LIAQUAT NATIONAL HOSPITAL AND MEDICAL COLLEGE

Institute for Postgraduate Medical Studies & Health Science

Blood-1 Module

15th April 2024 TO 11th May 2024

STUDY GUIDE FOR BLOOD-1 MODULE

Module name: **Blood-1** *Year:* ***One*** *Duration:* ***4 weeks (April to May 2024)***

Timetable hours: **Lectures, Case-Based Learning (CBL), Self-Directed Learning, Team-Based Learning, Practical, Skills sessions, Demonstrations**

MODULE INTEGRATED COMMITTEE

MODULE COORDINATOR:	• Prof. Faiza Waseem (**Biochemistry**)
CO-COORDINATOR:	• Dr. Fatima Rehman (**Anatomy**)

DEPARTMENTS & RESOURCE PERSONS' FACILITATING LEARNING

BASIC HEALTH SCIENCES	CLINICAL AND ANCILLARY DEPARTMENTS
ANATOMY Professor Zia-ul-Islam	***FAMILY MEDICINE*** Dr. Rabeeya Saeed
BIOCHEMISTRY Prof. Faiza Waseem	***HAEMATOLOGY*** Dr. Naila Raza
COMMUNITY MEDICINE Dr. Saima Zainab	
PATHOLOGY Professor Naveen Faridi	
PHYSIOLOGY Professor Syed Hafeezul Hassan	
FACULTY RESPONSIBLE FOR THE FACILITATION OF LEARNING. • Prof. Sobia Ali • Prof. Nighat Huda • Dr. Afifa Tabassum • Dr. Muhammad Ahsan • Dr. Yusra Nasir	
LNH&MC MANAGEMENT Professor KU Makki, Principal LNH&MC Dr. Shaheena Akbani, Director A.A & R.T LNH&MC	
STUDY GUIDE COMPILED BY: Department of Health Professions Education	

INTRODUCTION

WHAT IS A STUDY GUIDE?

It is an aid to:

- Inform students how the student learning program of the module has been organized
- Help students organize and manage their studies throughout the module
- Guide students on assessment methods, rules, and regulations

THE STUDY GUIDE:

- Communicates information on the organization and management of the module. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as Interactive Lectures, small group teachings, clinical skills, demonstrations, tutorials, and case-based learning that will be implemented to achieve the module objectives.
- Provides a list of learning resources such as books, computer-assisted learning programs, web- links, and journals, for students to consult to maximize their learning.
- Highlights information on the contribution of continuous and module examinations on the student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's achievement of objectives.
- Focuses on information about examination policy, rules, and regulations.

CURRICULUM FRAMEWORK

Students will experience an integrated curriculum similar to previous modules**.**

INTEGRATED CURRICULUM comprises system-based modules such as Foundation II, Blood II, Locomotor II, Respiratory system-II, CVS-II, and GIT Liver II which links basic science knowledge to clinical problems. Integrated teaching means that subjects are presented as a meaningful whole. Students will be able to have a better understanding of basic sciences when they repeatedly learn about clinical examples.

LEARNING EXPERIENCES: Case-based integrated discussions, and skills acquisition in the skills lab. Computer-based assignments, learning experiences in clinics, wards, and outreach centers

INTEGRATING DISCIPLINES OF FOUNDATION MODULE-

LEARNING METHODOLOGIES

The following teaching/learning methods are used to promote better understanding:

- Interactive Lectures
- Tutorial
- Case- Based Learning (CBL)
- Clinical Experiences
  - Clinical Rotations
- Skills session
- Self-Directed Learning

INTERACTIVE LECTURES: In a large group, the Interactive Lectures introduce a topic or common clinical conditions and explains the underlying phenomena through questions, pictures, videos of patients' interviews, exercises, etc. Students are actively involved in the learning process.

