KHYBER MEDICAL UNIVERSITY

MEDICAL LABORATORY TECHNOLOGY CURRICULUM

STUDY GUIDE SEMESTER 6

16 Weeks Activity Planner

2024-25

CENTRAL CURRICULUM AND ASSESSMENT COMMITTEE FOR NURSING, REHABILITATION SCIENCES AND ALLIED HEALTH SCIENCES

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TEAM OF MLT TOS DEVELOPMENT

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SUBJECTS OF BS MEDICAL LABORATORY TECHNOLOGY 6th SEMESTER

S. No	Subject Name	Course Code	Credit Hours	Duration
1	BLOOD BANKING	MLT-614	3 (2+1)	16 WEEKS
2	IMMUNOLOGY AND SEROLOGY	MLT-615	3 (2+1)	16 WEEKS
3	LABORATORY INSTRUMENTATION AND TECHNIQUES	MLT-616	3 (2+1)	16 WEEKS
4	CLINICAL VIROLOGY AND MYCOLOGY	MLT-617	3 (2+1)	16 WEEKS
5	CYTOLOGY AND CYTOGENETICS	MLT-618	3 (2+1)	16 WEEKS
6	HISTOTECHNIQUES	MLT-619	3 (2+1)	16 WEEKS

VISION AND MISSION

Khyber Medical University (KMU) Vision:

Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Medical University (KMU) Mission:

Khyber Medical University's goals are to encourage professional aptitude through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Paramedical Sciences Peshawar (IPMS-PESH) Mission:

To produce allied health professionals who excel in their skills, research, compassionate care, and community involvement, thereby enhancing the healthcare system

MLT-614 BLOOD BANKING Credit Hours 3(2+1)

COURSE DESCRIPTION

This course provides a foundational understanding of blood banking and immunohematology, focusing on the principles and practices essential for safe and effective blood transfusion. Students will explore key topics, including the structure and types of immunoglobulins, major and minor blood group systems, and the use of anticoagulants in blood banking. The course also covers donor selection, blood collection procedures, and processing, along with the management of transfusion reactions and hemolytic disease of the newborn (HDN). Additionally, students will gain insights into the preparation, storage, and quality control of blood products. Practical skills such as ABO and Rh blood grouping, cross-matching, Coombs tests, and antibody screening will be developed, preparing students for roles in clinical and laboratory settings.

LEARNING OBJECTIVES

Cognitive Domain

By the end of this course, students should be able to

1. Describe basic concepts in Blood Banking and transfusion medicine.
2. Explain major and minor blood group systems.
3. Discuss blood donation managements in blood bank.
4. Explain transfusion reactions, investigation and management of transfusion reactions.
5. Describe blood products, preparation, storage and its importance.

Psychomotor Domain

By the end of this course, students should be able to

1. Perform the procedure of Various blood grouping in blood bank
2. Demonstrate the procedure collecting, labelling, and process donor blood samples for further testing and storage.
3. Perform the procedure of cross match to ensure compatibility between donor and recipient blood
4. perform quality control checks on reagents, equipment, and blood products to maintain compliance with safety standards.

Affective Domain

By the end of this course, students should be able to

1. Adopt responsibility and adherence to ethical standards in blood donation and transfusion procedures.
2. Maintain ethical norms during donation and commit to practices that prioritize patient safety in transfusion medicine.
3. Appreciate the critical role of quality control in blood product preparation and handling.
4. Adopt to implement rigorous safety protocols to minimize the risk of transfusion reactions.
5. Demonstrate humbleness and use socially acceptable language when counseling families of Hemolytic disease of newborn patients.
6. Comply with SOPs of practical & procedure in an effective way

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TABLE OF SPECIFICATIONS

BLOOD BANKING 3(2+1)

S.No	Weeks	Contents	Learning Outcome	Domain C	Domain P	Domain A	MIT's	Time/Hours	Assessment	No of Items
TOPIC: 2										
1	Week-1	Definition	Define Blood Bank	C1			Interactive Lecture/SGD	2	MCQs	2
2		Requirements	Discuss the requirements of a standard blood bank	C2						
3		Reagents	Describe the preparation of basic reagents	C4						
		Anticoagulants	Explain different anticoagulants used in blood bank	C3						
4		Practical performance	Demonstrate introduction to Laboratory equipment used in Blood Bank		P4		Demo	1	OSPE	1
5		SOPs compliance	Comply to SOPs for observation of Laboratory equipment			A4	Role Play			
TOPIC: IMMUNOGLUBULIN										
6	Week-2	Introduction	Introduction to Immunoglobulin	C1			Interactive Lecture/SGD	2	MCQs	6
7		Structure	Describe the structure of Immunoglobulin	C3						
8		Types	Explain the types of Immunoglobulins	C3						
		Reaction	Discuss antigen and antibody reaction	C2						
9		Practical performance	identify different components of antibodies on charts		P4		Demo	1	OSPE	2
10		Care of charts	Adopt how to take care of charts			A4	Role Play			
TOPIC: ABO BLOOD GROUP SYSTEM										
11	Week-3	Introduction	Introduction to ABO blood group system	C1			Interactive Lecture	2	MCQs	6
12		Genetics	Discuss the genetics of the ABO system	C2						
		Antigens	Describe the antigens of the ABO system	C3						
		Antibodies	Explain the antibodies of the ABO system	C3						
13		Types	Demonstrate the types of ABO grouping	C3						
14		Significance	Discuss the clinical significance of ABO blood group system	C2						
15		Practical performance	Perform the procedure of forward and reverse blood grouping		P4		Demo	1	OSPE	2
16		SOPs compliance	Comply to SOPs for ABO blood grouping in Laboratory			A4	Role Play			
TOPIC: RH BLOOD GROUP SYSTEM										
17	Week-4	History	History of Rh system	C1			Interactive Lecture/SGD	2	MCQs/SEQs	6
18		Antigens	Describe the antigens of the Rh system	C4						
19		Antibodies	Explain the antibodies of the Rh system	C3						
		Significance	Discuss the clinical significance of Rh blood group system	C2						

20		Practical performance	Perform the procedure of Rh blood grouping independently		P4		Demo	1	OSPE	2
21		SOP compliance	Comply to SOPs for Rh blood grouping in Laboratory			A4	Role Play			
TOPIC: KELL BLOOD GROUP SYSTEM										
22	Week-5	Introduction	Introduction to Kell system	C1			Interactive Lecture/SGD	2	MCQs/SEQs	3
23		Genetics	Discuss genetics of the Kell system	C2						
24		Antigens	Describe the antigens of the Kell system	C3						
25		Antibodies	Explain the antibodies of the Kell system	C3						
26		Practical performance	Perform the procedure of Kell blood group in the laboratory		P4		Demo	1	OSPE	1
27		SOPs compliance	Comply to SOPs for Kell blood grouping in Laboratory			A4	Role Play			
TOPIC: DUFFY BLOOD GROUP SYSTEM										
28	Week-6	Introduction	Introduction to Duffy system	C1			Interactive Lecture/SGD	2	MCQs/SEQs	3
29		Genetics	Discuss genetics of the Duffy system	C2						
30		Antigens	Describe the antigens of the Duffy system	C3						
31		Antibodies	Explain the antibodies of the Duffy system	C3						
32		Practical performance	Perform the procedure of Duffy blood group in the laboratory		P4		Demo	1	OSPE	1
33		SOPs compliance	Comply to SOPs for Duffy blood grouping in Laboratory			A4	Role Play			
TOPIC: KIDD BLOOD GROUP SYSTEM										
34	Week-7	Introduction	Introduction to Kidd system	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
35		Genetics	Discuss genetics of the Kidd system	C2						
36		Antigens	Describe the antigens of the Kidd system	C2						
37		Antibodies	Explain the antibodies of the Kidd system	C3						
38		Significance	Explain the clinical significance of Kidd blood group system	C2						
39		Practical performance	Perform the procedure of Kidd blood group in the laboratory		P4		Demo	1	OSPE	1
40		SOPs compliance	Comply to SOPs for Kidd blood grouping in Laboratory			A4	Role Play			
TOPIC: MNS BLOOD GROUP SYSTEM										
41	Week-8	Introduction	Introduction to MNS system	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
42		Antigens	Describe antigens of the MNS system	C2						
43		Antibodies	Explain antibodies of the MNS system	C3						
44		Practical performance	Perform the procedure of MNS blood group in the laboratory		P4		Demo	1	OSPE	
45		SOPs compliance	Comply to SOPs for MNS blood grouping in Laboratory			A4	Role Play			
TOPIC: DONOR MANAGEMENTS IN BLOOD BANK										
46		Types	Explain various types of Donors	C2			Interactive Lecture/SGD	2	MCQs/SEQs	5
47		Pre-donation	Describe steps which are required before blood donation	C3						
48		Blood donation	Explain blood donation procedure of the donor	C4						

