowledge of technology in an ethical manner	05	
Independent work by student		
a. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behavior and appearance.	05	
Log book	10	
Viva	10	
Attendance	05	
Total	50 Marks	

Sign of Internal Examiner: _____

Sign of External Examiner: _____

Resolution No. 5.1 of Academic Council (AC-52/2025):

Resolved to approve the CBCS syllabus, including Program Outcomes (POs) and Course Outcomes (COs), for Postgraduate (PG) 2-year programs under MGMSBS (semester III & IV) for M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Clinical Embryology, M.Sc. Clinical Nutrition, M.Sc. Medical Dialysis Technology, M.Sc. Molecular Biology, M.Sc. Medical Radiology & Imaging Technology, M.Sc. Cardiac Care Technology, M.Sc. Operation Theatre and Anaesthesia Technology, M.Sc. Emergency and Trauma Care, M. Optometry, Masters in Hospital Administration, Masters of Public Health, M.Sc. Health Informatics, M.Sc. Medical Laboratory Technology, M.Sc. Clinical Research, to be effective from batch admitted in the Academic Year 2025-26 onwards. Guidelines for selected programmes as per National Commission for Allied & Healthcare Professions will be adopted for the given programmes from academic year 2026-27 onwards [ANNEXURE-17A, 17B, 17C, 17D, 17E, 17F, 17G, 17H, 17I, 17J, 17K, 17L, 17M, 17N, 17O & 17P and ANNEXURE-18A, 18B, 18C, 18D, 18E, 18F, 18G, 18H, 18I, 18J, 18K, 18L, 18M, 18N, 18O & 18P].

Annexure-17O of AC-52/2025**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

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.:022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website : www.mgmsbsnm.edu.in**CHOICE BASED CREDIT SYSTEM (CBCS)****(Academic Year 2025 - 26)****Curriculum for****M.Sc. Allied Health Sciences****M.Sc. Medical Laboratory Technology****Semester III & IV**

Course Outcome

SEMESTER – III				
MMLT 116 T	Integrative Histocytology, Genetics and Molecular Biology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Conceptual Understanding: Explain the foundational concepts of Histocytology, molecular biology, and genetics, and their clinical relevance.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO2	Molecular Mechanism Analysis: Analyze molecular and genetic regulatory mechanisms, including cell signaling pathways in health and disease.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO3	Diagnostic Differentiation & Correlation: Differentiate normal and abnormal histological, cytological, biochemical and genetic changes with pathological conditions.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
MMLT 117 T	Mycology, Parasitology & Virology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	To provide Medical laboratory services in all types of clinical laboratories from Primary healthcare laboratory to Tertiary health care institution in the fields of Mycology, Parasitology and Virology.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO2	Make specimen-oriented decision on predetermined criteria including working knowledge of critical values.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
CO3	Should know the logical interpretation of clinical lab investigations. Communicate	PO1, PO2, PO3, PO4, PO5, PO6,	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom,	University exam, Internal Assessment, Theory exam, Viva-

	with other members of healthcare team, customers and patients in an effective manner.	PO7, PO8, PO9	Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	voce, Log Book, Station exercise / OSCE
CO4	Process information and ensure quality control as appropriate to routine laboratory.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Clinical postings, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Theory exam, Viva-voce, Log Book, Station exercise / OSCE
MMLT 118	Research Project / Dissertation	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting, Bed-side learning, Discussion, Seminar, E-learning, Conferences, Workshops	Internal Exam, Seminar, Synopsis, Presentations
CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting, Bed-side learning, Discussion, Seminar, E-learning, Conferences, Wrokshops	Internal Exam, Seminar, Synopsis, Presentations
MMLT 119 P	Integrative Histocytology, Genetics and Molecular Biology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Histocytology Skills: Demonstrate competency in tissue processing, staining, and cytological preparations.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Cytogenetics Proficiency: Perform cytogenetic techniques including metaphase spread preparation, G-banding, and basic karyotyping.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Molecular Biology Techniques: Execute basic molecular biology techniques such as nucleic acid extraction, PCR, electrophoresis,	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book,

