PROGRAM OUTCOME (POs)	
Code	**M.Sc Medical Laboratory Technology (MMLT)**
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 integraity 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.
Course Outcomes (COs)	
Course Code	**MASTERS IN MEDICAL LABORATORY TECHNOLOGY**
SEMESTER I	
MMLT 101 T	**Introduction to Medical Laboratory Technology**
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.
MMLT 102 T	**Haematology and Clinical Pathology MMLT 102 L**
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 signifinance urine, Semen, different body fluid analysis
MMLT 103 T	**Basics of Microbiology**

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.
MMLT 104 T	**Essentials of Biochemistry and Laboratory Techniques (Theory)**
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
CC 001 T	**Research Methodology & Biostatistics (Core Course)**
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.
MMLT 105 P	**Haematology and Clinical Pathology MMLT 102 L**
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
MMLT 106 P	**Basics of Microbiology**
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.
MMLT 107 P	**Essentials of Biochemistry and Laboratory Techniques (Practical)**
CO1	Demonstration and analysis of various Body fluids in diagnosis
CO2	Proficiency in calibration and application of Basic Instruments used in the Biochemistry laboratory
MMLT 108 CP	**MMLT Clinical Directed Education I**
CO1	Should know all SOPs of Lab working
CO2	Able to handle and perfom all tests
CO3	Sholud be able to do reporting and coorelation clinically
CC 001 P	**Research Methodology & Biostatistics (Core Course)**
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.
SEMESTER II	
MMLT 109 T	**Immunohematology & Blood Transfusion**
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 seperation and components.
CO3	Should Know blood donation procedures, donor selection criteria, and screening tests.
MMLT 110 T	**Immunology and Serology**
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.
MMLT 111 T	**Advances in Clinical Biochemistry and Quality Control (Theory)**
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
MMLT 112 P	**Immunohematology & Blood Transfusion**
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
MMLT 113 P	**Immunology and Serology**
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
MMLT 114 P	**Advances in Clinical Biochemistry and Quality Control (Practical)**
CO1	Proficiency in estimation and interpretation of various Biochemical tests for diagnosis
CO2	Demonstration of principle, working and applications of advanced Biochemical techniques
MMLT 115 CP	**MMLT Directed Clinical Education - II**
CO1	Should know all SOPs of Lab working
CO2	Able to handle and perfom all tests
CO3	Sholud be able to do reporting and coorelation clinically
Skill Ehancement Courses	
SEC 001 T	**Innovation and Enterprenuarship**
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.

SEC 002 T	One Health (NPTEL)
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)														
Programe - 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 integraity 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	1.0	2.7
	Average			3	3	2	3	3	3	3	3	1.5	3

Sem 1	**Essentials of Biochemistry and Laboratory Techniques MMLT 104 L**	**CO1**	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
		CO2	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
		CO3	In depth knowledge of Principle and applications of Good Laboratory Practices.	2	3	2	3	1	3	3	3	3	2.6
		CO4	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
		CO5	Competent knowledge of collection and analysis of various body fluid used for diagnostics	3	3	3	3	2	2	3	1	3	2.6
		CO6	Comprehension of applications of Basic Biochemical Laboratory Techniques with accuracy	3	3	3	3	2	1	3	2	3	2.6
	Average			2.9	2.0	2.0	1.7	0.7	1.0	2.4	2.0	3.0	2.0
	MMLT Clinical Directed Education I MMLT 105 CP	**CO1**	Should know all SOPs of Lab working	2	3	3	3	3	3	0	3	3.0	2.6
		CO2	Able to handle and perfom all tests	3	2	3	3	3	3	1	3	2.0	2.6
		CO3	Sholud be able to do reporting and coorelation clinically	2	0	3	3	3	3	0	3	3.0	2.2
	Average			2	2	3	3	3	3	0	3	3	2.4
	Research Methodology & Biostatistics (Core Course) CC 001 T	**CO1**	Describe types of research (qualitative, quantitative, experimental, observational).	2	2	2	2	1	3	1	2	2.0	1.9
		CO2	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
		CO3	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
		CO4	Understand the structure of scientific reports, theses, and research papers.	2	2	2	2	1	2	1	1	3.0	1.8
	Average			2	3	2	2	2	2	1	2	2	1.9
	Hematology and Clinical Pathology MMLT 1012 P	**CO1**	Perform and analyze tests like all hematology & Blood Clotting Factor	3	3	3	3	3	3	3	2	2.0	2.8
		CO2	Should perform urine, Semen, different body fluid analysis experiments under guidance	3	3	3	3	3	3	3	3	3.0	3.0
		CO3	Perform lab test for bone marrow	3	3	3	3	3	3	3	3	2.0	2.9
	Average			3	3	3	3	3	3	3	2.7	2.3	2.9