49	Week-9	Post-donation	Discuss post donation advice of donor	C2						
50		Video Demonstration	Demonstrate the procedure of blood donation through videos		P4		Demo	1	OSPE	2
51		Communication	Communicate the procedure of blood donation to the donor effectively			A4	Role Play			
TOPIC: BLOOD PRODUCTS										
52	Week-10	Introduction	Introduction to blood bags	C1			Interactive Lecture/SGD	2	MCQs/SEQs	7
53		Preparation	Discuss the preparation of blood components	C4						
54		Indication	Describe indication of different blood components	C3						
55		Quality Assurance	Explain quality assurance of various blood components	C3						
		Significance	Describe importance of blood components separation	C2						
56		Video Demonstration	Demonstrate the procedure of separation of different blood components through videos		P4		Demo	1	OSPE	2
57		SOPs compliance	Comply to SOPs for the separation and maintaining cold chain of the blood products			A4	Role Play			
TOPIC: CROSS MATCH										
58	Week-11	Introduction	Introduction to cross match	C1			Interactive Lecture/SGD	2	MCQs/SEQs	5
59		Types	Discuss the types of cross match	C2						
60		Procedure	Illustrate the procedure of cross match	C4						
61		Importance	Discuss the importance of cross match	C3						
62		Practical performance	Perform the procedure of cross match independently		P4		Demo	1	OSPE	2
63		SOPs compliance	Comply to SOPs for a cross match in laboratory			A4	Role Play			
TOPIC: ANTI-HUMAN GLOBULIN TEST										
64	Week-12	Introduction	Introduction to anti-human globulin test	C1			Interactive Lecture/SGD	2	MCQs/SEQs	4
65		Types	Discuss the types of anti-human globulin test	C2						
66		Procedure	Illustrate the procedure of anti-human globulin test	C4						
67		Importance	Explain the importance of anti-human globulin test	C2						
		Check cells	Describe the preparation of check cells	C3						
		Importance of check cells	Discuss the importance of check cells	C2						
68		Practical performance	Perform the procedure of Coombs test independently		P4		Demo	1	OSPE	2
69		SOPs compliance	Comply to SOPs for Coombs test in Laboratory			A4	Role Play			
TOPIC: TRANSFUSION REACTIONS										
70		Introduction	Introduction to transfusion reactions	C1			Interactive Lecture/CBL	2	MCQs/SEQs	7
71		Classification	Classify transfusion reactions	C3						
72		Pathophysiology	Describe the pathophysiology of different transfusion reactions	C4						
73		Clinical Features	Illustrate clinical features of different transfusion reactions	C3						

74	Week-13	Laboratory Diagnosis	Demonstrate the laboratory diagnosis of different transfusion reactions	C4						
75		Video Demonstration	Demonstrate the observation of peripheral smear of transfusion reaction under microscope		P4		Demo	1	OSPE	2
76		SOPs compliance	Adopt how to take care of microscope			A4	Role Play			
TOPIC: HEMOVIGILANCE										
77	Week-14	Introduction	Introduction to hemovigilance	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
78			Explain the process the hemovigilance in blood bank	C2						
82		Practical performance	Demonstrate the process of hemovigilance on charts		P4		Demo	1	OSPE	1
83		Good manners	Adopt how to behave in groups in an effective way			A4	Role Play			
TOPIC: HEMOLYTIC DISEASE OF NEWBORN										
84	Week-15	Introduction	Introduction to hemolytic disease of newborn	C1			Interactive Lecture/CBL	2	MCQs/SEQs	7
85		Classification	Classify the hemolytic disease of newborn	C2						
86		Pathophysiology	Explain the pathophysiology of hemolytic disease of newborn	C4						
87		Clinical Features	Describe clinical presentation of hemolytic disease of newborn	C3						
88		Diagnosis	Demonstrate laboratory diagnosis of hemolytic disease of newborn	C4						
89		Video Demonstration	Demonstrate the procedure of Kleihauer test independently		P4		Demo	1	OSPE	2
90		SOPs compliance	Comply to SOPs for Kleihauer test			A4	Role Play			
TOPIC: QUALITY CONTROL										
91	Week-16	Introduction	Introduction to quality control in blood bank	C1			Interactive Lecture/SGD	2	MCQs/SEQs	4
92		External quality control	Explain the external quality control in blood bank	C3						
93		Internal quality control	Explain the internal quality control in blood bank	C3						
95		Practical performance	Demonstrate the comparison of quality control procedures		P4		Demo	1	OSPE	1
96			Adopt professional behaviors while communicating things among colleagues			A4	Role Play			

RECOMMENDED BOOKS

1. Practical Hematology, Dacie J.V. 10th edition

2. An Introduction to Immunohematology. Third edition. Neville J. Bryant

3. AABB Technical Manual 20th Edition

ASSESSMENT BREAKDOWN				
S. No	**TOPICS**	**No of MCQs**	**No of OSPE/OSCE STATIONS**	**STATIC/INTERACTIVE**
1	Introduction to Blood Bank	02	-	-
2	Immunoglobulin	06	01	Interactive
3	ABO Blood Group System	06	02	Static
4	Rh Blood Group System	06	02	Stati
5	Kell Blood Group System	03	-	-
6	Duffy Blood Group System	03	-	-
7	Kidd Blood Group System	02	-	-
8	MNS Blood Group System	02	-	-
9	Donor Managements in Blood Bank	O5	01	Static
10	Blood Products	07	02	Static
11	Cross Match	05	02	Interactive
12	Anti-Human Globulin Test	04	01	Static
13	Transfusion Reactions	07	01	Static
14	Hemovigilance	02	-	-
15	Hemolytic Disease of Newborn	07	02	Static
16	Quality Control	04	-	-
	Total	**70**	**14**	

MLT-615 IMMUNOLOGY AND SEROLOGY Credit Hours 3(2+1)

COURSE DESCRIPTION

This course provides an in-depth exploration of the immune system, focusing on innate and adaptive immunity. Students will study the cellular basis of immune responses, including the roles of antibodies, humoral and cell-mediated immunity, and the major histocompatibility complex. Emphasis is placed on understanding complement systems, antigen-antibody reactions in the laboratory, and mechanisms of hypersensitivity, tolerance, and autoimmune diseases. The course also delves into tumor immunity, and immunodeficiency, and introduces serological methods for diagnosing bacterial, viral, fungal, and parasitic infections. Through theoretical instruction and practical laboratory sessions, students will gain proficiency in advanced immunological and serological techniques essential for modern diagnostic practices.

LEARNING OBJECTIVES

Cognitive Domain

By the end of this course, students should be able to

1. Define key immunological terms and recall the basic components of the immune system, including innate and adaptive immunity.
2. List serological techniques like ELISA, agglutination, and immunofluorescence.
3. Describe the mechanisms of antigen-antibody interactions in laboratory diagnostics.
4. Summarize the processes involved in hypersensitivity reactions and autoimmune diseases.
5. Apply knowledge of immune mechanisms to diagnose diseases using serological techniques.
6. Interpret laboratory results, such as antibody titers and complement activation, in a clinical context.
7. Follow safety protocols and quality control standards in diagnostic testing.
8. Recognize advancements in immunological and serological diagnostics.

Psychomotor Domain

By the end of this course, students should be able to

1. Identify appropriate laboratory tools, reagents, and equipment for immunological and serological testing.
2. Recognize procedural steps for serological techniques, including ELISA and agglutination tests.
3. Prepare laboratory setups for performing serological assays, ensuring all safety protocols are followed.
4. Demonstrate readiness to handle laboratory specimens for immunological testing.
5. Perform serological techniques such as antibody titers (e.g., ASO titer) and hemagglutination under supervision.
6. Follow procedural steps for chemiluminescent immunoassays and radioimmunoassay accurately.
7. Adapt laboratory techniques to handle atypical samples or uncommon clinical scenarios.
8. Troubleshoot common issues in laboratory procedures and equipment operations.

Affective Domain

By the end of this course, students should be able to

1. Appreciate the importance of accurate immunological and serological diagnostics in patient care.
2. Organize and prioritize tasks effectively to ensure timely and accurate completion of serological tests.
3. Exhibit a strong commitment to professional integrity and ethical standards in all laboratory activities.
4. Show attentiveness during laboratory demonstrations and lectures related to immunology and serology.

5. Demonstrate responsibility and accountability in handling sensitive clinical data and patient information.
6. Value the role of quality control and safety protocols in maintaining laboratory integrity and patient safety.
7. Demonstrate awareness of the ethical considerations in immunological and serological testing.

TABLE OF SPECIFICATIONS

IMMUNOLOGY AND SEROLOGY 3(2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: IMMUNE ORGANS AND CELLS										
1	Week-1	Introduction to Immunology	Definition, scope, and history	C1			Interactive Lecture	2	MCQs	5
2		Immune Organs and Cells	Analyze innate and adaptive immunity components. Overview of immune cells and organs	C2						
4		Practical performance	Safety protocols and sample handling in immunology labs.		P4		Demo	1	OSPE	2
5		SOPs compliance	Demonstrate a conscientious attitude toward implementing safety protocols and proper sample handling to ensure laboratory safety and integrity.			A4	Role Play			
TOPIC: CELLULAR BASIS OF IMMUNE RESPONSE										
6	Week-2	Roles of immune cells	Describe the roles of immune cells, including T cells, B cells, macrophages, and natural killer cells.	C2			Interactive Lecture	2	MCQs	10
7		Immune cell activation	Analyze the processes of immune cell activation and communication during an immune response.	C3						
9		Practical performance	Preparation and staining of blood smears to identify immune cells.		P4		Demo	1	OSPE	2
10		SOPs compliance	Exhibit patience, precision, and care when preparing and staining blood smears, respecting the importance of accurate immune cell identification.			A4	Role Play			
TOPIC: ANTIBODIES AND HUMORAL IMMUNITY										
11	Week-3	Antibodies	Explain the structure, classes, and functions of antibodies.	C3			Interactive Lecture	2	MCQs	5
12		Humoral immune response	Understand the mechanisms of antibody production and their role in the humoral immune response	C4						
15		Practical performance	Use an ICT kit to detect *H. pylori* antigens in stool or serum.		P4		Demo	1	OSPE	1
16		SOPs compliance	Display responsibility and diligence in performing diagnostic tests, acknowledging the importance of reliable results for patient care.			A4	Role Play			
TOPIC: CELL-MEDIATED IMMUNITY										
17	Week-4	Role of T lymphocytes	Describe the role of T lymphocytes in cell-mediated immunity.	C3			Interactive Lecture	2	MCQs	4
18		Antigen presentation	Explain the processes of antigen presentation and T cell activation.	C4						
20		Practical performance	Video Demonstration of the Working principles of ELISA		P4		Demo	1	OSPE	1