	and enzyme assays.	PO9	Based Learning	Journal, Clinical postings, Station exercise / OSCE
CO4	Laboratory Data Interpretation: Interpret laboratory results from histology, cytogenetics, and molecular diagnostics to support clinical decision-making.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 120 P	Mycology, Parasitology & Virology	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	To be able to do basic laboratory identification and classification of medically significant isolates in mycology, parasitology.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO2	Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
CO3	Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Practical, Demonstration, Clinical postings, Hand-on training, Industrial visits/Camps, Problem-Based Learning	University exam, Internal Assessment, Practical exam, Viva-voce, Log Book, Journal, Clinical postings, Station exercise / OSCE
MMLT 121 CP	MMLT Directed Clinical Education - III	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Perform diagnostic tests and laboratory procedures in clinical environments while following safety and quality guidelines.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar, Log Book,
CO2	Exhibit professional conduct, communication skills, and collaboration within healthcare teams.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar, Log Book,
CO3	Analyze laboratory results and prepare accurate reports in compliance with established	PO1, PO2, PO3, PO4, PO5, PO6,	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar, Log

	protocols and quality standards	PO7, PO8, PO9		Book,
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SEMESTER – IV

MMLT 122 T	Bioethics, IPR and Biosafety	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Apply core principles of biomedical Ethics-autonomy, beneficence, non-maleficence, and justice-in clinical practice and research decision-making.	PO1,PO2, PO3,PO4, PO6,PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Industrial visits/Camps	University exam, Internal Assessment, Theory exam
CO2	Demonstrate understanding of ethical guidelines and regulatory frameworks governing biomedical and clinical research.	PO1,PO2, PO3,PO4, PO6,PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Industrial visits/Camps	University exam, Internal Assessment, Theory exam
CO3	Explain the significance of Intellectual Property Rights (IPR) in biomedical innovation, including patentability, filing procedures, and academic–industrial relevance.	PO1,PO2, PO3,PO4, PO5,PO6, PO7,PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Industrial visits/Camps	University exam, Internal Assessment, Theory exam
CO4	Implement biosafety and biosecurity principles through appropriate risk assessment, containment practices, and adherence to national and international norms.	PO1,PO2, PO3,PO4, PO6,PO7, PO8, PO9	Lecture, Demonstration, Group Discussion, Assignment, Flip classroom, Seminar, E-learning, Posters / Videos, Industrial visits/Camps	University exam, Internal Assessment, Theory exam
MMLT 123 P	Internship/Training (Clinical/ Industrial)	Mapped PO	Teaching-Learning Methodology	Assessment Tools
CO1	Apply theoretical knowledge to clinical or laboratory practice with adherence to safety and quality standards.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar, Log Book,
CO2	Demonstrate professional skills, ethical conduct, and effective communication in healthcare or research settings.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar, Log Book,
CO3	Analyze and interpret clinical/laboratory data for accurate reporting and patient care/research applications.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,	Clinical Posting in Different Department, Discussion	University exam, Clinical postings, Viva-voce, Seminar,

MMLT 118	Research Project / Dissertation	Mapped PO	Teaching-Learning Methodology	Log Book, Assessment Tools
CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting, Bed-side learning, Discussion, Seminar, E-learning, Conferences, Workshops	University exam, Seminar, Synopsis, Thesis, Defense Presentations
CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9	Clinical Posting, Bed-side learning, Discussion, Seminar, E-learning, Conferences, Workshops	University exam, Seminar, Synopsis, Thesis, Defense Presentations

OUTLINE OF COURSE CURRICULUM

M.Sc. Medical Laboratory Technology (MMLT)

Semester III

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMLT 116 T	Integrative Histocytology, Genetics and Molecular Biology	3	-	-	-	3	45	-	-	-	45	20	80	100
MMLT 117 T	Mycology, Parasitology & Virology	4	-	-	-	4	60	-	-	-	60	20	80	100
MMLT 118	Research Project/ Disserration	-	-	10	-	5	-	-	150	-	150	50	-	50
Discipline Specific Core Practical														
MMLT 119 P	Integrative Histocytology, Genetics and Molecular Biology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 120 P	Mycology, Parasitology & Virology	-	-	2	-	1	-	-	30	-	30	10	40	50
MMLT 121 CP	MMLT Directed Clinical Education - III	-	-	-	18	6	-	-	-	270	270	-	50	50
Total		7	0	14	18	20	105	0	210	270	585	110	290	400

