

<b>PROGRAM OUTCOME (POs)</b>	
<b>Code</b>	<b>M.Sc Medical Laboratory Technology (MMLT)</b>
PO1	<b>Advanced Knowledge in Medical Laboratory Science:</b> 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	<b>Proficiency in Laboratory Techniques and Instrumentation:</b> Expertise to perform, utilize and troubleshoot modern diagnostic instruments and technologies in medical laboratory with accuracy and precision.
PO3	<b>Integration of Laboratory Science in Healthcare:</b> Collaborate with healthcare teams for accurate diagnosis and evidence-based laboratory practices for clinical decision-making in real-world situations.
PO4	<b>Quality Assurance and Laboratory Management:</b> Implement quality control and quality assurance measures in laboratory settings. Gain knowledge about application of laboratory accreditation, biosafety, and bioethics in clinical practice.
PO5	<b>Data Analysis and Interpretation:</b> Develop skills for analysis of laboratory data using statistical tools and their interpretation for clinical conditions.
PO6	<b>Professional Ethics and Compliance:</b> 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	<b>Research and Innovation:</b> Develop research-oriented thought process by learning about research methodology, innovation incubation and conducting independent / collaborative research in medical laboratory sciences.
PO8	<b>Leadership and Communication Skills:</b> Demonstrate effective leadership, teamwork, and interpersonal communication in laboratory settings with students, laboratory personnel, and healthcare professionals
PO9	<b>Lifelong Learning and Professional Development:</b> Engage in continuous education, professional training and scientific contributions, to stay updated with advancements in the field of diagnosis and healthcare.
<b>Course Outcomes (COs)</b>	
<b>Course Code</b>	<b>MASTERS IN MEDICAL LABORATORY TECHNOLOGY</b>
<b>SEMESTER I</b>	
<b>MMLT 101 T</b>	<b>Introduction to Medical Laboratory Technology</b>
CO1	Comprehend the importance of medical laboratory technology in diagnosing, monitoring, and treating diseases.
CO2	Learn the ethical and legal responsibilities of a medical laboratory professional, including patient confidentiality, consent, and reporting of results.
CO3	Understand and demonstrate fundamental laboratory techniques, such as sample collection, preparation, and analysis.
CO4	Explain the different branches of medical laboratory technology, such as clinical chemistry, microbiology, hematology, immunology, blood banking, and molecular diagnostics.
<b>MMLT 102 T</b>	<b>Haematology and Clinical Pathology MMLT 102 L</b>
CO1	Student should be know the basic concepts in hematology and clinical pathology
CO2	Understand importance of tests like Blood Clotting Factor & Bone marrow
CO3	Should understand clinical significance urine, Semen, different body fluid analysis
<b>MMLT 103 T</b>	<b>Basics of Microbiology</b>

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.
CO2	Should understand Molecular identification of bacterial pathogenes.
<b>MMLT 104 T</b>	<b>Essentials of Biochemistry and Laboratory Techniques (Theory)</b>
CO1	Understand the Classification, Functions and Metabolism of Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic acids with their significance in homeostasis and related disorders
CO2	Understand the role of Enzymes and biochemical processes of Cellular Respiration involved in energy production
CO3	In depth knowledge of Principle and applications of Good Laboratory Practices.
CO4	Proficiency in handling Instruments used in Biochemistry laboratory and their applications in clinical diagnosis.
CO5	Competent knowledge of collection and analysis of various body fluid used for diagnostics
CO6	Comprehension of applications of Basic Biochemical Laboratory Techniques with accuracy
<b>CC 001 T</b>	<b>Research Methodology &amp; Biostatistics (Core Course)</b>
CO1	Describe types of research (qualitative, quantitative, experimental, observational).
CO2	Understand sampling methods (random, stratified, systematic) and their applications in lab-based studies.
CO3	Learn hypothesis testing methods (t-tests, chi-square tests, ANOVA) in medical research.
CO4	Understand the structure of scientific reports, theses, and research papers.
<b>MMLT 105 P</b>	<b>Haematology and Clinical Pathology MMLT 102 L</b>
CO1	Perform and analyze tests like all hematology & Blood Clotting Factor
CO2	Should perform urine, Semen, different body fluid analysis experiments under guidance
CO3	Perform lab test for bone arrow
<b>MMLT 106 P</b>	<b>Basics of Microbiology</b>
CO1	Should perform test for identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques.
CO2	Should perform Molecular identification of bacterial pathogenes.
<b>MMLT 107 P</b>	<b>Essentials of Biochemistry and Laboratory Techniques (Practical)</b>
CO1	Demonstration and analysis of various Body fluids in diagnosis
CO2	Proficiency in calibration and application of Basic Instruments used in the Biochemistry laboratory
<b>MMLT 108 CP</b>	<b>MMLT Clinical Directed Education I</b>
CO1	Should know all SOPs of Lab working
CO2	Able to handle and perform all tests
CO3	Should be able to do reporting and correlation clinically
<b>CC 001 P</b>	<b>Research Methodology &amp; Biostatistics (Core Course)</b>
CO1	Describe types of research (qualitative, quantitative, experimental, observational).
CO2	Understand sampling methods (random, stratified, systematic) and their applications in lab-based studies.
CO3	Learn hypothesis testing methods (t-tests, chi-square tests, ANOVA) in medical research.
CO4	Understand the structure of scientific reports, theses, and research papers.
<b>SEMESTER II</b>	
<b>MMLT 109 T</b>	<b>Immunohematology &amp; Blood Transfusion</b>
CO1	Understand antigen-antibody reactions and their role in blood group identification.