	Basics of Microbiology MMLT 103 P	**CO1**	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
		CO2	Should perform Molecular identification of bacterial pathogenes.	3	3	3	3	3	3	3	3	2.0	2.9
	Average			3	3	2.5	3	3	3	3	3	2	2.8
	Essentials of Biochemistry and Laboratory Techniques (MMLT 104 P)	**CO1**	Demonstration and analysis of various Body fluids in diagnosis	3	3	3	3	2	1	3	3	3	2.7
		CO2	Proficiency in calibration and application of Basic Instruments used in the Biochemistry laboratory	3	3	3	3	2	2	3	3	3	2.8
	Average			3	3	2	2	0	1	3	2	3	2.1
	Research Methodology & Biostatistics (Core Course) CC 001 P	**CO1**	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
		CO2	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
		CO3	Use Excel, SPSS, or R for data entry, statistical calculations, and analysis	2	1	2	2	2	2	2	2	3.0	2.0
		CO4	Create tables, graphs, and charts to summarize research findings.	2	2	1	2	1	1	2	2	2.0	1.7
	Average			2	2	2	2	2	2	2	2	3	2.0
SEMESTER II													
	Immunohematology & Blood Transfusion MMLT 106 L	**CO1**	Understand antigen-antibody reactions and their role in blood group identification.	3	3	3	3	2	3	3	2	2.0	2.7
		CO2	Understand ABO and Rh blood group systems, their genetics, and clinical significance, Cell seperation and components.	3	3	3	3	3	3	3	3	2.0	2.9
		CO3	Should Know blood donation procedures, donor selection criteria, and screening tests.	3	3	3	3	1	3	3	3	3.0	2.8
	Average			3	3	3	3	2	3	3	3	2	2.8
	Immunology and Serology MMLT 107 L	**CO1**	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
		CO2	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

		CO3	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
	Average			3	3	3	3	1	3	3	3	3	2.7
	Advances in Clinical Biochemistry and Quality Control MMLT 203 L	**CO1**	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
		CO2	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
		CO3	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
		CO4	Explore Biochemistry of Hormones and their mechanism of action.	3	2	2	1	1	0	3	2	3	1.9
		CO5	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
		CO6	Insightful knowledge of advanced Biochemistry Techniques with their applications in Diagnosis	3	3	3	3	3	2	3	2	3	2.8
	Average			3	2	3	1	2	1	3	2	3	2.3
Sem 2	**Immunohematology & Blood Transfusion MMLT 106 P**	**CO1**	Demonstrate ABO and Rh blood grouping using forward and reverse typing.	3	3	3	3	3	3	3	2	2.0	2.8
		CO2	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
		CO3	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
	Average			3	3	3	3	3	3	3	3	3	2.9
	Immunology and Serology MMLT 107 P	**CO1**	Demonstrate agglutination and precipitation techniques for detecting antigen-antibody interactions	3	3	2	3	3	3	3	3	2.0	2.8
		CO2	Maintain biosafety measures and quality control standards in immunology testing.	3	3	3	3	3	3	3	3	3.0	3.0
		CO3	Able to perform Analyze Hypersensitivity Reactions	3	3	2	3	3	3	3	3	2.0	2.8
	Average			3	3	2	3	3	3	3	3	2	2.9

Advances in Clinical Biochemistry and Quality Control MMLT 108P	**CO1**	Proficiency in estimation and interpretation of various Biochemical tests for diagnosis	3	3	3	3	2	2	3	2	3	2.7
	CO2	Demonstration of principle, working and applications of advanced Biochemical techniques	3	3	3	3	2	2	3	2	3	2.7
Average			3	3	3	3	2	2	3	2	3	2.7
MMLT Clinical Directed Education II MMLT 109 CP	**CO1**	Should know all SOPs of Lab working	2	3	3	3	3	3	0	3	3.0	2.6
	CO2	Able to handle and perfom all tests	3	2	3	3	3	3	1	3	2.0	2.6
	CO3	Sholud be able to do reporting and coorelation clinically	2	1	3	3	3	3	0	3	3.0	2.3
Average			2	2	3	3	3	3	0	3	3	2.5
Innovation and Enterprenuarship SEC 001 L	**CO1**	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
	CO2	Analyze current challenges in laboratory diagnostics and identify areas for innovation.	2	1	2	2	3	2	3	3	3	2.3
	CO3	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
	CO4	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
	CO5	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
Average			2	1.2	2	2	2.6	2.4	2.2	2.6	2.8	2.2
One Health (NPTEL) SEC 002 L	**CO1**	Recognize the importance of a multidisciplinary approach in disease prevention and control.	2	2	2	2	3	2	3	2	3	2.3
	CO2	Understand biosafety protocols and quality control measures in laboratory testing.	2	3	2	2	3	2	2	2	3	2.3
	CO3	Utilize big data, AI, and digital health tools in disease tracking and diagnostics.	2	2	3	2	2	3	3	2	2	2.3
	CO4	Apply laboratory research to develop vaccines, diagnostics, and disease control strategies.	3	3	2	2	3	2	2	2	2	2.3
Average			2	3	2	2	3	2	3	2	3	2.3