OUTLINE OF COURSE CURRICULUM

M.Sc. Medical Laboratory Technology (MMLT)

Semester IV

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MMLT 122 T	Bioethics, IPR and Biosafety	3	-	-	-	3	45	-	-	-	45	20	80	100
Discipline Specific Core Practical														
MMLT 123 P	Internship/Training (Clinical/Industrial)	-	-	-	18	6	-	-	-	270	270	-	50	50
MMLT 118	Research Project/ Disserration	-	-	22	-	11	-	-	-	330	330	-	200	200
Total		3	0	22	18	20	45	0	0	600	645	20	330	350

SECOND YEAR

M.Sc. Medical Laboratory Technology

SEMESTER-III

Code No.	Core Subjects
Discipline Specific Core Theory	
MMLT 116 T	Integrative Histocytology, Genetics and Molecular Biology
MMLT 117 T	Mycology, Parasitology & Virology
MMLT 118	Research Project / Dissertation
Discipline Specific Core Practical	
MMLT 119 P	Integrative Histocytology, Genetics and Molecular Biology
MMLT 120 P	Mycology, Parasitology & Virology
MMLT 121 CP	MMLT Directed Clinical Education - III

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	Integrative Histocytology, Genetics and Molecular Biology
Subject Code	MMLT 116 T

Teaching Objective	<ul style="list-style-type: none"> To equip students with integrated knowledge and practical skills in histocytology, molecular Biology, and genetics, enabling them to understand normal and abnormal cellular structures, molecular mechanisms of disease, and genetic alterations. The course aims to develop competency in diagnostic laboratory techniques, interpretation of results, and application of advanced methodologies for accurate diagnosis and research in biomedical sciences.
Course Outcomes	<ul style="list-style-type: none"> Conceptual Understanding: Explain the foundational concepts of histocytology, molecular biology, and genetics, and their clinical relevance. Molecular Mechanism Analysis: Analyze molecular and genetic regulatory mechanisms, including cell signaling pathways in health and disease. Diagnostic Differentiation & Correlation: Differentiate normal and abnormal histological, cytological, biochemical and genetic changes with pathological conditions.

Sr. No.	Topics	No. of Hrs.
1	Foundations of Histocytology <ul style="list-style-type: none"> Introduction to histology and cytology Types of tissues and cell morphology Sample collection: biopsy, FNAC, exfoliative cytology Fixation and staining techniques (H&E, PAP, special stains, G-banding) 	10
2	Histological, Cytological & Chromosomal Diagnostics <ul style="list-style-type: none"> Overview of tissue structures of key organs (liver, kidney, lymph node, uterus, thyroid) Cytology in routine diagnostics: Pap smear, FNAC of thyroid, breast, lymph node Identifying normal vs abnormal cells (inflammation, infection, malignancy) Common genetic abnormalities: Down syndrome, Turner syndrome, Klinefelter syndrome (Overview) 	10
3	Molecular Cell Signaling & Genetic Regulation <ul style="list-style-type: none"> Types of cell signaling: endocrine, paracrine, autocrine Membrane receptors: GPCRs, RTKs Second messengers: cAMP, Ca²⁺, IP₃, DAG Inflammatory signaling (NF-κB, cytokines) Cancer-related signaling (Ras/MAPK, p53, Wnt) Gene expression regulation, epigenetics, and non-coding RNAs in cell signaling 	13

4	Biochemical & Genetic Basis of Cell Function and Dysfunction <ul style="list-style-type: none"> • Enzyme regulation and signal transduction • Cellular stress responses and redox signaling • Apoptosis vs necrosis: morphological and molecular changes • Protein phosphorylation and post-translational modifications • Molecular basis of mutations, DNA repair mechanisms 	12
Total		45 Hrs.