TUTORIAL: This format helps students to clarify concepts, and acquire skills or desired attitudes. Sessions are structured with the help of specific exercises such as patient cases, interviews, or discussion topics. Students exchange opinions and apply knowledge gained from Interactive Lectures, tutorials, and self-study. The facilitator's role is to ask probing questions, summarize, or rephrase to help clarify concepts.

CASE-BASED LEARNING (CBL): A small group discussion format where learning is focused on a series of questions based on a clinical scenario. Students discuss and answer the questions by applying relevant knowledge gained previously in clinical and basic health sciences during the module and constructing new knowledge. The CBIL will be provided by the concerned department.

- **CLINICAL LEARNING EXPERIENCES:** In small groups, students observe patients with signs and symptoms in hospital wards, clinics, and outreach centers. This helps students relate knowledge of the module's basic and clinical sciences and prepare **CLINICAL ROTATIONS:** In small groups, students rotate in different wards like Medicine, Pediatrics, Surgery, Obs & Gyne, ENT, Eye, Family Medicine clinics, outreach centers & Community

Medicine experiences. Here students observe patients, take histories and perform supervised clinical examinations in outpatient and inpatient settings. They also get an opportunity to observe medical personnel working as a team. These rotations help students relate basic medical and clinical knowledge in diverse clinical areas.

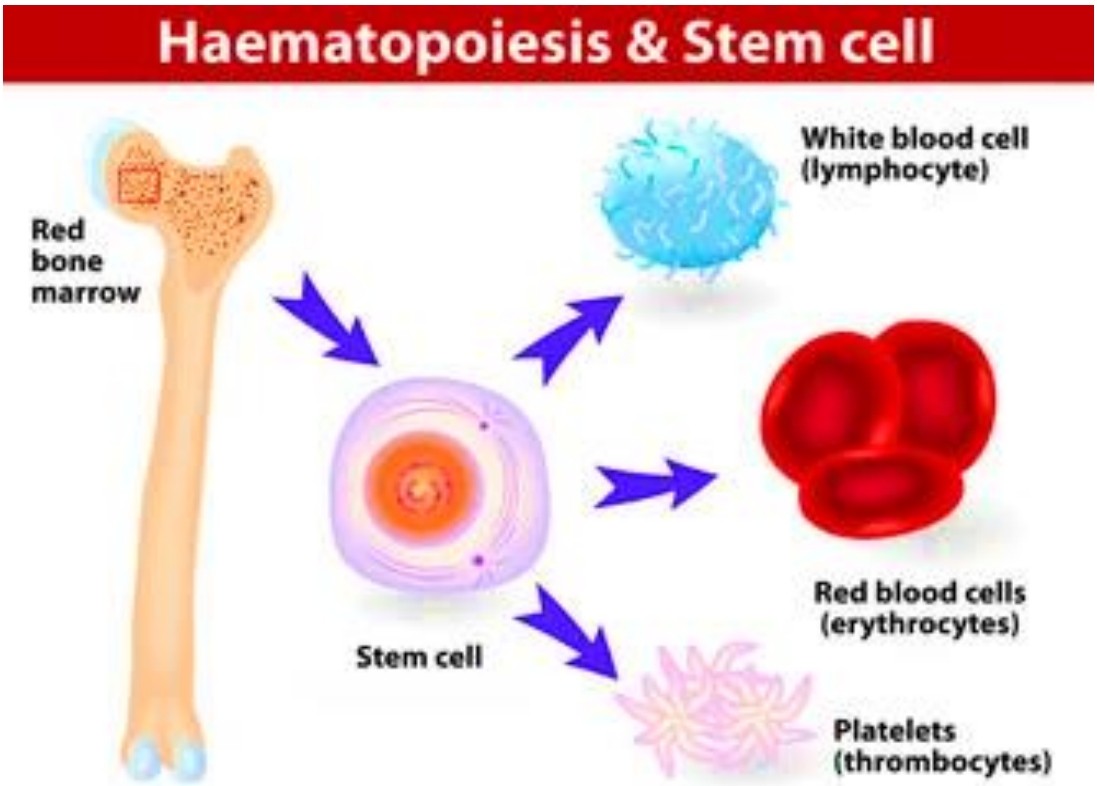
SKILLS SESSION: Skills relevant to the respective module are observed and practiced where applicable in the skills laboratory.