CO2	Understand ABO and Rh blood group systems, their genetics, and clinical significance, Cell separation and components.
CO3	Should Know blood donation procedures, donor selection criteria, and screening tests.
<b>MMLT 110 T</b>	<b>Immunology and Serology</b>
CO1	Should perform test for identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques.
CO2	Should perform Molecular identification of bacterial pathogens.
<b>MMLT 111 T</b>	<b>Advances in Clinical Biochemistry and Quality Control (Theory)</b>
CO1	Comprehensive knowledge of Principle and applications of Quality Control and Automation in Biochemistry Laboratory
CO2	Analyse the Role of Vitamins, Minerals and Electrolytes in Human Health with respect to biochemical functions and deficiency manifestations
CO3	Understand the different types of plasma proteins and its related disorders specifically Jaundice and Hemoglobinopathies
CO4	Explore Biochemistry of Hormones and their mechanism of action.
CO5	Mastery to Analyse and Interpret Biochemical Laboratory Tests to assess organ dysfunction and disease progression.
CO6	Insightful knowledge of advanced Biochemistry Techniques with their applications in Diagnosis
<b>MMLT 112 P</b>	<b>Immunoematology &amp; Blood Transfusion</b>
CO1	Demonstrate ABO and Rh blood grouping using forward and reverse typing.
CO2	Perform major and minor crossmatching using saline, enzyme, and AHG methods, Conduct Direct and Indirect Antiglobulin Tests (DAT & IAT).
CO3	Demonstrate proper phlebotomy techniques for blood donation, basic steps in blood component separation
<b>MMLT 113 P</b>	<b>Immunology and Serology</b>
CO1	Demonstrate agglutination and precipitation techniques for detecting antigen-antibody interactions
CO2	Maintain biosafety measures and quality control standards in immunology testing.
CO3	Able to perform Analyze Hypersensitivity Reactions
<b>MMLT 114 P</b>	<b>Advances in Clinical Biochemistry and Quality Control (Practical)</b>
CO1	Proficiency in estimation and interpretation of various Biochemical tests for diagnosis
CO2	Demonstration of principle, working and applications of advanced Biochemical techniques
<b>MMLT 115 CP</b>	<b>MMLT Directed Clinical Education - II</b>
CO1	Should know all SOPs of Lab working
CO2	Able to handle and perform all tests
CO3	Should be able to do reporting and correlation clinically
<b>Skill Enhancement Courses</b>	
<b>SEC 001 T</b>	<b>Innovation and Entrepreneurship</b>
CO1	Define the role of innovation and entrepreneurship in the medical laboratory and healthcare industry.
CO2	Analyze current challenges in laboratory diagnostics and identify areas for innovation.
CO3	Explore opportunities in point-of-care testing (POCT), AI-driven diagnostics, and personalized medicine.
CO4	Learn how to take calculated risks and adapt to the evolving medical diagnostics field.
CO5	Understand funding options, including venture capital, angel investors, and government grants for healthcare innovations.