21		SOPs compliance	Value the importance of clear and effective communication when demonstrating and explaining complex immunological techniques like ELISA.			A4	Role Play			
TOPIC: MAJOR HISTOCOMPATIBILITY COMPLEX (MHC) AND TRANSPLANTATION										
22	Week-5	Role of MHC	Analyze the molecules in antigen presentation and immune responses.	C3			Interactive Lecture	2	MCQs	4
23		MHC in organ transplantation	Discuss the relevance of MHC in organ transplantation and graft rejection.	C4						
26		Practical performance	Detect *Plasmodium* antigens in blood using a malaria ICT kit.		P4		Demo	1	OSPE	0
27		SOPs compliance	Show empathy and commitment to high-quality diagnostic practices to aid in the timely detection and management of malaria.			A4	Role Play			
TOPIC: COMPLEMENT SYSTEM										
28	Week-6	Classical Pathway	Describe the pathways of complement activation and their biological effects.	C3			Interactive Lecture	2	MCQs	5
29		Lectin Pathway	Discuss Complement system dysfunctions relate to clinical conditions.	C4						
32		Practical performance	Perform a qualitative test for human chorionic gonadotropin (hCG) in urine using ICT.		P4		Demo	1	OSPE	2
33		SOPs compliance	Maintain a respectful and professional attitude toward sensitive diagnostic procedures, ensuring accuracy and confidentiality			A4	Role Play			
TOPIC: ANTIGEN–ANTIBODY REACTIONS IN THE LABORATORY										
34	Week-7	principles of antigen-antibody interactions	Explain the principles of antigen-antibody interactions and their diagnostic applications.	C3			Interactive Lecture	2	MCQs	4
35		Immunological techniques	Analyze techniques such as precipitation, agglutination, and ELISA.	C4						
39		Practical performance	Demonstrate antigen-antibody interactions through a simple agglutination reaction		P4		Demo	1	OSPE	2
40		SOPs compliance	Appreciate the scientific principles underlying antigen-antibody interactions, fostering curiosity and a desire to deepen immunological understanding.			A4	Role Play			
TOPIC: HYPERSENSITIVITY (ALLERGY), TOLERANCE										
41	Week-8	Hypersensitivity reactions	Categorize the four types of hypersensitivity reactions and their clinical implications.	C3			Interactive Lecture	2	MCQs	4
42		Concepts of immune tolerance	Understand the concepts of immune tolerance and the mechanisms underlying diseases.	C4						

44		Practical performance	Video demonstration of the Western blotting technique for detecting specific proteins in a sample.		P4		Demo	1	OSPE	1
45		SOPs compliance	Emphasize the importance of clarity and ethical standards when demonstrating advanced techniques like Western blotting.			A4	Role Play			
TOPIC: TUMOR IMMUNITY										
46	Week-9	Tumor growth detecting	Discuss the role of the immune system in detecting and controlling tumor growth.	C3			Interactive Lecture	2	MCQs	3
47		Mechanisms	Analyze the mechanisms by which tumors evade immune responses.	C4						
50		Practical performance	Perform VDRL Test using Standard Protocols		P4		Demo	1	OSPE	0
51		SOPs compliance	Prioritize ethical considerations and accuracy in conducting diagnostic tests to uphold patient trust and laboratory standards.			A4	Role Play			
TOPIC: AUTOIMMUNE DISEASES										
52	Week-10	Concept of self-tolerance	Define and differentiate autoimmune diseases and explain the concept of self-tolerance breakdown.	C3			Interactive Lecture	2	MCQs	3
54		Role and mechanisms	Describe the mechanisms underlying autoimmune disorders, such as molecular mimicry and epitope spreading.	C3						
56		Practical performance	Perform RF test "autoimmune disease marker" using standard protocols		P4		Demo	1	OSPE	2
57		SOPs compliance	Exhibit professionalism and a commitment to detail while performing tests crucial for diagnosing autoimmune conditions.			A4	Role Play			
TOPIC: INTRODUCTION TO SEROLOGY										
58	Week-11	Role of Serology	Define serology and its role in diagnosing infectious diseases.	C3			Interactive Lecture	2	MCQs	4
59		Principles of serological testing	Identify the principles of serological testing and its clinical applications.	C4						
62		Practical performance	Perform an ICT-based HBsAg rapid test to detect Hepatitis B surface antigen.		P4		Demo	1	OSPE	2
63		SOPs compliance	Foster accountability and reliability in conducting tests for infectious diseases like Hepatitis B, ensuring accurate diagnosis.			A4	Role Play			
TOPIC: BACTERIAL AND VIRAL IMMUNOLOGICAL DIAGNOSIS										
64	Week-12	Key serological reactions	Analyze serological test results to differentiate bacterial infections based on specific antigen-antibody reactions	C3			Interactive Lecture	2	MCQs	4
65		Diagnosing viral infections	Explain the principles and applications of immunological techniques in diagnosing viral infections.	C4						
68		Practical performance	Perform ASO titer bacterial diagnostic assays, with accuracy and reliability.		P4		Demo	1	OSPE	1
69		SOPs compliance	Display persistence and a quality-focused mindset when performing diagnostic assays to detect bacterial infections.			A4	Role Play			

TOPIC: ADVANCED SEROLOGICAL TECHNIQUES										
70	Week-13	Advanced serological techniques	Understand the principles of advanced serological techniques like immunofluorescence and Western blotting.	C3			Interactive Lecture	2	MCQs	3
71		Clinical applications	Describe the clinical applications of flow cytometry in diagnosing immune disorders.	C3						
75		Practical performance	Use a typhoid ICT kit to detect antibodies against *Salmonella typhi*		P4		Demo	1	OSPE	1
76		SOPs compliance	Demonstrate an empathetic and patient-centered approach while conducting diagnostic tests for typhoid fever.			A4	Role Play			
TOPIC: PRINCIPLES OF VACCINATION										
77	Week-14	Basic principles of vaccination	Explain the basic principles of vaccination, including types of vaccines and the immune mechanisms they activate	C3			Interactive Lecture	2	MCQs	4
78		Significance of herd immunity	Discuss the significance of herd immunity and its role in controlling infectious diseases.	C4						
82		Practical performance	Video Demonstration OF Handling and preparation of vaccines		P4		Demo	1	OSPE	1
83		SOPs compliance	Highlight the importance of responsible vaccine handling, preparation, and advocacy for public health through effective demonstration.			A4	Role Play			
TOPIC: POINT-OF-CARE TESTING IN SEROLOGY										
84	Week-15	Principles of POCT	Understand the principles of Point-of-Care Testing (POCT) in serology, its operational mechanisms, and its advantages, including rapid diagnosis, portability, and ease of use	C3			Interactive Lecture	2	MCQs	5
85		Applications in immunology	Evaluate its clinical applications, such as testing for HIV, HBV, and CRP, while understanding the importance of quality control and result interpretation.	C4						
89		Practical performance	Detect antibodies against Hepatitis C virus using a rapid diagnostic kit		P4		Demo	1	OSPE	1
90		SOPs compliance	Respect the sensitivity of Hepatitis C diagnostic tests and maintain strict ethical standards in their application.			A4	Role Play			
TOPIC: QUALITY **ASSURANCE AND FUTURE DIRECTIONS IN IMMUNOLOGY AND SEROLOGY**										
91	Week-16	Quality Assurance in Immunology	Demonstrate a commitment to maintaining accuracy, precision, and ethical standards in diagnostic testing.							3
92		Future Directions in Immunology and Serology	Applications of AI, bioinformatics, and personalized medicine in immunodiagnostics.							
95		Practical performance	Demonstrate the LJ chart and implementations of West Guard Rules.		P4		Demo	1	OSPE	1
96		SOPs compliance	Advocate for meticulous quality control in laboratory processes, valuing the role of systematic monitoring for maintaining diagnostic accuracy.			A4	Role Play			

RECOMMENDED BOOKS

1. Turgeon, M. L. (2021). Immunology & Serology in Laboratory Medicine (7th ed.). Elsevier. ISBN: 9780323834683.
2. Stevens, C. D. (2016). Clinical Immunology and Serology: A Laboratory Perspective (4th ed.). F.A. Davis Company. ISBN: 9780803625627.
3. Stanley, J. (2002). Essentials of Immunology and Serology. Cengage Learning. ISBN: 9780766810652.
4. Punt, J., Stranford, S. A., Jones, P. P., & Owen, J. A. (2019). Kuby Immunology (8th ed.). W.H. Freeman. ISBN: 9781464189784.
5. Murphy, K., & Weaver, C. (2016). Janeway's Immunobiology (9th ed.). Garland Science. ISBN: 9780815345053.

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	Immune Organs and Cells.	5	2	Static
2	Cellular Basis of Immune Response.	10	2	1 Interactive/1 Static
3	Antibodies and Humoral Immunity.	5	1	Static
4	Cell-Mediated Immunity	4	1	Static
5	Major Histocompatibility Complex (MHC) and Transplantation.	4	0	
6	Complement System.	5	2	Static
7	Antigen–Antibody Reactions in the Laboratory.	4	2	Static
8	Hypersensitivity (Allergy), Tolerance.	4	1	Static
9	Autoimmune Diseases.	3	0	
10	Tumor Immunity	3	0	
11	Introduction to Serology.	4	1	Static
12	Bacterial and Viral Immunological Diagnosis.	4	2	1 Interactive/ 1Static
13	Advanced Serological Techniques.	3	2	Static
14	Principles of Vaccination.	4	1	Static
15	Point-of-Care Testing in Serology.	5	2	Interactive
16	Quality Assurance and Future Directions in Immunology and Serology.	3	1	Static
Total		70	20	

MLT-617 LABORATORY INSTRUMENTATION AND TECHNIQUES 3(2+1)

COURSE DESCRIPTION

This course provides comprehensive theoretical knowledge and hands-on training in the principles, operation, calibration, and maintenance of advanced laboratory instruments used in clinical and research laboratories. The course aims to build competence in handling and troubleshooting equipment while ensuring adherence to quality control standards. Students will gain expertise in techniques essential for molecular biology, hematology, biochemistry, and immunology diagnostics, along with practical exposure to cutting-edge technologies. The structured combination of interactive lectures, demonstrations, and role-play-based OSPE (Objective Structured Practical Examination) sessions ensures a holistic learning experience.