SELF-DIRECTED LEARNING Students assume responsibilities for their learning through individual study, sharing and discussing with peers, and seeking information from Learning Resource Center, teachers, and resource persons within and outside the college. Students can utilize the time within the college's scheduled hours of self-study.

MODULE 2: BLOOD-1

INTRODUCTION

This module aims to provide an overview of the hematological system and a basic understanding of hematopoiesis and hemostasis at the molecular level. The module will give the 1st year medical students, an opportunity to know the presentations of common hematological, immunological, and inflammatory disorders. Overall, it will provide the students with the necessary factual knowledge and stimulate them to apply this in the interpretation of the disease.



COURSE OBJECTIVES AND STRATEGIES

At the end of the module, the students will be able to:

ANATOMY

OBJECTIVES	LEARNING STRATEGY
HISTOLOGY	Interactive Lecture/ SGD/ Practical
1. Lymphoid tissue, Immune system, and Thymus	
• List the components of the immune system and lymphoid tissue	
• Differentiate between central lymphoid organs and peripheral lymphoid organs	
• Describe the structure of lymph nodes	
• Describe the structure and histological appearance of the thymus	
• Discuss the clinical anatomy of lymphoid organs	
2. Histology of Lymph Nodes and Thymus	Interactive Lecture/ SGD/ Practical
• Enumerate lymphoid organs	
• Discuss briefly the microscopic structure of lymphoid tissue	
• Describe the structure and histological features of lymph nodes	
• Describe the structure and histological features of the thymus	
3. Histology of Spleen and Tonsils	Interactive Lecture/ SGD/ Practical
• Define the structure and location of tonsils and spleen	
• Describe histological features of tonsils and spleen	
EMBRYOLOGY	Interactive Lecture/ Small Group Discussion
4. Development of blood	
• Define hematopoiesis	
• List the sites and sources of hematopoiesis before and after birth	

BIOCHEMISTRY

OBJECTIVES	LEARNING STRATEGY
HEMOGLOBIN	Interactive Lecture
1. Structure and types of Hemoglobin	
• Explain the structure of hemoglobin	
• Describe the types of hemoglobin	
• Discuss the biochemical function of hemoglobin	
• Discuss the clinical significance of hemoglobin	
2. Oxygen dissociation curves of Hemoglobin	Interactive Lecture
• Explain the biochemical basis of the oxygen dissociation curve	
• Describe the oxygen dissociation curve for Hemoglobin	