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	Integrative Histocytology, Genetics and Molecular Biology
Subject Code	MMLT 119 P

Course Outcomes	<ul style="list-style-type: none"> • Histocytology Skills: Demonstrate competency in tissue processing, staining, and cytological preparations. • Cytogenetics Proficiency: Perform cytogenetic techniques including metaphase spread preparation, G-banding, and basic karyotyping. • Molecular Biology Techniques: Execute basic molecular biology techniques such as nucleic acid extraction, PCR, electrophoresis, and enzyme assays. • Laboratory Data Interpretation: Interpret laboratory results from histology, cytogenetics, and molecular diagnostics to support clinical decision-making.
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Sr. No.	Topics	No. of Hrs.
1	Histocytology Techniques <ul style="list-style-type: none"> • Fixation, paraffin embedding, microtomy • H&E and special stains (PAS, Reticulin, Masson's trichrome) • PAP smear preparation and staining • Giemsa staining for Cytology and FNAC smear interpretation 	10
2	Cytogenetics <ul style="list-style-type: none"> • Peripheral Blood Lymphocyte Culture • Hypotonic treatment & fixation • Metaphase spread preparation & G-banding • Karyotyping & ISCN basics (Demonstration and Interpretation) 	08
3	Immunohistochemistry & Molecular Biochemistry Techniques <ul style="list-style-type: none"> • Estimation of enzyme activity (ALT/ALP/LDH) • DNA / RNA extraction from blood/tissue • PCR and RT-PCR – visualization and interpretation (demonstration) • Gel electrophoresis (DNA/protein) • IHC marker staining (HER2 / Ki-67 / p53 – demonstration) 	12
Total		30 hrs.

Reference Books:

1. Ross, M.H., Pawlina, W. – *Histology: A Text and Atlas* (Wolters Kluwer)
Best for: Histology concepts, tissue identification, clinical correlations.
2. Bancroft, J.D., Gamble, M. – *Theory and Practice of Histological Techniques* (Elsevier)
Best for: Fixation, embedding, staining, and histotechniques.
3. Barch, M.J., Knutsen, T., Spurbeck, J.L. – *The AGT Cytogenetics Laboratory Manual* (Wiley-Blackwell)
Best for: Karyotyping, G-banding, cytogenetics lab methods.
4. Alberts, B. et al. – *Molecular Biology of the Cell* (Garland Science)
Best for: Cell signaling, gene regulation, molecular biology foundation.
5. Nelson, D.L., Cox, M.M. – *Lehninger Principles of Biochemistry* (W.H. Freeman)
Best for: Enzyme regulation, biochemical pathways, cell function/dysfunction.
6. Wilson, K., Walker, J. – *Principles and Techniques of Biochemistry and Molecular Biology* (Cambridge University Press)
7. Brown, T.A. – *Genomes* (Garland Science) – Genomics, mutations, and molecular genetics applications.

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	Mycology, Parasitology & Virology
Subject Code	MMLT 117 T

Teaching Objective	<ul style="list-style-type: none"> • Introduce students to the basic concepts of microbiology, including the types and characteristics Mycology, Parasitology & Virology • Teach students about the structure, function, Various diseases caused by fungus, viruses & parasites, general characteristics and lab diagnosis of it. • Provide knowledge about how cause of infections, their virulence factors, process of pathogenesis and testing.
Course Outcomes	<ul style="list-style-type: none"> • To provide Medical laboratory services in all types of clinical laboratories from Primary healthcare laboratory to Tertiary health care institution in the fields of Mycology, Parasitology and Virology. • Make specimen-oriented decision on predetermined criteria including working knowledge of critical values. • Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner. • Process information and ensure quality control as appropriate to routine laboratory.