LEARNING OBJECTIVES

Cognitive Domain (Knowledge and Understanding)

At the end of this course students will be able:

1. Understand the fundamental principles behind the operation of key laboratory instruments (e.g., microscope, spectrophotometer, ELISA).
2. Explain the procedures for calibration, maintenance, and troubleshooting of lab equipment.
3. Identify the applications of laboratory techniques in clinical and research diagnostics.
4. Demonstrate critical thinking in selecting appropriate instruments and methods for specific laboratory tests.

Psychomotor Domain (Practical Skills)

At the end of this course students will be able:

1. Operate laboratory instruments, including microscopes, pH meters, spectrophotometers, centrifuges, and hematology analyzers, with precision.
2. Perform calibration and routine maintenance of laboratory instruments to ensure accuracy.
3. Execute diagnostic procedures such as ELISA, electrophoresis, chromatography, and PCR with hands-on proficiency.
4. Handle laboratory samples safely, adhering to standard protocols and biosafety guidelines.

Affective Domain (Professional Attitudes and Ethics)

At the end of this course students will be able:

1. Develop a professional attitude towards maintaining cleanliness, accuracy, and efficiency in the laboratory.
2. Show respect for biosafety standards and ethical considerations in handling patient samples.
3. Collaborate effectively with peers during group tasks, demonstrating teamwork and communication skills.
4. Cultivate a sense of responsibility for delivering reliable and reproducible diagnostic result

TABLE OF SPECIFICATIONS

LABORATORY INSTRUMENTATION AND TECHNIQUES

S. No	Weeks	Contents	Learning Outcome	Domain C	Domain P	Domain A	MIT's	Time/Hours	Assessment	No of Items
TOPIC: MICROSCOPE										
1	Week-1	Definition and Principle	Understand the basic definition and principles of microscopy, including the different types of microscopes (light, electron, and fluorescent) and how magnification and resolution work to enhance image clarity.	C1			Interactive Lecture/SGD	2	MCQs	05
2		Components	Learn about parts of the microscope and their functions.	C2						
3		Applications	Understand how microscope is used in Clinical and research area.	C2						
4		Demonstration	Gain skills in setting up a microscope correctly, calibration, and slide focusing.		P4		Demo	1	OSPE	01
5		Practical performance	Understand how to prepare slides, develop proficiency in focusing techniques, and learn how to troubleshoot common issues with microscope usage.			A4	Role Play			
TOPIC: COLORIMETER										
6	Week-2	Definition and Principle	Understand the fundamental principles of colorimetry and the Beer-Lambert law.	C1			Interactive Lecture/SGD	2	MCQs	05
7		Components	Identify and understand the roles of the key components i.e. Light source, filters, cuvette, and detector.in a colorimetric setup.	C3						
8		Applications	Measuring concentration of various solutions using colorimeter	C2						
9		Demonstration	Perform Calibration and measure the absorbance of solutions.		P4		Demo	1	OSPE	01
10		Practical performance	Develop the skills to perform a colorimetric assay and interpret the results accurately.			A4	Role Play			
TOPIC: FLAME PHOTOMETER										
11	Week-3	Introduction	Explain flame excitation and emission detection.	C1			Interactive Lecture/SGD	2	MCQs	05
12		Components	Explain burner, filter, and photo detector system.	C2						
13		Applications	Analyzing sodium, potassium, and calcium ions.	C2						
14		Demonstration	Demonstrate calibration with standards and sample analysis.		P4		Demo	1	OSPE	01
15		Practical performance	Preparing and analyzing clinical samples.			A4	Role Play			
TOPIC: SPECTROPHOTOMETRY										

16	Week-4	Definition	Understand the absorption and transmission of light by a substance.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
17		Components	Learn about the Light source, monochromatic, cuvette, and detector.	C2						
18		Applications	Perform Quantitative analysis in biochemistry.	C3						
19		Demonstration	Calibrating the spectrophotometer and analyzing a sample.		P4		Demo	1	OSPE	01
20		Practical performance	Conducting a spectrophotometric assay.			A4	Role Play			
TOPIC: WATER BATH										
21	Week-5	Definition and Principle:	Understand the heat transfer for maintaining constant temperature.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
22		Components	Learn about the thermostat, heating element, and tank	C2						
23		Applications	Explain incubation of samples.	C3						
24		Demonstration	Demonstrate setting temperature and maintaining a water bath.		P4		Demo	1	OSPE	01
25		Practical performance	Incubating enzyme or bacterial samples.			A4	Role Play			
TOPIC: CENTRIFUGE										
26	Week-6	Definition and Principle:	Understand centrifugal force and sample separation.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	05
27		Components	Learn about the rotor, centrifuge tubes, and control panel	C2						
28		Applications	Fractionating blood and isolating biomolecules.	C3						
29		Demonstration	Demonstrate balancing tubes and centrifuge operation.		P4		Demo	1	OSPE	01
30		Practical performance	Handling and separating patient samples.			A4	Role Play			
TOPIC: BALANCE										
31	Week-7	Introduction	Explain the importance of accurate weighing in laboratory settings, and how it contributes to the precision and reliability of experimental results.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	05
32		Components	Explain Pan, digital display, and calibration tools	C2						
33		Applications	Explain preparing solutions and reagents.	C3						
34		Demonstration	Demonstrate calibrating and weighing a sample.		P4		Demo	1	OSPE	0.5
35		Practical performance	Measuring reagents for solution preparation.			A4	Role Play			
TOPIC: INCUBATOR, pH METER VORTEX MIXER										
36	Week-8	Definition	Explain incubator, pH Meter and vertex mixer.	C1				2	MCQs/SEQs	05

37		Components	Identify the components of incubator pH meter, and Vertex mixer.	C2			Interactive Lecture/SGD			
38		Applications	Use incubators to culture microorganisms, explaining the significance of this process in biological and medical research. Explain use of pH meter for finding pH of buffers and solution Explain the use of Vortex mixer	C3						
39		Demonstration	Set the temperature and humidity in an incubator, demonstrating the correct procedures for ensuring optimal growth conditions for cultures. Demonstrate calibration of pH meter and correct procedure to find out pH Demonstrate mixing of sample by the use of vertex mixer		P4		Demo	1	OSPE	01
40		Practical performance	Place and monitor culture plates in an incubator, adjusting conditions as needed to achieve optimal results. Calibration of pH meter and correct procedure to find out pH Mixing of sample by the use of vertex mixer			A4	Role Play			
TOPIC: HOT AIR OVEN & WATER STILL										
41	Week-9	Definition and Principle	Explain Dry heat sterilization and water purification.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
42		components	Identify heating elements, thermostat (oven), and condenser (still)	C2						
43		Application	Explain sterilizing lab tools and producing distilled water.	C1						
44		Demonstration	Demonstrate operating and maintaining both instruments.		P4		Demo	1	OSPE	0.5
45		Practical performance	Sterilizing glassware and collecting distilled water.			A4	Role Play			
TOPIC: ELECTROPHORESIS ASSEMBLY										
46	Week-10	Definition and Principle	Separation of molecules by charge in an electric field.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
47		Components	Identify the Gel tray, buffer tank, and power supply.	C2						
48		Application	Perform DNA/RNA analysis.	C1						
49		Demonstration	Demonstrate setting up and running electrophoresis.		P4		Demo	1	OSPE	01
50		Practical performance	Loading gel samples and interpreting results.			A4	Role Play			
TOPIC: THERMO-CYCLER										
51	Week-11	Introduction	Amplifying DNA using temperature cycles.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
52		Components	Identify Heating block, lid, and control panel.	C1						

53		Application	Explain genetic diagnostics and research.	C2						
54		Demonstration	Demonstrate programming and running PCR.		P4		Demo	1	OSPE	01
55		Practical performance	Amplifying and analyzing DNA samples.			A4	Role Play			
TOPIC: CHROMATOGRAPHY										
56	Week-12	Introduction	Introduction to separation of compounds using stationary and mobile phases.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
57		Components	Explain paper, gas, and liquid chromatography.	C2						
58		Application	Explain drug testing and biomolecule separation.	C3						
59		Demonstration	Demonstrate performing a chromatography experiment.		P4		Demo	1	OSPE	0.5
60		Practical performance	Interpreting chromatographic separation.			A4	Role Play			
TOPIC: HEMATOLOGY ANALYZER										
61	Week-13	Introduction	Explain the process of Automated blood cell analysis.	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
62		Components	Identify the sample handler, detector, and analyzer.	C2						
63		Application	Perform complete blood count and differential analysis.	C4						
64		Demonstration	Demonstrate operating the analyzer and reading results.		P4		Demo	1	OSPE	01
65		Practical performance	Generating and interpreting a patient's blood report.			A4	Role Play			
TOPIC: RIA, ELISA, CMIA										
66	Week-14	Introduction	Provide an overview of RIA, ELISA, CMIA,	C1			Interactive Lecture/SGD	2	MCQs/SEQs	04
67		Components	Identify the Equipment and reagents.	C2						
68		Application	Perform diagnostics and advanced research.	C3						
69		Demonstration	Demonstrate performing one advanced technique (e.g., ELISA).		P4		Demo	1	OSPE	01
70		Practical performance	Conducting and analyzing results from an advanced diagnostic test.			A4	Role Play			
TOPIC: INSITU HYBRIDIZATION, BLOTTING TECHNIQUES										
71	Week-15	Introduction	Provide an overview of Insitu Hybridization and Blotting Techniques,	C1			Interactive Lecture/SGD	2		04
72		Components	Identify the Equipment and reagents.	C2						
73		Application	Perform diagnostics and advanced research.	C3						
74		Demonstration	Demonstrate performing technique (e.g., FISH and Western Blott).		P4		Demo	1	OSPE	01
75		Practical performance	Conducting and analyzing results from an advanced diagnostic test.			A4	Role Play			