<b>SEC 002 T</b>	<b>One Health (NPTEL)</b>
CO1	Recognize the importance of a multidisciplinary approach in disease prevention and control.
CO2	Understand biosafety protocols and quality control measures in laboratory testing.
CO3	Utilize big data, AI, and digital health tools in disease tracking and diagnostics.
CO4	Apply laboratory research to develop vaccines, diagnostics, and disease control strategies.

CO PO MAPPING (Matrix)													
Programme - Bsc Medical Lab Technology													
Semester - Smester III, IV, V & VI													
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 knowlegde 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													
PO6 – Research and Innovation: Develop research-oriented thought process by learning about research methodology, innovation incubation and conducting independent / collaborative research in medical laboratory sciences.													
PO 8- 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.													
PO Mapping same with correlation level 3,2,1 The notation of 1 - low, 2 - moderate , 3 - high													
				Advanced Knowledge in Medical Laboratory Science	Proficiency in Laboratory Techniques and Instrumentation	Integration of Laboratory Science in Healthcare	Quality Assurance and Laboratory Management	Data Analysis and Interpretation	Professional Ethics and Compliance	Research and Innovation	Leadership and Communication Skills	Lifelong Learning and Professional Development:	Average
Semester	Course / Course Code	Course Outcome	CO Detail	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
	Introduction to Medical Laboratory Technology MMLT 101 L	CO4	Explain the different branches of medical laboratory technology, such as clinical chemistry, microbiology, hematology, immunology, blood banking, and molecular diagnostics.	3	3	3	3	3	3	3	3	3	3.0
	Average			3	3	3	2.75	2	3	2.5	2.5	3	2.75
	Haematology and Clinical Pathology MMLT 102 L	CO1	Student should be know the basic concepts in hematology and clinical pathology	3	3	3	3	2	3	2	2	2.0	2.6
		CO2	Understand importance of tests like Blood Clotting Factor & Bone marrow	3	3	3	3	1	3	2	3	3.0	2.7
		CO3	Should understand clinical signifinance urine, Semen, different body fluid analysis	3	3	3	3	1	3	1	3	2.0	2.4
	Average			3	3.0	3.0	3.0	1.3	3.0	1.7	2.7	2.3	2.6
	Basics of Microbiology MMLT 103 L	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.	3	3	2	3	3	3	3	3	2.0	2.8
		CO2	Should understand Molecular identification of bacterial pathogenes.	3	3	2	3	3	3	3	3	3	1.0
	Average			3	3	2	3	3	3	3	3	1.5	3

Sem 1

<b>Essentials of Biochemistry and Laboratory Techniques MMLT 104 L</b>	<b>CO1</b>	Understand the Classification, Functions and Metabolism of Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic acids with their significance in homeostasis and related disorders	3	2	2	1	1	2	2	3	3	2.1
	<b>CO2</b>	Understand the role of Enzymes and biochemical processes of Cellular Respiration involved in energy production	3	2	2	1	2	3	2	2	3	2.2
	<b>CO3</b>	In depth knowledge of Principle and applications of Good Laboratory Practices.	2	3	2	3	1	3	3	3	3	2.6
	<b>CO4</b>	Proficiency in handling Instruments used in Biochemistry laboratory and their applications in clinical diagnosis.	3	3	2	2	0	3	3	3	3	2.4
	<b>CO5</b>	Competent knowledge of collection and analysis of various body fluid used for diagnostics	3	3	3	3	2	2	3	1	3	2.6
	<b>CO6</b>	Comprehension of applications of Basic Biochemical Laboratory Techniques with accuracy	3	3	3	3	2	1	3	2	3	2.6
<b>Average</b>			2.9	2.0	2.0	1.7	0.7	1.0	2.4	2.0	3.0	2.0
<b>MMLT Clinical Directed Education I MMLT 105 CP</b>	<b>CO1</b>	Should know all SOPs of Lab working	2	3	3	3	3	3	0	3	3.0	2.6
	<b>CO2</b>	Able to handle and perform all tests	3	2	3	3	3	3	1	3	2.0	2.6
	<b>CO3</b>	Should be able to do reporting and correlation clinically	2	0	3	3	3	3	0	3	3.0	2.2
<b>Average</b>			2	2	3	3	3	3	0	3	3	2.4
<b>Research Methodology &amp; Biostatistics (Core Course) CC 001 T</b>	<b>CO1</b>	Describe types of research (qualitative, quantitative, experimental, observational).	2	2	2	2	1	3	1	2	2.0	1.9
	<b>CO2</b>	Understand sampling methods (random, stratified, systematic) and their applications in lab-based studies.	2	3	2	2	2	3	2	2	2.0	2.2
	<b>CO3</b>	Learn hypothesis testing methods (t-tests, chi-square tests, ANOVA) in medical research.	2	3	3	1	2	1	1	1	2.0	1.8
	<b>CO4</b>	Understand the structure of scientific reports, theses, and research papers.	2	2	2	2	1	2	1	1	3.0	1.8
<b>Average</b>			2	3	2	2	2	2	1	2	2	1.9
<b>Hematology and Clinical Pathology MMLT 1012 P</b>	<b>CO1</b>	Perform and analyze tests like all hematology & Blood Clotting Factor	3	3	3	3	3	3	3	2	2.0	2.8
	<b>CO2</b>	Should perform urine, Semen, different body fluid analysis experiments under guidance	3	3	3	3	3	3	3	3	3.0	3.0
	<b>CO3</b>	Perform lab test for bone marrow	3	3	3	3	3	3	3	3	2.0	2.9
<b>Average</b>			3	3	3	3	3	3	3	2.7	2.3	2.9