Sr. No.	Topics	No. of Hrs.
1	Mycology Classification, morphological classification, classification of fungal diseases, clinical manifestation, Pathogenesis, Lab diagnosis of fungal diseases, Specimen collection, macroscopy & microscopy, Culture, Superficial mycosis, Tinea versicolor, tinea nigra, piedra, black piedra & white Piedra, Dermatophytosis: Tinea Ring Worm, Subcutaneous mycosis Mycetoma, Sporotrichosis: Rhinosporidiosis, Systemic Mycosis Histoplasmosis, Blastomycosis, Opportunistic mycosis Candidiasis, Cryptococcosis, Mucormycosis - Pathogenesis	20
2	Parasitology: Classification, morphology, important developmental stages, symptoms, pathogenesis & diagnosis of Entamoeba histolytica, Giardia, Trichomonas, Leishmania donovani, Malarial parasites, Toxoplasma gondii, Isospora, Cyclospora, Cryptosporidium Pneumocystis carinii Helminthology: Nematodes, Ascarislumbricoides (Round worms) (Hookworms, S. stercoralis, Trichuristrichiura, E.vermicularis, Filarial worms (In details), D.medinensis. Cestodes: Taenia saginata, T. solium H. Nana, D. latum, E. granulosus Trematode: Schistosomes, F. hepatica, F. buski, C.sinensis ,P.westermanii	20
3	Virology: General properties- Morphology, Classification, Pathogenesis & Transmission Clinical Manifestations, Antigenic variation, Antigenic shift and antigenic drift. Lab Diagnosis, Specimen collection, Molecular Method, Antibody Detection, Virus isolation techniques, General preventive measures (Vaccination) Parvoviruses, Adenoviruses, Herpes viruses, Pox viruses (small pox and chicken pox, molluscum contagiosum), Orthomyxo viruses – Influenza viruses, Mumps viruses,	20

	Measles viruses, Picorna viruses (Polio virus), Hepatitis viruses- Hepatitis A, B, C, D & E. Miscellaneous viruses	
Total		60 hrs

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	Mycology, Parasitology & Virology
Subject Code	MMLT 120 P

Course Outcome	<ul style="list-style-type: none"> • To be able to do basic laboratory identification and classification of medically significant isolates in mycology, parasitology. • Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment. • Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.
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Sr. No.	Topics	No. of Hrs.
1	ELISA tests <ul style="list-style-type: none"> • Lab diagnosis of viral infections • Cultivation of viruses, PCR 	10
2	Lab diagnosis of fungal infections. <ul style="list-style-type: none"> • Various medias used for fungus. • Identification of fungus from various specimens. 	10
3	Diagnostic tests for detection of parasitic infections- methods for demonstration of parasites in clinical specimens <ul style="list-style-type: none"> • Identification of different Ova and Cysts in stool. • Stool examination 	10
Total		30 hrs.

Reference Books: -

1. Microbiology for Nursing and Allied Sciences. Dr. Arora 2nd Edition
2. Paniker's Textbook of Medical Parasitology:
3. Text Book of Microbiology Anantnarayan 10th Edition

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	Research Project / Dissertation
Subject Code	MMLT 118

Teaching Objective	<ul style="list-style-type: none"> • To develop the ability to design, conduct, and analyse a scientific research study in the field of Medical Laboratory Technology. • To enhance proficiency in advanced laboratory techniques and data interpretation. • To cultivate skills in scientific writing, presentation, and critical evaluation of research findings. • To promote ethical conduct, independent thinking, and professional responsibility in biomedical research.
Course Outcomes	<ul style="list-style-type: none"> • Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis. • Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.

***The Dissertation work will begin from 3rd Semester, and will continue through the 4th Semester. (150 hrs)**

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester III
Name of the Subject	MMLT Directed Clinical Education – III
Subject Code	MMLT 121 CP

Teaching Objectives	<ul style="list-style-type: none"> • To provide hands-on exposure to routine and specialized diagnostic procedures in various clinical laboratory departments. • To develop technical competence, accuracy, and adherence to quality control and biosafety standards in laboratory practice. • To strengthen clinical correlation skills by interpreting laboratory results in relation to patient conditions. • To foster professional behaviour, teamwork, communication, and adherence to ethical and institutional guidelines during clinical work.
Course Outcomes	<ul style="list-style-type: none"> • Perform diagnostic tests and laboratory procedures in clinical environments while following safety and quality guidelines. • Exhibit professional conduct, communication skills, and collaboration within healthcare teams. • Analyse laboratory results and prepare accurate reports in compliance with established protocols and quality standards