• Describe the oxygen dissociation curve for Myoglobin	
• Describe the factors affecting the binding of oxygen with hemoglobin	
• Describe the allosteric effectors of the Oxygen dissociation curve	
• Explain the transportation of oxygen and carbon dioxide through hemoglobin	
3. Abnormalities of Hemoglobin synthesis and degradation	Interactive Lecture
• Explain the pathway of hemoglobin synthesis and degradation	
• List the abnormalities of Hemoglobin synthesis	
• Classify Porphyria	
• Discuss Porphyria	
4. Hemoglobinopathies	TBL
• Enumerate the Hemoglobinopathies	
• Explain the biochemical, genetic, and clinical significance of Thalassemia	
• Explain the biochemical, genetic, and clinical significance of Sickle cell anemia	
VITAMINS & MINERALS	Interactive Lecture
5. Iron metabolism	
• Discuss Iron metabolism in the body with its abnormalities	
• Describe the biochemical functions, dietary sources, recommended daily intake, and distribution of iron in the body	
• Explain the mechanism of absorption, transport, storage, and elimination of iron	
• Discuss the clinical significance of Iron deficiency and Iron overload	
6. Vitamin B12 & Folic acid	Interactive Lecture
• Discuss the factors regulating Erythropoiesis	
• Discuss Vitamin B12 and Folic acid metabolism in the body	
• Describe the biochemical functions, dietary sources, and recommended daily intake of Vitamin B12 and Folic acid	
• Discuss the clinical significance of Vitamin B12 and Folic acid deficiency	
7. Vitamins E & K	Interactive Lecture
• Discuss metabolism of Vitamin E & Vitamin K in the body	
• Describe the biochemical functions, dietary sources, and recommended daily intake of Vitamin E & Vitamin K	
• Discuss the clinical significance of Vitamin E & Vitamin K deficiency	
PLASMA PROTEINS	Interactive Lecture
8. Plasma Proteins	
• Explain the composition of plasma and plasma proteins	
• Explain the difference between plasma and serum	
• Discuss the separation techniques of plasma proteins	
• Describe the individual plasma proteins and their biological functions	
• Discuss the clinical abnormalities related to plasma proteins	
9. Immunoglobulins	Interactive Lecture
• Classify immunoglobulins	
• Differentiate between immunoglobulins and antibodies	
• Describe the chemical structure & biochemical functions of immunoglobulins	

• Discuss the clinical significance of immune deficiency diseases	
10. Porphyria & Hemoglobinopathies	Interactive Lecture
• Discuss the clinical importance of Porphyria & Hemoglobinopathies	
• Interpret clinical conditions correlated with their laboratory investigations	
11. Plasma Proteins	Interactive Lecture
• Discuss the clinical importance of plasma proteins	
• Interpret clinical conditions correlated with their laboratory investigations	
12. Anemia	Case-based Learning/ Tutorial
• Discuss the clinical importance of vitamins & minerals in relation to Anemia	
• Interpret clinical conditions correlated with their laboratory investigations	
13. Specimen collection	Practical/ Small Group Discussion
• Discuss the samples used for biochemical analysis	
• Demonstrate the uses of the blood collection tubes	
• Observe the collection of blood specimens for biochemical analysis	
• Separate plasma from a blood sample	
• Separate serum from a blood sample	
• Correlate the laboratory investigations with relevant clinical conditions	
14. Spectrophotometry	Practical/ Small Group Discussion
• Explain the principle of Spectrophotometry	
• Demonstrate the technique of Spectrophotometry	
• Illustrate the parts of a Spectrophotometer	
• Explain the significance of making a blank solution	
• Explain the significance of transmittance and optical density	
• Calculate the concentration of the analyte in the sample	
• Perform analysis of an analyte in the sample by Spectrophotometry	
• Correlate the laboratory investigations with relevant clinical conditions	
15. Flame Photometry	Practical/ Small Group Discussion
• Explain the principle and technique of Flame Photometry	
• Explain the significance of using de-ionized water in Flame Photometry	
• Calculate the concentration of the analyte in the sample	
• Demonstrate the use of a Flame photometer	
• Correlate the laboratory investigations with relevant clinical conditions	
16. Estimation of Plasma Proteins	Practical/ Small Group Discussion
• Interpret the plasma protein levels in different diseases	
• Estimate the plasma protein levels by Spectrophotometry using the Kit Method	
• Correlate the laboratory investigations with relevant clinical conditions	
17. Electrophoresis	Practical/ Small Group Discussion
• Explain the principle of electrophoresis	
• Demonstrate the technique of electrophoresis	
• Discuss the applications of electrophoresis	

• Correlate the laboratory investigations with relevant clinical conditions	
18. ELISA	Practical/ Small Group Discussion
• Explain the principle of ELISA	
• Demonstrate the technique of ELISA	
• Discuss the applications of ELISA	
• Correlate the laboratory investigations with relevant clinical conditions	
19. Biochemical Parameters in Covid 19	Case-Based Learning
• Identify the type of coronavirus and its transmission	
• Identify the various diagnostic markers of Covid infection and their biochemical basis	
• Describe the basic mechanism in various biochemical parameters during covid infection	