TOPIC: FLOW CYTOMETRY										
76	Week-16	Introduction	Provide an overview of Flow cytometry	C1			Interactive Lecture/SGD	2		04
77		Components	Identify the Equipment and reagents.	C2						
78		Application	Perform diagnostics and advanced research.	C3						
79		Demonstration	Demonstrate performing technique of flow cytometry.		P4		Demo	1	OSPE	0.5
80		Practical performance	Conducting and analyzing results from an advanced diagnostic test.			A4	Role Play			

RECOMMENDED BOOKS

1. Medical Instrumentation by Kaplin, edition 5th edition

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	Microscope	8	2	Static
2	Colorimeter	4	2	1 Interactive/1 Static
3	Flame Photometer	3	1	Static
4	Spectrophotometry	4	1	Static
5	Water bath	1	0	
6	Centrifuge	2	2	Static
7	Balance	2	2	Static
8	Incubator, pH meter, Vertex Mixer	3	1	Static
9	Hot Air Oven, Water Still	3	0	
10	Electrophoresis Assembly	4	0	
11	Thermocycler	4	1	Static
12	Chromatography	8	2	1 Interactive/ 1Static
13	Hematology Analyzer	4	2	Static
14	RIA, ELISA, CMIA	8	1	Static
15	Insitu Hybridization, Blotting techniques	8	2	Interactive
16	Flowcytometry	4	1	Static
Total		70	20	

MLT-617 CLINICAL VIROLOGY AND MYCOLOGY 3 (2-1)

COURSE DESCRIPTION

The purpose of this course is to equip the students by imparting knowledge and understanding of the medically important viruses and fungi, to foster the development of professional skills through this curriculum by understanding the transmission, pathogenesis and diagnosis of viruses and fungi and see how this knowledge comes into play in real-world scenarios and in clinical settings. For this, curriculum is designed in such a way to get insight of basics and explanations of different viral and fungal infection.

LEARNING OBJECTIVES

Cognitive Domain

By the end of this course, students should be able to

1. Discuss the history of virology with recent advancement in this field
2. Describe the structure of virus along with properties of being a-cellular in nature
3. Discuss the basic concepts in medical virology and mycology
4. Identify different viruses with their importance
5. Discuss the nature of pathogenic viruses and fungi
6. Describe the transmission, pathogenesis, clinical finding and laboratory diagnosis of viruses and fungi

Psychomotor Domain

By the end of this course, students should be able to

1. Demonstrate ability to Identify and label different instruments in microbiology lab
2. Demonstrate the lab safety practices and use of PPE's
3. Demonstrate different technique for the diagnosis of viral infection
4. Demonstrate different technique for the diagnosis of fungal infection
5. Study of Microscope and use the microscope to look slides effectively.

Affective Domain

By the end of this course, students should be able to

1. Demonstrate punctuality.
2. Follow the specified norms of the IL, SGD teaching & learning.
3. Demonstrate the humbleness and use the socially acceptable language during academic and social interactions with human models, colleagues and teachers.
4. Demonstrate ethically competent decisions when confronted with an ethical, social or moral problem related to professional or personal life.

TABLE OF SPECIFICATIONS
4 CLINICAL VIROLOGY AND MYCOLOGY

S. No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/ Hours	Assessment	No of Items
				C	P	A				
TOPIC: INTRODUCTION AND HISTORICAL REVIEW OF VIROLOGY										
1	Week-1	Definition	Define Virus	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	4
2		Historical review	Relate current advances in virology with the origin of virology	C2						
3		Differences between virus and cell	Compare the differences between virus and cell	C2						
4		Size, shape and types of viruses	Describe the size, shape and structure of virus	C2						
5		Atypical Virus like agents	Discuss atypical virus like agents	C2						
6		Classification	Classification of viruses	C3						
7		Laboratory Safety Practices	Perform laboratory safety practices and use of PPE		P 4		Practical/Video Demonstration	2	OSPE	1
8		SOPs compliance	Comply SOPs of laboratory safety practices and adopt how to care and handle laboratory equipment's			A 4	Role Play			
TOPIC: VIRAL REPLICATION										
9	Week-2	Definition	Define Viral Replication	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
10		Viral growth	Discuss viral growth curve and the events during growth cycle of viruses	C3						
11		Definition	Define lysogeny	C1						
12		Lysogeny	Explain lysogenic life cycle of viruses	C3						
13		Specimen collection	Perform appropriate specimen for different viral infection		P 4		Practical/Video Demonstration	2	OSPE	1
14		SOPs compliance	Adopt the care, use and SOPs for specimen collection			A 4	Role Play			
TOPIC: VIRAL PATHOGENESIS AND HOST DEFENSES										
15	Week-3	Definition	Define viral Pathogenesis	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
16		Pathogenesis	Explain the mechanism of viral pathogenesis	C2						
17		Non-Specific Defenses	Explain non-specific immune defenses	C2						
18		Specific Defenses	Explain specific immune defenses	C2						
19		Immunochromatographic Test (ICT)	Demonstrate Immunochromatographic Test used for the diagnosis of viral infection.		P 3		Practical/Video Demonstration	2	OSPE	1
20		SOPs compliance	Comply to SOPs of ICT to perform affectively			A 3	Role Play			

TOPIC: LABORATORY DIAGNOSIS										
21	Week-4	Definition	Define Cell Culture techniques	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
22		Cell culture	Discuss viral diagnosis on the basis of cell culture	C2						
23		Microscopy	Illustrate microscopic identification of viruses	C3						
24		Serological identification	Explain serological procedures for viral identification	C2						
25		Viral antigens	Discuss detection of different viral antigens	C2						
26		Viral Nucleic acid	Discuss extraction and quantification/detection of viral nucleic acids	C2						
27		Agglutination test	Demonstrate agglutination test used for the diagnosis of viral infection.		P 3		Practical/Video Demonstration	2	OSPE	1
28		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: DNA ENVELOPED VIRUSES										
29	Week-5	DNA Enveloped Viruses	Explain general properties of DNA enveloped viruses	C2			Interactive lecture /video demonstration	2	MCQs /SEQs	4
30		Important DNA Enveloped Viruses	Discuss the clinical important DNA enveloped viruses and its associated infection	C!						
31		Herpes Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Herpes virus	C2						
32		Neutralizing antibody test	Demonstrate Neutralizing antibody test used for the diagnosis of viral infection.		P 2		Practical/Video Demonstration	2	OSPE	2
33		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
34	Week 6	Cytomegalovirus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Cytomegalovirus virus	C3			Interactive lecture /video demonstration	2	MCQs /SEQs	4
35		Epstein-Barr Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Epstein-Barr virus	C3						
36		Enzyme Link Immunosorbent Assay (ELISA)	Demonstrate Enzyme Link Immunosorbent Assay (ELISA) for viral infections		P 2		Practical/Video Demonstration	2	OSPE	1
37		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: RNA ENVELOPED VIRUSES										
38	Week 7	RNA Enveloped Viruses	Explain general properties of RNA enveloped viruses	C3			Interactive lecture /video demonstration	2	MCQs /SEQs	7
39		Important RNA Enveloped Viruses	Discuss the clinical important RNA enveloped viruses and its associated infection	C1						
40		Influenza Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Influenza virus	C3						

41		Measles Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Measles virus	C3						
41		Chemiluminescent microparticle immunoassay (CMIA)	Demonstrate Chemiluminescent microparticle immunoassay (CMIA) for viral infections		P 2		Practical/Video Demonstration	2	OSPE	1
42		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: RNA ENVELOPED VIRUSES										
43	Week-8	Mumps Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Mumps virus	C3			Interactive lecture /video demonstration	2	MCQs /SEQs	7
44		Corona Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Corona viruses	C3						
45		Rubella	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Rubella viruses	C3						
46		Chemiluminescent Immunoassay (CLIA)	Demonstrate Chemiluminescent Immunoassay (CLIA) for viral infections		P 2		Practical/Video Demonstration	2	OSPE	1
47		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: ARBOVIRUS FAMILY										
48	Week-9	Introduction	Introduce arboviruses	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
49		Arbovirus Family	Discuss the arboviruses family and its associated infections	C2						
50		Dengue Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Dengue viruses	C3						
51		Electrochemiluminescence Immunoassay (ECLIA)	Demonstrate Electrochemiluminescence Immunoassay (ECLIA) for viral infections		P 1		Practical /Video Demonstration	2	OSPE	2
52		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: RNA NON-ENVELOPED VIRUSES										
53	Week-10	RNA Non- enveloped Viruses	Explain general properties of RNA Non-enveloped viruses	C1			Team Base Learning	2	MCQs /SEQs	4
54		Important RNA Non-enveloped Viruses	Discuss the RNA Non-enveloped virus's family and its associated infections	C1						
55		Polio Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Polio virus	C3						
56		Polymerase Chain Reaction	Demonstrate Polymerase Chain Reaction for viral infections		P 1		Video Demonstration	2	OSPE	1
57		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: HEPATITIS VIRUSES										