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students will apply knowledge from clinical learning experience under the supervision of senior technologist. Students are tested on intermediate clinical Laboratory skills. **(Total -270 hrs.)**

SECOND YEAR**M.Sc. Medical Laboratory Technology****SEMESTER- IV**

Code No.	Core Subjects
Discipline Specific Core Theory	
MMLT 122 T	Bioethics, IPR and Biosafety
Discipline Specific Core Practical	
MMLT 123 P	Internship/Training (Clinical/ Industrial)
MMLT 118	Research Project / Dissertation

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester IV
Name of the Course	Bioethics, IPR and Biosafety
Course Code	MMLT 122 T

Teaching Objective	<ul style="list-style-type: none"> To introduce the principles and importance of biomedical ethics in healthcare and research. To familiarize students with ethical guidelines and regulatory frameworks. To impart basic knowledge of Intellectual Property Rights and patent processes. To develop awareness of biosafety, biosecurity, and laboratory risk management practices.
Course Outcomes	<ul style="list-style-type: none"> Apply core principles of biomedical ethics—autonomy, beneficence, non-maleficence, and justice—in clinical practice and research decision-making. Demonstrate understanding of ethical guidelines and regulatory frameworks governing biomedical and clinical research. Explain the significance of Intellectual Property Rights (IPR) in biomedical innovation, including patentability, filing procedures, and academic–industrial relevance. Implement biosafety and biosecurity principles through appropriate risk assessment, containment practices, and adherence to national and international norms.

Sr. No.	Topics	No. of Hrs.
1	Ethics: Benefits of Allied Health Sciences, ELSI of Bioscience, recombinant therapeutic products for human health care, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetics DNA research, human embryonic stem cell research.	10
2	Patenting: Patent and Trademark, Bioscience products and processes, Intellectual property rights, Plant breeders' rights, trademarks, industrial designs, copyright biotechnology in developing countries. Biosafety and its implementation, Quality control in Biotechnology.	10
3	Introduction to quality assurance, accreditation & SOP writing: Concept of ISO standards and certification, National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clinical and testing laboratory.	10
4	Funding Agencies (Financing alternatives, VC funding, funding for Bioscience in India, Existing strategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio-entrepreneurship efforts in India, difficulties in India experienced, organizations supporting growth, areas of scope, funding agencies in India, policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and up gradation)	15
Total		45 hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester IV
Name of the Course	Internship/Training (Clinical/ Industrial)
Course Code	MMLT 123 P

Teaching Objective	<ul style="list-style-type: none"> • To apply theoretical knowledge in real laboratory or industrial settings. • To develop technical and analytical skills through hands-on experience. • To understand laboratory management, quality control, and safety practices. • To foster professionalism, teamwork, and ethical conduct in practice.
Course Outcomes	<ul style="list-style-type: none"> • Apply theoretical knowledge to clinical or laboratory practice with adherence to safety and quality standards. • Demonstrate professional skills, ethical conduct, and effective communication in healthcare or research settings. • Analyse and interpret clinical/laboratory data for accurate reporting and patient care/research applications.

Internship or training in clinical and industrial settings helps students apply theoretical knowledge in real-world environments, improving their technical skills, problem-solving, and understanding of safety and quality protocols. It also develops professional communication, teamwork, and ethical practices, preparing them for career challenges while ensuring accurate and reliable laboratory work. **(Total – 270 Hrs.)**

Name of the Program	M.Sc. Medical Laboratory Technology
Semester	Semester IV
Name of the Course	Research Project / Dissertation
Course Code	MMLT 118

Teaching Objective	<ul style="list-style-type: none"> • To develop the ability to design, conduct, and analyse a scientific research study in the field of Medical Laboratory Technology. • To enhance proficiency in advanced laboratory techniques and data interpretation. • To cultivate skills in scientific writing, presentation, and critical evaluation of research findings. • To promote ethical conduct, independent thinking, and professional responsibility in biomedical research.
Course Outcomes	<ul style="list-style-type: none"> • Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis. • Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.