<b>Basics of Microbiology MMLT 103 P</b>	<b>CO1</b>	Should perform test for identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques.	3	3	2	3	3	3	3	3	2.0	2.8
	<b>CO2</b>	Should perform Molecular identification of bacterial pathogens.	3	3	3	3	3	3	3	3	2.0	2.9
<b>Average</b>			<b>3</b>	<b>3</b>	<b>2.5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2.8</b>
<b>Essentials of Biochemistry and Laboratory Techniques (MMLT 104 P)</b>	<b>CO1</b>	Demonstration and analysis of various Body fluids in diagnosis	3	3	3	3	2	1	3	3	3	2.7
	<b>CO2</b>	Proficiency in calibration and application of Basic Instruments used in the Biochemistry laboratory	3	3	3	3	2	2	3	3	3	2.8
<b>Average</b>			<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2.1</b>
<b>Research Methodology &amp; Biostatistics (Core Course) CC 001 P</b>	<b>CO1</b>	Identify research problems related to medical laboratory technology. Develop appropriate research questions, objectives, and hypotheses.	2	2	2	2	2	3	2	3	3.0	2.3
	<b>CO2</b>	Conduct a systematic literature review using databases like PubMed, Google Scholar, and Scopus.	1	2	2	1	2	2	2	2	3.0	1.9
	<b>CO3</b>	Use Excel, SPSS, or R for data entry, statistical calculations, and analysis	2	1	2	2	2	2	2	2	3.0	2.0
	<b>CO4</b>	Create tables, graphs, and charts to summarize research findings.	2	2	1	2	1	1	2	2	2.0	1.7
<b>Average</b>			<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2.0</b>

**SEMESTER II**

<b>Immunohematology &amp; Blood Transfusion MMLT 106 L</b>	<b>CO1</b>	Understand antigen-antibody reactions and their role in blood group identification.	3	3	3	3	2	3	3	2	2.0	2.7
	<b>CO2</b>	Understand ABO and Rh blood group systems, their genetics, and clinical significance, Cell separation and components.	3	3	3	3	3	3	3	3	2.0	2.9
	<b>CO3</b>	Should Know blood donation procedures, donor selection criteria, and screening tests.	3	3	3	3	1	3	3	3	3.0	2.8
<b>Average</b>			<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2.8</b>
<b>Immunology and Serology MMLT 107 L</b>	<b>CO1</b>	Understand the structure and function of the immune system, including primary and secondary lymphoid organs	3	3	3	3	0	3	3	3	3.0	2.7
	<b>CO2</b>	Understand antigen-antibody reactions and their significance in immunity and disease diagnosis, hypersensitivity reactions (Type I-IV), their mechanisms, and clinical implications.	3	3	3	3	1	3	3	3	2.0	2.7