58	Week-11	Definition	Define Viral Hepatitis	C1			Interactive lecture /video demonstration	4	MCQs /SEQs	8
59		Hepatitis Viruses	Discuss the family of Hepatitis viruses	C1						
60		Hepatitis A Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Hepatitis viruses	C3						
61		Hepatitis B Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Hepatitis B virus	C3						
62		Hepatitis C Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Hepatitis C virus	C3						
63		Hepatitis D, E & G Virus	Illustrate the properties, route of transmission, clinical findings and Lab Diagnosis of Hepatitis D virus	C3						
64		Summary	Summarize the differences between Hepatitis Virus	C2						
65		Cell Culture/Tissue Culture	Demonstrate cell culture/Tissue culture for viral infections		P 1		Video Demonstration	2	OSPE	2
66		SOPs compliance	Comply to SOPs of practical affectively							
TOPIC: HUMAN IMMUNODEFECIENCY VIRUS										
67	Week-12	Important properties of HIV	Discuss Important properties of HIV	C2			Interactive lecture /video demonstration	2	MCQs /SEQs	5
68		Transmission and epidemiology	Explain the transmission and epidemiology of HIV	C2						
69		Clinical Findings	Analyze the clinical findings of HIV	C4						
70		Laboratory tests for HIV	Enlist the laboratory diagnosis of HIV	C1						
71		Lab Test Reports Interpretation	Demonstrate different lab reports performed for the diagnosis of viral infection		P 3		Practical /Video Demonstration	4	OSPE	1
72		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: INTRODUCTION TO MYCOLOGY										
73	Week-13	Definition	Define mycology	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
74		Classification	Classification of fungi	C3						
75		Fungal structure	Describe structure and growth of fungi	C2						
76		Diagnostic procedure	Explain different diagnostic procedure used for the diagnosis of fungal infection	C2						
77		Specimen Collection	Collect appropriate specimen for different fungal infection		P 2		Practical /Video Demonstration	4	OSPE	1
78		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: CUTANEOUS AND SUBCUTANEOUS MYCOSIS										
79	Week-14	Definition	Define Cutaneous and subcutaneous mycosis	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	4
80		Cutaneous and Subcutaneous fungi	Enlist the fungi that cause Cutaneous and sub-Cutaneous mycosis	C3						

81		Clinical Manifestation	Analyze the clinical manifestation of these fungi	C4						
82		Diagnostic tests and Treatment	Enlist the diagnostic tests for Cutaneous and subcutaneous mycosis	C3						
83		KOH preparation	Demonstrate KOH preparation for fungal infection specimens		P 2		Practical /Video Demonstration	2	OSPE	1
84		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: SYSTEMIC MYCOSIS										
85	Week-15	Definition	Define systemic mycosis	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	5
86		Systemic Mycosis	Enlist the fungi that causes systemic mycosis	C3						
87		Clinical Manifestation	Analyze the clinical manifestation of these fungi	C4						
88		Diagnostic tests and Treatment	Enlist the diagnostic tests for systemic mycosis	C1						
89		KOH preparation	Perform KOH preparation for fungal infection specimens		P 2		Practical /Video Demonstration	4	OSPE	1
90		SOPs compliance	Comply to SOPs of practical affectively			A 4	Role Play			
TOPIC: OPPORTUNISTIC MYCOSIS										
91	Week-16	Definition	Define opportunistic Mycosis	C1			Interactive lecture /video demonstration	2	MCQs /SEQs	3
92		Opportunistic Mycosis	Enlist the fungi that causes opportunistic mycosis	C3						
93		Clinical Manifestation	Analyze the clinical manifestation of these fungi	C4						
94		Diagnostic tests and Treatment	Enlist the diagnostic tests opportunistic mycosis	C1						
95										
96		Microbiology Laboratory Reports	Interpretate fungal culture reports		P 2		Practical /Video Demonstration	2	OSPE	1
97		SOPs compliance	Adopt how to interpret the microbiological reports			A 4	Role Play			

RECOMMENDED BOOKS

1. Levinson's Review of Medical Microbiology and Immunology: A Guide to Clinical Infectious Disease, 18th Edition, 2024
2. Ryan & Sherris Medical Microbiology, 8th Edition 8th Edition by Kenneth J. Ryan & Nafees Ahmad, 2022
3. Medical Microbiology and Infection at a Glance. Gillespie, S., H., Bamford, K., B., 4th ed. Wiley Black well, 2012.
4. Jawetz, Melnick, & Adelberg's Medical Microbiology. Brooks, G., Carroll, K., C., Butel, J., & Morse, S., 26th ed. McGraw-Hill Medical, 2012.

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	Introduction and Historical Review of Virology	4	1	Interactive
2	Viral Replication	3	1	Interactive
3	Viral Pathogenesis and Host Defenses	3	1	Interactive
4	Laboratory Diagnosis	3	1	Interactive
5	DNA Enveloped Viruses	4	2	Interactive
6	DNA Enveloped Viruses	4	1	Interactive
7	RNA Enveloped Viruses	7	1	Interactive
8	RNA Enveloped Viruses	7	1	Interactive
9	Arbovirus Family	3	2	Interactive
10	RNA Non-Enveloped Viruses	4	1	Interactive
11	Hepatitis Viruses	8	2	Interactive
12	Human Immunodeficiency Virus	5	1	Interactive
13	Introduction To Mycology	3	1	Interactive
14	Cutaneous And Subcutaneous Mycosis	4	1	Interactive
15	Systemic Mycosis	5	1	Interactive
16	Opportunistic Mycosis	3	1	Interactive
Total	**16**	**70**	**14**	**14**

MLT-618 CYTOLOGY AND CYTOGENETICS 3(2+1)

COURSE DESCRIPTION

This course explores the fundamental concepts of cellular biology, focusing on the structure and function of cells and their organelles in both healthy and diseased states. Students will learn techniques for collecting, fixing, and analyzing various body cavity fluids under different pathological conditions. Additionally, the course introduces cytogenetics, including the collection and processing of blood samples for karyotyping and the examination of slides for numerical and structural chromosomal abnormalities.

LEARNING OBJECTIVES

By the end of this course, students of BS MLT 6th semester should be able to:

Cognitive Domain

1. Define cytology and cytogenetics
2. Describe cytomorphology of normal and malignant tumor cells
3. Describe techniques for collection and preparation of cytological smears
4. Explain cell culture and banding techniques

Psychomotor Domain

1. Prepare smears of different cytological fluids
2. Perform routine and special staining techniques
3. Collect blood sample for cytogenetic analysis
4. Screen cytological smears for normal and malignant cells
5. Examine slides for numerical and structural chromosomal abnormalities

Affective Domain

1. Follow good laboratory practices and procedures (GLPPs)
2. Adopt to SOPs
3. Demonstrate punctuality
4. Assist Laboratory technologist/supervisor in organizing/proper storage of reagents/fixatives
5. Cooperate with fellows/coworkers
6. Adopt to ethical and social norms
7. Adopt to QC/QA procedures effectively

TABLE OF SPECIFICATIONS

TOS-CYTOLOGY AND CYTOGENETICS

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: Basic cellular structures										
1	Week-1&2	Definition	Define basic cellular organelles	C1			Interactive Lecture	4	MCQs	
2		Size and shape of cellular organelles	Explain the different types of cellular organelles and their identification	C3						
3		Basic structures of epithelial tissues	Describe different types of epithelial tissues	C3						
4		Practical performance	Identify and collect different body fluids for cytology		P4		Demo		OSPE	
5		Comply with SOPs	Comply with SOPs of good laboratory practices			A4	Role Play			
TOPIC: Characteristics of malignant tumor cells										
6	Week-3	Changes in cellular shapes and sizes	Describe the changes in cellular shapes and sizes in malignancy	C3			Interactive Lecture	2	MCQs	
7		Cytoplasmic changes	Explain cytoplasmic changes in cells in malignancy	C3						
8		Nuclear changes	Explain nuclear changes in cells in malignancy	C2						
9		Practical performance	Identify different normal cell types and label its parts on a chart		P4		Demo	1	OSPE	
10		Comply with SOPs	Adopt to SOPs of different fixatives and maintain a clean and clear working bench			A4	Role Play			
TOPIC: Screening for malignant cells										
11	Week-4	Introduction to microscope and its types	Briefly describe microscope and its types	C3			Interactive Lecture	4	MCQs	
12		Introduction to different parts of light microscope	Briefly describe the function of different parts of microscope	C3						
13		Points in the screening	Identify different cellular patterns during screening slides	C3						
15		Practical performance	Record characteristics of malignant cells on a paper/chart		P4		Demo	1	OSPE	
16		Comply with SOPs	Keep the instrument and working bench clean and clear			A4	Role Play			
TOPIC: Preparation and fixation of cytological smears, liquid based cytology (LBC)										
17	Week-5-7	Processing methods of fluid specimens	Describe preparation and fixation of smears	C2			Interactive Lecture	6	MCQs/SEQs	
18		Centrifugation methods	Describe centrifugation methods of smearing	C2						
19		Automatic centrifugal smearing methods Cell collection methods	Explain liquid based cytology and automatic smearing methods Describe different cell collection methods for smear	C3						
		Cell block method	Describe cell block preparation	C3						