The Dissertation work will begin from 3rd Semester and will continue through the 4th Semester (330 hrs.)

1. Dissertation/Project work should be carried out as an individual Dissertation and actual bench work.
2. The students will carry independent project work under the supervision of the staff of Department on an advanced topic assigned to him/her. In house projects are encouraged. Students may be allowed to carry out the project work in other Departmental laboratories /Research institutes /Industries as per the availability of Infrastructure.
3. Co guides from the other institutions may be allowed.
4. The Dissertation/Project work will begin from 3rd Semester, and will continue through the 4th Semester.
5. The Dissertation/Project report (also work book shall be presented at the time of presentation and viva voce) will be submitted at the end of the 4th Semester and evaluated.
6. Five copies of the project report shall be submitted to the Director, SBS.
7. For the conduct of the End Semester Examination and evaluation of Dissertation/Project work the University will appoint External Examiners.
8. Since the dissertation is by research, Dissertation/Project work carries a total of 250 marks and evaluation will be carried out by both internal and external evaluators.
9. The student has to defend his/her Dissertation/Project Work in a seminar which will be evaluated by a internal and external experts appointed by the University.
10. The assignment of marks for Project/Dissertation is as follows:
 - Part I-
Topic Selection, Review of Literature, Novelty of works-50 marks
 - Part-II-
 - a. Continuous Internal Assessment, Novelty, Overall Lab Work Culture - 100 Marks
 - b. Dissertation/Project work book: 50 Marks
 - c. Viva-Voce: 50 Marks



**MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)**

Department of Medical Biotechnology

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

Grade "A++" Accredited by NAAC

Sector 1, Kamothe Navi Mumbai-410209, Tel.No.:022-27437631,27432890

Email. sbsnm@mgmuhs.com / Website : www.mgmsbsnm.edu.in

Internship / Training Logbook

MASTER IN MEDICAL LABORATORY TECHNOLOGY

STUDENT NAME: _____

PRN NUMBER: _____

BATCH: _____

SEMESTER: _____

PERIOD FROM: _____ **TO** _____

LOCATION OF INTERNSHIP: _____

NAME OF INTERNSHIP SUPERVISOR: _____



Passport Size Photo of
Student



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AIM:

To provide a structured learning experience that enhances students' technical, analytical, and professional skills while addressing the evolving needs of healthcare organizations. By integrating academic knowledge with hands-on practice, these internships prepare medical biotechnology students to become competent professionals capable of driving biotechnological applications in healthcare.

Guidelines:

1. The internship shall commence after the student has completed and passed all subjects up to Semester III
2. The internship is compulsory
3. The duration of the internship shall be 270 Hours.
4. Activities carried out by the student during the internship must be clearly mentioned.

Evaluation of Interns:

Formative Evaluation: The continuous assessment of interns during their internship should be conducted by the Head of the Department, assigned faculty, or a designated individual from the organization (in the case of industry-based internships). The primary objective of this evaluation is to ensure that interns develop the necessary competencies to function effectively in real-world scenarios. This can be facilitated through the maintenance of records or a logbook by all interns. Such documentation serves as tangible evidence of the training process and, more importantly, reflects the intern's progression in acquiring the required competencies for professional performance.

Summative Evaluation: It will be based on the observations of the assigned person from the Department/Organization and record/logbook maintained by the intern.

Based on these two evaluations, the Head of the Department shall issue certificate of satisfactory completion of the internship.



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Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

Internship/ Training Completion Certificate

Class: _____

Year: _____

This is to certify that _____, bearing PRN _____, has successfully completed the internship at _____ **from** _____ to _____. During this period, the student has completed a total of **270 hours** of internship, as per the university guidelines.

The student demonstrated a high level of professionalism, technical competence, and problem-solving skills. We wish him/her success in his/her future endeavors.