Sem 2

	<b>CO3</b>	Understand the principles of graft rejection, HLA typing, and immunosuppressive therapy. applications of immunotherapy, CRISPR gene editing, and emerging trends in immunology	3	3	3	3	2	3	3	3	3.0	2.9
	<b>Average</b>		3	3	3	3	1	3	3	3	3	2.7
<b>Advances in Clinical Biochemistry and Quality Control MMLT 203 L</b>	<b>CO1</b>	Comprehensive knowledge of Principle and applications of Quality Control and Automation in Biochemistry Laboratory	3	1	3	1	1	1	3	2	3	2.0
	<b>CO2</b>	Analyse the Role of Vitamins, Minerals and Electrolytes in Human Health with respect to biochemical functions and deficiency manifestations	3	2	3	1	3	1	3	2	3	2.3
	<b>CO3</b>	Understand the different types of plasma proteins and its related disorders specifically Jaundice and Hemoglobinopathies	3	2	2	1	3	1	3	2	3	2.2
	<b>CO4</b>	Explore Biochemistry of Hormones and their mechanism of action.	3	2	2	1	1	0	3	2	3	1.9
	<b>CO5</b>	Mastery to Analyse and Interpret Biochemical Laboratory Tests to assess organ dysfunction and disease progression.	3	2	2	1	3	3	3	2	3	2.4
	<b>CO6</b>	Insightful knowledge of advanced Biochemistry Techniques with their applications in Diagnosis	3	3	3	3	3	2	3	2	3	2.8
	<b>Average</b>		3	2	3	1	2	1	3	2	3	2.3
<b>Immunoematology &amp; Blood Transfusion MMLT 106 P</b>	<b>CO1</b>	Demonstrate ABO and Rh blood grouping using forward and reverse typing.	3	3	3	3	3	3	3	2	2.0	2.8
	<b>CO2</b>	Perform major and minor crossmatching using saline, enzyme, and AHG methods, Conduct Direct and Indirect Antiglobulin Tests (DAT & IAT).	3	3	2	3	3	3	3	3	3.0	2.9
	<b>CO3</b>	Demonstrate proper phlebotomy techniques for blood donation, basic steps in blood component separation	3	3	3	3	3	3	3	3	3.0	3.0
	<b>Average</b>		3	3	3	3	3	3	3	3	3	2.9
<b>Immunology and Serology MMLT 107 P</b>	<b>CO1</b>	Demonstrate agglutination and precipitation techniques for detecting antigen-antibody interactions	3	3	2	3	3	3	3	3	2.0	2.8
	<b>CO2</b>	Maintain biosafety measures and quality control standards in immunology testing.	3	3	3	3	3	3	3	3	3.0	3.0
	<b>CO3</b>	Able to perform Analyze Hypersensitivity Reactions	3	3	2	3	3	3	3	3	2.0	2.8
	<b>Average</b>		3	3	2	3	3	3	3	3	2	2.9

<b>Advances in Clinical Biochemistry and Quality Control MMLT 108P</b>	<b>CO1</b>	Proficiency in estimation and interpretation of various Biochemical tests for diagnosis	3	3	3	3	2	2	3	2	3	2.7
	<b>CO2</b>	Demonstration of principle, working and applications of advanced Biochemical techniques	3	3	3	3	2	2	3	2	3	2.7
<b>Average</b>			<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2.7</b>
<b>MMLT Clinical Directed Education II MMLT 109 CP</b>	<b>CO1</b>	Should know all SOPs of Lab working	2	3	3	3	3	3	0	3	3.0	2.6
	<b>CO2</b>	Able to handle and perform all tests	3	2	3	3	3	3	1	3	2.0	2.6
	<b>CO3</b>	Sholud be able to do reporting and coorelation clinically	2	1	3	3	3	3	0	3	3.0	2.3
<b>Average</b>			<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>2.5</b>
<b>Innovation and Enteprenuarship SEC 001 L</b>	<b>CO1</b>	Define the role of innovation and entrepreneurship in the medical laboratory and healthcare industry.	2	1	3	2	3	2	2	3	3	2.3
	<b>CO2</b>	Analyze current challenges in laboratory diagnostics and identify areas for innovation.	2	1	2	2	3	2	3	3	3	2.3
	<b>CO3</b>	Explore opportunities in point-of-care testing (POCT), AI-driven diagnostics, and personalized medicine.	2	1	2	2	2	3	2	3	3	2.2
	<b>CO4</b>	Learn how to take calculated risks and adapt to the evolving medical diagnostics field.	2	2	2	2	3	2	2	2	3	2.2
	<b>CO5</b>	Understand funding options, including venture capital, angel investors, and government grants for healthcare innovations.	2	1	1	2	2	3	2	2	2	1.9
<b>Average</b>			<b>2</b>	<b>1.2</b>	<b>2</b>	<b>2</b>	<b>2.6</b>	<b>2.4</b>	<b>2.2</b>	<b>2.6</b>	<b>2.8</b>	<b>2.2</b>
<b>One Health (NPTEL) SEC 002 L</b>	<b>CO1</b>	Recognize the importance of a multidisciplinary approach in disease prevention and control.	2	2	2	2	3	2	3	2	3	2.3
	<b>CO2</b>	Understand biosafety protocols and quality control measures in laboratory testing.	2	3	2	2	3	2	2	2	3	2.3
	<b>CO3</b>	Utilize big data, AI, and digital health tools in disease tracking and diagnostics.	2	2	3	2	2	3	3	2	2	2.3
	<b>CO4</b>	Apply laboratory research to develop vaccines, diagnostics, and disease control strategies.	3	3	2	2	3	2	2	2	2	2.3
<b>Average</b>			<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2.3</b>