20		Practical performance	Prepare and fix smear of anybody fluid		P4		Demo	1	OSPE	
21		Comply with SOPs	Assist Laboratory technologist/supervisor in organizing/proper storage of reagents/fixatives			A4	Role Play			
TOPIC: Effusion cytology- Cytology of Pleural fluid, peritoneal fluid, pericardial fluid, CSF, urine cytology, sputum										
22	Week-8-9	Introduction to effusion cytology	Define effusion cytology and its significance	C1			Interactive Lecture	6	MCQs/SEQs	
23		Body cavity fluids	Describe different fluids associated with body cavities	C2						
24		Techniques of collection of effusions	Describe methods of collection of different effusions	C3						
25		Physiochemical properties of effusions	Differentiate between exudates and transudates	C3						
		Urine cytology	Describe collection and processing of urine for cytological examination	C4						
26		Practical performance	Prepare and fix smears of urine and or sputum for cytological examination		P4		Demo	1	OSPE	
27		Comply with SOPs	Cooperate lab technologist in handling/storage of cytological samples in lab			A4	Role Play			
TOPIC: Cytology of the female genital tract										
28	Week-10	Introduction to parts of FGT	Briefly describe different parts of FGT	C3			Interactive Lecture	4	MCQs/SEQs	
29		Cell collection methods from FGT	Discuss different methods of cell collection from FGT	C3						
30		Cervical smear, Vaginal smear, Endometrial smear, Endocervical smear	Describe different FGT smears	C3						
31		Epithelial cell found in FGT smear	Identify different cell types in FGT smear	C4						
32		Practical performance	Record key features of vaginal smear on paper/chart		P4		Demo	1	OSPE	
33		Comply with SOPs	Organize and carefully handle the cytological smears in lab			A4	Role Play			
TOPIC: Cytology **of the respiratory tract**										
34	Week-11	Normal cells of the respiratory tract	Briefly describe normal cell types of the respiratory tract	C3			Interactive Lecture	6	MCQs/SEQs	
35		Non-cellular components of the respiratory smear	Discuss different non-cellular components of the respiratory tract	C3						
36		Mycosis	Briefly describe fungal elements in respiratory smear	C4						
39		Practical performance	Prepare and fix smear of sputum	C4	P4		Demo	1	OSPE	
40		Comply with SOPs	Follow lab SOPs and carefully handle the slides and microscope			A4	Role Play			
TOPIC: Routine and special cytological stains										
41	Week-12	Introduction to cytological stains	Describe different staining reactions and theories	C2			Interactive Lecture	6	MCQs/SEQs	

42		Routine cytological stains (Gram, ZN, H&E)	Describe staining technique for routine stains	C3						
43		Special cytological stains (Pap, PAS, Oil red-O, Nigrosine, Feulgen stain)	Describe staining technique for special stains	C3						
44		Practical performance	Perform Gram/ZN staining on cytology smear		P4		Demo	1	OSPE	
45		Comply with SOPs	Organize reagents and stains properly			A4	Role Play			
TOPIC: Immunocytochemistry (ICC)										
46	Week-13	Introduction to immunostains	Briefly describe immunochemical stains	C1			Interactive Lecture	6	MCQs/SEQs	
47		Antibodies used in ICC	Discuss different types of antibodies used in ICC	C2						
48		Techniques of immunostaining	Describe methods of ICC	C3						
49				C3						
50		Practical performance	Demonstrate the equipment and reagents used in ICC		P4		Demo	1	OSPE	
51		Comply with SOPs	Adopt to SOPs of ICC			A4	Role Play			
TOPIC: FNAC										
52	Week-14	Aspiration cytology	Describe aspiration cytology and its advantages and disadvantages	C3			Interactive Lecture	6	MCQs/SEQs	
53		Exfoliation vs aspiration cytology	Compare exfoliative and aspiration cytology	C3						
56		Practical performance	Set up materials required for FNAC on a model		P4		Demo	1	OSPE	
57		Comply with SOPs	Cooperate in keeping records/labeling slides			A4	Role Play			
TOPIC: Cytogenetics										
58	Week-15	Introduction to chromosomes	Briefly describe chromosome and their structure	C4			Interactive Lecture	6	MCQs/SEQs	
59		Conventional cytogenetics	Describe conventional cytogenetics and techniques	C4						
60		Molecular cytogenetics	Describe molecular cytogenetics and techniques	C4						
62		Practical performance	Label different chromosomes on model/karyogram		P4		Demo	1	OSPE	
63		Comply with SOPs	Assist the pathologist/cytotechnologist			A4	Role Play			
TOPIC: Cell culture and banding techniques and chromosome identification										
64	Week-16	Cell culture and harvest	Describe cell culture methods	C3			Interactive Lecture	4	MCQs/SEQs	
65		Chromosome banding techniques	Explain different chromosome banding/staining methods	C4						
68		Practical performance	Set up materials required for banding on a model		P4		Demo	1	OSPE	
69		Comply with SOPs	Comply to SOPs of cell culture			A4	Role Play			

RECOMMENDED BOOKS

1. Koss's Diagnostic Cytology Volume I & II
2. The principle of clinical cytogenetics by Steven L, Gersen Martha

Topics	No. of MCQs	OSPE/OSCE stations	Interactive or static
Basic cellular structures	6	1	Static
Characteristics of malignant tumor cells	6	1	Static
Screening for malignant cells	6	1	Static
Preparation and fixation of cytological smears, liquid-based cytology (LBC)	6	1	Static
Effusion cytology- Cytology of Pleural fluid, peritoneal fluid, pericardial fluid, CSF, urine cytology, sputum	6	1	Static
Cytology of the female genital tract	6	1	Static
Cytology of the respiratory tract	6	1	Static
Routine and special cytological stains	6	1	Static
Immunocytochemistry (ICC)	6	1	Static
FNAC	6	1	Static
Cytogenetics	6	1	Static
Cell culture and banding techniques and chromosome identification	6	1	Static

MLT-619 HISTO-TECHNIQUES Credit Hours 3(2+1)

COURSE DESCRIPTION

This course provides a comprehensive foundation in Histo-techniques and immunohistochemistry, focusing on the principles and practices essential for tissue biopsy reception, processing, staining, and microscopic examination. Students will explore key topics, including sample documentation, gross examination, Fixation, decalcification, tissue processing, microtomy, and staining. This course also covers biopsy dissection, tissue fixation, dehydration, clearing, paraffin wax infiltration, blocking, tissue sectioning, staining, and mounting. Additionally, techniques and protocols used for immunohistochemistry and its quality control. This course prepares students for roles in clinical and histopathology laboratory settings.

LEARNING OBJECTIVES

Cognitive Domain

By the end of this course, students should be able to

7. Describe the fundamental concepts of Histo-techniques.
8. Discuss histopathology laboratory sections and integration with advanced technologies.
9. Develop a comprehensive understanding of histo-technique steps (e.g., fixation, decalcification, tissue processing, embedding, sectioning, staining).
10. Outline the essential procedures employed in histo-techniques to accurately diagnose histopathological abnormalities and malignancies.
11. Analyze the skills required for various histo-techniques and emphasize their quality management practices.
12. Special techniques like immunohistochemistry (IHC) and special stains (PAS, ZN, Giemsa).

Psychomotor Domain

By the end of this course, students should be able to

6. Perform the procedure for preparing a 10% formaldehyde solution from the stock solution in the histopathology lab.
7. Perform the procedure of gross examination and tissue dissection under supervision.
8. Perform the procedure of the calcium oxalate test for decalcification independently.
9. Demonstrate the procedure of dehydration, clearing, paraffin infiltration, and blocking preparation for tissue sectioning.
10. Perform the procedure of sectioning 0.5-micron thin tissue slices using a microtome for staining.
11. Perform the procedure for H&E staining and mounting of a histopathology slide.
12. Demonstrate the procedure for immunohistochemistry (IHC) and the interpretation of IHC slides under the microscope.

Affective Domain

By the end of this course, students should be able to

1. Adopt responsibility and adherence to ethical handling of tissue specimens and patient data
2. Adopt to implement safety protocols in the histopathology laboratory.
3. Appreciate the critical role of quality control in reagent and staining preparation and handling.
4. Compliance with SOPs for reagent preparation, tissue processing, and staining.

TABLE OF SPECIFICATIONS
HISTOTECHNIQUES 3(2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: INTRODUCTION TO HISTOTECHNIQUES										
1	Week-1	Introduction	Define Histo-techniques	C1			Interactive Lecture/SGD	2	MCQs	2
2		Lab Sections	Describe Histopathology laboratory sections	C2						
3		Histo-Techniques Steps	Discuss major steps in Histo-Techniques	C3						
4		Practical performance	Perform the procedure for preparing a 10% formaldehyde solution from the stock solution independently		P4		Demo	1	OSPE	1
5		SOPs compliance	Comply with SOPs of preparing 10% formaldehyde solution from the stock solution			A4	Role Play			
TOPIC: HISTOPATHOLOGY SPECIMEN RECEPTION										
6	Week-2	Introduction	Introduce Histopathology lab reception	C1			Interactive Lecture/SGD	2	MCQs	6
7		Specimen reception	Describe the structure and layout of Hiso-lab-reception	C2						
8		Specimen receiving	Explain the standard procedure for receiving biopsy samples	C3						
9		Practical performance	Calculate the fixative volume for different-size biopsies independently		P4		Demo	1	OSPE	2
10		SOPs compliance	Comply with SOPs for calculating the fixative volume according to biopsy size			A4	Role Play			
TOPIC: GROSS EXAMINATION										
11	Week-3	Introduction	Describe the grossing room or dissection area	C1			Interactive Lecture	2	MCQs	6
12		Modern dissection room	Discuss the structure and facilities in the modern gross room	C2						
13		Dissection Procedure	Explain the procedure for dissecting a tissue and selecting a suspected piece of tissue for testing	C3						
14		Tissue samples for different analysis	Discuss the procedures and protocols for sample collection for microbiological culture, molecular analysis, and cytogenetics	C3						
15		Practical performance	Perform the procedure of gross examination and tissue dissection under supervision		P4		Demo	1	OSPE	2
16		SOPs compliance	Comply with SOPs for gross examination and tissue dissection in the histopathology laboratory			A4	Role Play			
TOPIC: HISTOLOGICAL FIXATIVES										
17	Week-4	Definition	Define histological fixative	C1				2	MCQs/SEQs	6