Head of Department
Dept. of Medical Laboratory Technology
MGMSBS, MGMIHS

Director
MGMSBS
Kamothe, Navi Mumbai

Weekly Summary Report

Week dates: _____

Total Hours Completed This Week: _____

Key Activities Performed:

Challenges Faced & How They Were Addressed:

New Skills Acquired:

Comments by Internship Supervisor:



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Final Evaluation (50 Marks)

Sr. No.	Section	Out of Marks	Obtained Marks
1	Technical Knowledge & Application	10 marks	
2	Problem-Solving & Critical Thinking	5 marks	
3	Communication & Teamwork	5 marks	
4	Professionalism & Punctuality	5 marks	
5	Quality of Log Book Maintenance	5 marks	
6	Learning Outcome & Skill Development	5 marks	
7	Final Internship Report Quality	5 marks	
8	Student's Initiative & Engagement	5 marks	
9	Overall Performance	5 marks	
10	Total	50 marks	

Final Remark: _____

Name & Sign of Internal Examiner: _____

Name & Sign of External Examiner: _____

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		Marks distribution	Marks allotted per section	Marks
Sec: A	MCQ	10 x 1 M = 10	10	10
Sec: B	SAQ	3/4x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4x 5 M = 15	15	35
Sec: C	LAQ	2/3x 10 M = 10	20	
Total				80 Marks

Practical exam pattern: Total 40 marks with following breakup:

Exercise	Description	Marks
Q No 1	Practical exercise - 1	1 x 15 = 15 M
Q No 2	Station exercise	2 x 5 M = 10 M
Q No 3	VIVA	10 M
Q No 4	Journal	5M
Total		40 Marks

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	20 Marks

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
Total	20 Marks

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Model Checklist for Evaluation of the Clinical Directed Posting (PG)

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Core Competencies	Marks allotted	Marks obtained
	Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.	
Clinical Teaching		
a. Demonstrate beginning competency in technical skills.	10	
Independent Work by Student guided by faculty		
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	2.5	
b. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	2.5	
Hands on practical work by students		
a. Protect confidentiality of electronic/manual health records data, information, and knowledge of technology in an ethical manner	05	
Independent work by student		
a. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behavior and appearance.	05	
Log book	10	
Viva	10	
Attendance	05	
Total	50 Marks	

Sign of Internal Examiner: _____

Sign of External Examiner: _____

Evaluation for Semester III – Dissertation (PG) (Internal Assessment)

Dissertation/Project Proposal: overall performance of the student	Marks allotted	Marks Obtained
Open mindedness/ Receptivity to feedback Integrates feedback	5 Marks	
Meets deadlines / Regularity in meeting / Consistency in communication	10 Marks	
Continuous Internal evaluation (CIE)		
Interest shown in selecting topic	5 marks	
Appropriate review	10 marks	
Discussion with guide and other faculty	10 marks	
Quality of protocol	5marks	
Preparation of proforma / log book / daily reports	5marks	
TOTAL	Out of 50	

Evaluation for Semester IV - Evaluation parameter (Research Project / Dissertation)

Evaluation parameter (Semester IV)	Continuous Internal Evaluation (CIE) Guide	Semester End Evaluation (SEE)	
		Internal examiner	External examiner
Thesis preparation, Novelty, Overall Lab Work Culture	25	-	-
Dissertation/Project work book	25	25	25
Evaluation of thesis including Viva Voce	-	50	50
Total	50	75	75
Overall Total = 200 Marks			

**Evaluation for Semester IV - Evaluation of the Internship/Training (Clinical/ Industrial)
(PG)**

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Final Evaluation (50 Marks)

1. Technical Knowledge & Application (10 marks): _____
2. Problem-Solving & Critical Thinking (5 marks): _____
3. Communication & Teamwork (5 marks): _____
4. Professionalism & Punctuality (5 marks): _____
5. Quality of Log Book Maintenance (5 marks): _____
6. Learning Outcome & Skill Development (5 marks): _____
7. Final Internship Report Quality (5 marks): _____
8. Student's Initiative & Engagement (5 marks): _____
9. Overall Performance (5 marks): _____
10. Total: _____
11. **Final Remark:**

Sign of Internal Examiner: _____

Sign of External Examiner: _____



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