<b>PROGRAM OUTCOME (POs)</b>	
<b>Course Code</b>	<b>M.Sc. Medical Laboratory Technology</b>
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.
PO7	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.
<b>Course Outcomes (COs)</b>	
<b>Course Code</b>	<b>M.Sc. Medical Laboratory Technology</b>
<b>SEMESTER III</b>	
<b>MMLT 116 T</b>	<b>Integrative Histocytology, Genetics and Molecular Biology</b>
CO1	Conceptual Understanding: Explain the foundational concepts of histocytology, molecular biology, and genetics, and their clinical relevance.
CO2	Molecular Mechanism Analysis: Analyze molecular and genetic regulatory mechanisms, including cell signaling pathways in health and disease.
CO3	Diagnostic Differentiation & Correlation: Differentiate normal and abnormal histological, cytological, biochemical and genetic changes with pathological conditions.
<b>MMLT 117 T</b>	<b>Mycology, Parasitology &amp; Virology</b>
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.
CO2	Make specimen oriented decision on predetermined criteria including working knowledge of critical values.

CO3	Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.
CO4	Process information and ensure quality control as appropriate to routine laboratory.
<b>MMLT 118</b>	<b>Research Project / Dissertation</b>
CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.
CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.
<b>MMLT 119 P</b>	<b>Integrative Histocytology, Genetics and Molecular Biology</b>
CO1	Histocytology Skills: Demonstrate competency in tissue processing, staining, and cytological preparations.
CO2	Cytogenetics Proficiency: Perform cytogenetic techniques including metaphase spread preparation, G-banding, and basic karyotyping.
CO3	Molecular Biology Techniques: Execute basic molecular biology techniques such as nucleic acid extraction, PCR, electrophoresis, and enzyme assays.
CO4	Laboratory Data Interpretation: Interpret laboratory results from histology, cytogenetics, and molecular diagnostics to support clinical decision-making.
<b>MMLT 120 P</b>	<b>Mycology, Parasitology &amp; Virology</b>
CO1	To be able to do basic laboratory identification and classification of medically significant isolates in mycology, parasitology.
CO2	Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment.
CO3	Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.
<b>MMLT 121 CP</b>	<b>MMLT Directed Clinical Education - III</b>
CO1	Perform diagnostic tests and laboratory procedures in clinical environments while following safety and quality guidelines.
CO2	Exhibit professional conduct, communication skills, and collaboration within healthcare teams.
CO3	Analyze laboratory results and prepare accurate reports in compliance with established protocols and quality standards
<b>SEMESTER IV</b>	
<b>MMLT 122 T</b>	<b>Bioethics, IPR and Biosafety</b>
CO1	Apply core principles of biomedical ethics-autonomy, beneficence, non-maleficence, and justice-in clinical practice and research decision-making.
CO2	Demonstrate understanding of ethical guidelines and regulatory frameworks governing biomedical and clinical research.
CO3	Explain the significance of Intellectual Property Rights (IPR) in biomedical innovation, including patentability, filing procedures, and academic-industrial relevance.
CO4	Implement biosafety and biosecurity principles through appropriate risk assessment, containment practices, and adherence to national and international norms.
<b>MMLT 123 P</b>	<b>Internship/Training (Clinical/ Industrial)</b>
CO1	Apply theoretical knowledge to clinical or laboratory practice with adherence to safety and quality standards.
CO2	Demonstrate professional skills, ethical conduct, and effective communication in healthcare or research settings.
CO3	Analyze and interpret clinical/laboratory data for accurate reporting and patient care/research applications.
<b>MMLT 118</b>	<b>Research Project / Dissertation</b>

CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.
CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.