18		Mechanism of action	Explain the mechanisms of action of various histological fixatives	C2			Interactive Lecture/SGD			
19		Classification	Discuss the different classifications of various histological fixatives	C2						
20		Preparation of fixatives	Explain the procedure for preparing common histopathological fixatives	C3						
21		Practical performance	Perform the procedure for preparing Formal Calcium Acute (10% Formalin) fixative independently		P4		Demo	1	OSPE	2
22		SOPs compliance	Comply with SOPs of 10% Formalin preparation			A4	Role Play			
TOPIC: FIXATION OF BIOPSY										
23	Week-5	Introduction	Define Fixation of biopsy	C1			Interactive Lecture/SGD	2	MCQs/SEQs	3
24		Methods	Describe different procedures used for fixations of biopsy	C2						
26		Procedure of fixation	Discuss the procedures of different methods of tissue fixations	C3						
27		Practical performance	Perform the procedure for fixing a small biopsy independently		P4		Demo	1	OSPE	1
28		SOPs compliance	Comply with SOPs for fixation of biopsy in histopathology laboratory			A4	Role Play			
TOPIC: DECALCIFICATION										
29	Week-6	Definition	Define decalcification	C1			Interactive Lecture/SGD	2	MCQs/SEQs	3
30		Types	Explain different types of decalcifiers used in the histopathology laboratory	C2						
31		Criteria for good decalcification	Describe the recommended criteria for effective calcification and the factors influencing the decalcification process	C3						
32		Procedure	Discuss in detail the procedure of decalcification of calcified tissues	C3						
33		Practical performance	Perform the procedure of the calcium oxalate test for decalcification independently		P4		Demo	1	OSPE	
34		SOPs compliance	Comply with SOPs for calcium oxalate test			A4	Role Play			
TOPIC: TISSUE PROCESSING (FIXATION, DEHYDRATION AND CLEARING)										
35	Week-7	Introduction	Define tissue processing	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
36		Methods	Describe different methods of tissue processing	C2						
37		Factors	Explain factors influencing tissue processing duration and overall quality	C2						
38		Tissue fixation and dehydration	Describe the procedure of tissue fixation and dehydration in the histopathology laboratory	C3						
39		Tissue clearing	Discuss the clearing agents and procedures involved in the clearing process during tissue processing in the histopathology laboratory	C3						

40		Practical performance	Perform the procedure of tissue fixation, dehydration, and clearing processing independently		P4		Demo	1	OSPE	1
41		SOPs compliance	Comply with SOPs for manel or automated tissue processing in the Histopathology Laboratory			A4	Role Play			
TOPIC: TISSUE PROCESSING (INFILTRATION AND TISSUE EMBEDDING)										
42	Week-8	Introduction	Define tissue Infiltration/impregnation and tissue embedding	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
43		Impregnation of tissue	Describe the procedure for tissue infiltration or impregnation	C2						
44		Tissue embedding	Discuss the standard procedure for tissue embedding	C3						
45		Practical performance	Perform the procedure of tissue infiltration and embedding independently		P4		Demo	1	OSPE	
46		SOPs compliance	Comply with SOPs for manual or automated tissue processing in the histopathology laboratory			A4	Role Play			
TOPIC: TISSUE EMBEDDING CENTER										
47	Week-9	Introduction	Define tissue embedding center	C1			Interactive Lecture/SGD	2	MCQs/SEQs	5
48		Different parts	Explain the different parts and their functions of the tissue embedding center	C2						
49		Operation	Describe the operation and maintenance of a tissue embedding center	C3						
50		Block formation	Describe the tissue orientation in a cassette and the block formation in a mold	C3						
51		Practical performance	Perform the procedure of tissue embedding or block formation independently		P4		Demo	1	OSPE	2
52		SOPs compliance	Comply with SOPs for the procedure of tissue embedding or block formation			A4	Role Play			
TOPIC: TISSUE SECTIONING TECHNIQUES										
53	Week-10	Introduction	Define tissue sectioning through microtome	C1			Interactive Lecture/SGD	2	MCQs/SEQs	7
54		Techniques	Discuss different techniques used for tissue sectioning	C2						
56		Procedure	Describe the procedure of Rotary Microtome sectioning techniques	C3						
57		Practical performance	Perform the procedure of tissue sectioning through simi automated rotary Microtome independently		P4		Demo	1	OSPE	2
58		SOPs compliance	Comply with SOPs for tissue sectioning through simi automated rotary Microtome			A4	Role Play			
TOPIC: MICROTOME AND CRYOSTAT										
59	Week-11	Introduction	Define Microtome	C1			Interactive Lecture/SGD	2	MCQs/SEQs	5
60		Types of Microtomes	Discuss different types of Microtomes used in Histopathology laboratory	C2						

61		Cryostat	Define a cryostat and explain its importance and utility	C2						
62		Rotatory Microtome types and parts	Discuss the different types of rotary microtomes, along with their parts and functions	C3						
63		Practical performance	Perform the procedure for cutting a 5 µm slice of paraffin-embedded tissue using a rotary microtome independently		P4		Demo	1	OSPE	2
64		SOPs compliance	Comply with SOPs for tissue sectioning through rotary Microtome			A4	Role Play			
TOPIC: FLOATING WATER BATH										
65	Week-12	Introduction	Define Floating water bath used in histopathology laboratory	C1			Interactive Lecture/SGD	2	MCQs/SEQs	4
66		Types	Discuss different types of floating water baths and their characteristics	C2						
67		Parts	Explain different parts and their functions of floating water bath in routine histopathology lab	C2						
68		Uses	Discuss the procedure for the smooth transfer of thin tissue sections, cut using a microtome, onto microscope slides	C3						
69		Practical performance	Perform the procedure for smoothly transferring thin tissue sections onto microscope slides independently		P4		Demo	1	OSPE	2
70		SOPs compliance	Comply with SOPs for the procedure of transferring thin tissue sections onto microscope slides			A4	Role Play			
TOPIC: HEMATOXYLIN AND EOSIN (H & E) STAIN AND MOUNTING										
71	Week-13	Introduction	Define histopathological staining's	C1			Interactive Lecture/CBL	2	MCQs/SEQs	7
72		Principle	Discuss H & E staining principle and their reagents	C2						
73		Reagents preparations	Explain H & E staining reagents preparation in histopathology lab	C3						
74		Procedure	Discuss H & E staining procedure and interpretation	C4						
75		Mounting	Explain the process of mounting, the types of mounting media, and the mounting procedure	C4						
76		Practical performance	Preform the procedure of H & E staining independently		P4		Demo	1	OSPE	2
77		SOPs compliance	Comply with SOPs for the procedure of H & E staining			A4	Role Play			
TOPIC: HISTOPATHOLOGY SPECIAL STAINS										
78	Week-14	Introduction	Define special stain in the histopathology laboratory	C1			Interactive Lecture/SGD	2	MCQs/SEQs	2
79		Types	Describe the different types of histopathological stains and their uses in a histopathological diagnosis	C2						
80		PAS staining	Discuss the principle of PAS staining and its uses in histopathological diagnosis	C3						
81		PAS staining procedure	Explain the procedure of H & E staining	C4						

82		Practical performance	Perform the procedure of PAS staining independently		P4		Demo	1	OSPE	1
83		SOPs compliance	Comply with SOPs for the procedure of PAS staining			A4	Role Play			
TOPIC: ZIEHL NILSON (ZN) AND GIEMSA STAINING										
84	Week-15	Introduction	Define ZN and Giemsa staining in histopathology	C1			Interactive Lecture/CBL	2	MCQs/SEQs	7
85		Principle and reagents	Explain the principle of ZN staining and its reagents	C2						
86		Principle and reagents	Explain the principle of Giemsa staining and its reagents	C2						
87		Procedure of ZN staining	Discuss the procedure of ZN staining and their interpretation in Histopathological diagnosis	C4						
88		Procedure of Giemsa staining	Discuss the procedure of ZN staining and their interpretation in Histopathological diagnosis	C4						
89		Practical performance	Perform the procedure of Giemsa staining independently		P4		Demo	1	OSPE	2
90		SOPs compliance	Comply with SOPs for the procedure of Giemsa staining			A4	Role Play			
TOPIC: IMMUNOHISTOCHEMISTRY (IHC)										
91	Week-16	Introduction	Define Immunohistochemistry	C1			Interactive Lecture/SGD	2	MCQs/SEQs	4
92		Principle	Describe the principle of immunohistochemistry	C2						
93		Importance	Discuss the importances of immunohistochemistry in diagnosis and prognosis of a disease	C3						
94		Procedure	Describe the procedure of immunohistochemistry and their interpretation	C4						
95		Practical performance	Examine the immunohistochemistry for positive and negative CD markers under the microscope independently		P4		Demo	1	OSPE	1
96		SOPs compliance	Comply with SOPs for the procedure of immunohistochemistry			A4	Role Play			

RECOMMENDED BOOKS

1. Theory and Practice of Histological Techniques, S. Kim Suvarna, Christopher Layton and John D. Bancroft, 8th edition 2019

2. Histotechnology A self-instructional text, Freida L Carson, 5th Edition 2020

3. Manual of Laboratory Medicine 6th edition, 2021

ASSESSMENT BREAKDOWN				
S. No	**TOPICS**	**No of MCQs**	**No of OSPE/OSCE STATIONS**	**STATIC/INTERACTIVE**
1	Introduction To Histo-Techniques	02	-	-
2	Histopathology Specimen Reception	02	01	Interactive
3	Gross Examination	03	01	Static
4	Histological Fixatives	04	-	-
5	Fixation Of Biopsy	04	01	Static
6	Decalcification	04	01	Static
7	Tissue Processing (Fixation, Dehydration and Clearing)	06	01	Static
8	Tissue Processing (Infiltration and Tissue Embedding)	06	01	Static
9	Tissue Embedding Center	04	01	Static
10	Tissue Sectioning Techniques	06	01	Static
11	Microtome And Cryostat	05	01	Interactive
12	Floating Water Bath	03	01	Static
13	Hematoxylin and Eosin (H & E) Stain and Mounting	06	01	Static
14	Histopathology Special Stains	05	01	Static
15	Ziehl Nilson (ZN) and Giemsa Staining	05	01	Static
16	Immunohistochemistry (IHCA)	05	01	Interactive
	Total	**70**	**14**	

THE END