CO PO MAPPING (Matrix)														
Programme - MSc Medical Laboratory Technology														
Semester - Semester III and IV														
Semester	Course / Course Code	Course Outcome	CO Detail	PO1 (Advanced Knowledge in MLS)	PO2 (Proficiency in Laboratory Techniques and Instrumentation)	PO3 (Integration of Laboratory Science in Healthcare)	PO4 (Quality Assurance and Laboratory Management)	PO5 (Data Analysis and Interpretation)	PO6 (Professional Ethics and Compliance)	PO7 (Research and Innovation)	PO8 (Leadership and Communication Skills)	PO9 (Lifelong Learning and Professional Development)	Average	
<b>PO 1: Advanced Knowledge in Medical Laboratory Science:</b> 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.														
<b>PO 2: Proficiency in Laboratory Techniques and Instrumentation:</b> Expertise to perform, utilize and troubleshoot modern diagnostic instruments and technologies in medical laboratory with accuracy and precision.														
<b>PO 3: Integration of Laboratory Science in Healthcare:</b> Collaborate with healthcare teams for accurate diagnosis and evidence-based laboratory practices for clinical decision-making in real-world situations.														
<b>PO 4: Quality Assurance and Laboratory Management:</b> Implement quality control and quality assurance measures in laboratory settings. Gain knowledge about application of laboratory accreditation, biosafety, and bioethics in clinical practice.														
<b>PO 5: Data Analysis and Interpretation:</b> Develop skills for analysis of laboratory data using statistical tools and their interpretation for clinical conditions.														
<b>PO 6: Professional Ethics and Compliance:</b> 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.														
<b>PO 7: Research and Innovation:</b> Develop research-oriented thought process by learning about research methodology, innovation incubation and conducting independent / collaborative research in medical laboratory sciences.														
<b>PO 8: Leadership and Communication Skills:</b> Demonstrate effective leadership, teamwork, and interpersonal communication in laboratory settings with students, patients, laboratory personnel, and healthcare professionals														
<b>PO 9: Lifelong Learning and Professional Development:</b> Engage in continuous education, professional training and scientific contributions, to stay updated with advancements in the field of diagnosis and healthcare.														
<b>PO Mapping same with correlation level 3,2,1 The notation of 1 - low, 2 - moderate, 3 - high</b>														
Sem 3	Integrative Histocytology, Genetics and Molecular Biology (MMLT 116 T)	CO1	Conceptual Understanding: Explain the foundational concepts of histocytology, molecular biology, and genetics, and their clinical relevance.	3	3	3	3	3	2	3	2	3	2.8	
		CO2	Molecular Mechanism Analysis: Analyze molecular and genetic regulatory mechanisms, including cell signaling pathways in health and disease.	3	3	3	3	3	2	3	2	3	2.8	
		CO3	Diagnostic Differentiation & Correlation: Differentiate normal and abnormal histological, cytological, biochemical and genetic changes with pathological conditions.	3	2	3	3	3	3	3	3	3	3	2.9
		Average			3	3	3	3	3	2	3	2	3	2.8
	Mycology, Parasitology & Virology (MMLT 117 T)	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.	3	3	3	3	3	3	3	3	2	3	2.9
		CO2	Make specimen oriented decision on predetermined criteria including working knowledge of critical values.	3	3	3	3	3	3	3	3	2	3	2.9
		CO3	Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.	3	2	3	3	3	3	3	3	3	3	2.9
		CO4	Process information and ensure quality control as appropriate to routine laboratory.	3	3	3	3	3	3	3	3	2	3	2.9
	Average			3	2.75	3	3	3	3	3	3	2.25	3	2.9
	Research Project/ Dissertation (MMLT 118)	CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.	3	3	3	2	2	3	3	3	3	3	2.8
		CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.	3	2	3	2	3	3	3	3	3	3	2.8
		Average			3	2.5	3	2	2.5	3	3	3	3	2.8
	CO1	Histocytology Skills: Demonstrate competency in tissue processing, staining, and cytological preparations.	3	3	3	3	3	3	2	3	2	3	2.8	

Integrative Histocytology, Genetics and Molecular Biology (MMLT 119 P)	CO2	Cytogenetics Proficiency: Perform cytogenetic techniques including metaphase spread preparation, G-banding, and basic karyotyping.	3	3	3	3	3	3	3	3	3	3.0	
	CO3	Molecular Biology Techniques: Execute basic molecular biology techniques such as nucleic acid extraction, PCR, electrophoresis, and enzyme assays.	3	3	3	3	3	2	3	2	3	2.8	
	CO4	Laboratory Data Interpretation: Interpret laboratory results from histology, cytogenetics, and molecular diagnostics to support clinical decision-making.	3	3	3	3	3	3	3	2	3	2.9	
Average			3	3	3	3	3	2.5	3	2.25	3	2.9	
Mycology, Parasitology & Virology (MMLT 120 P)	CO1	To be able to do basic laboratory identification and classification of medically significant isolates in mycology, parasitology.	3	3	3	3	2	2	3	2	3	2.7	
	CO2	Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment.	3	3	3	2	2	2	3	2	3	2.6	
	CO3	Should know the logical interpretation of clinical lab investigations. Communicate with other members of healthcare team, customers and patients in an effective manner.	3	3	3	3	3	3	3	2	3	2.9	
Average			3.0	3.0	3.0	2.7	2.3	2.3	3.0	2.0	3.0	2.7	
MMLT Directed Clinical Education - III (MMLT 121 CP)	CO1	Perform diagnostic tests and laboratory procedures in clinical environments while following safety and quality guidelines.	3	3	3	3	3	2	3	2	3	2.8	
	CO2	Exhibit professional conduct, communication skills, and collaboration within healthcare teams.	3	3	3	3	3	2	3	2	3	2.8	
	CO3	Analyze laboratory results and prepare accurate reports in compliance with established protocols and quality standards	3	3	3	3	3	3	3	3	3	3.0	
Average			3.0	3.0	3.0	3.0	3.0	2.3	3.0	2.3	3.0	2.9	
Sem 4	Bioethics, IPR and Biosafety (MMLT 122 T)	CO1	Apply core principles of biomedical ethics—autonomy, beneficence, non-maleficence, and justice—in clinical practice and research decision-making.	3	2	3	3	0	3	3	3	3	2.6
		CO2	Demonstrate understanding of ethical guidelines and regulatory frameworks governing biomedical and clinical research.	3	1	2	2	0	3	3	2	3	2.1
		CO3	Explain the significance of Intellectual Property Rights (IPR) in biomedical innovation, including patentability, filing procedures, and academic-industrial relevance.	3	3	3	2	2	3	3	2	3	2.7
		CO4	Implement biosafety and biosecurity principles through appropriate risk assessment, containment practices, and adherence to national and international norms.	3	2	2	2	0	3	2	2	3	2.1
	Average			3.0	2.0	2.5	2.3	0.5	3.0	2.8	2.3	3.0	2.4
Internship/Training (Clinical/ Industrial) (MMLT 123 P)	CO1	Apply theoretical knowledge to clinical or laboratory practice with adherence to safety and quality standards.	3	3	3	3	3	3	1	1	3	2.6	
	CO2	Demonstrate professional skills, ethical conduct, and effective communication in healthcare or research settings.	3	3	3	3	2	3	2	2	3	2.7	
	CO3	Analyze and interpret clinical/laboratory data for accurate reporting and patient care/research applications.	3	3	3	3	1	3	2	2	3	2.6	
Average			3.0	3.0	3.0	3.0	2.0	3.0	1.7	1.7	3.0	2.6	
Research Project/ Dissertation (MMLT 124 P)	CO1	Design, execute, and critically evaluate an independent research study in Medical Laboratory Technology by applying advanced laboratory techniques, ethical principles, and statistical analysis.	3	3	3	2	2	3	3	3	3	2.8	

118)	CO2	Prepare, present, and defend a comprehensive dissertation, demonstrating proficiency in scientific writing, data interpretation, and effective communication of research outcomes.	3	2	3	2	3	3	3	3	3	2.8
Average			3	2.5	3	2	2.5	3	3	3	3	2.8