COMMUNITY MEDICINE

OBJECTIVES	LEARNING STRATEGY
Epidemiology of Nutritional Anemia	Interactive Lecture
• Discuss the prevalence of nutritional anemia	
• Identify the risk factors of nutritional anemia	
• Discuss the prevention of nutritional anemia	

FAMILY MEDICINE

OBJECTIVES	LEARNING STRATEGY
Clinical Assessment of Anemia	Small Group Discussion/ Practical
• Evaluate a patient with anemia based on detailed history.	
• Describe the common clinical presentation of various types of anemia.	
• Interpret the common lab findings of anemia (CBC, peripheral film).	

HEMATOLOGY

OBJECTIVES	LEARNING STRATEGY
1. Clinical Presentation of Thrombocytopenia	Interactive Lecture
• Define purpura, patachae and ecchymosis	
• Describe the pattern of bleeding in thrombocytopenia	
• Describe the common presentation of patients with bleeding disorders	
2. Interpretation of CBC Report	Small Group Discussion
• Discuss the common parameters calculated by CBC.	
• Describe the common conditions associated with changes in cell counts.	

• Differentiate between different types of anemias based on morphology.	
3. Introduction to Transfusion Medicine	Interactive Lecture
• Describe the significance of voluntary blood donation.	
• Define ABO and Rh blood groups based on antigens and antibodies	
• Discuss common complications of transfusion	
4. Genetic Markers in Blood Disorders	Interactive Lecture
• Describe the role of genetic testing in the diagnosis of common hematological disorders	
• Differentiate between different genetic tests; cytogenetics, FISH and PCR	

PATHOLOGY

OBJECTIVES	LEARNING STRATEGY
Introduction to Inflammation	Interactive Lecture
• Define Inflammation	
• Discuss types of inflammation	
• Difference between acute & chronic inflammation	
• Discuss the cardinal signs of inflammation	

PHYSIOLOGY

OBJECTIVES	LEARNING STRATEGY
1. Components of blood & its cellular components	Interactive Lecture/ Tutorial
• Enumerate the functions of the cellular components of blood	
• State the normal values of RBCs, WBCs & platelets	
• Define hematocrit, normal values & factors affecting hematocrit	
2. Formation and development of RBCs (erythropoiesis)	Interactive Lecture
• Discuss the different stages of RBCs formation	
• List the factors that are necessary for erythropoiesis	
• Discuss the significance of reticulocyte count	
• Discuss the role of Erythropoietin	
3. Classification of anemia and significance of red cell indices	
• Describe the morphological & etiological classification of anemia	
• Discuss the significance of red cell indices and their normal values	
4. Hemolytic anemias (Intracorpuscular and extracorpuscular causes)	Case-Based Learning
• Discuss the types of hemolytic anemia viz	

a) Hereditary spherocytosis	
b) G6PD deficiency	
c) Sickle cell anemia	
d) Erythroblastosis fetalis	
5. Megaloblastic /Iron, B12, Folic acid deficiency anemia	Interactive Lecture
• Discuss the etiology & microscopic features of megaloblastic and iron deficiency anemia	
• Differentiate between megaloblastic & pernicious anemia based on microscopic features and red cell indices	
6. Blood groups ABO/RH system	Interactive Lecture/ Tutorial
• Explain the ABO (classical) and Rh blood grouping systems & their inheritance pattern	
• Define agglutinogen, agglutinin & agglutination	
• List various Rh antigens & Rh immune response	
• Name the transfusion reactions associated with mismatched blood transfusion	
7. Polycythemia	Case-Based Learning
• Define the types of polycythemia	
• Explain the effects of polycythemia on the human body	
8 Hemostasis & role of Thrombocytes	Interactive Lecture
• Describe the events in Hemostasis	
• Explain the mechanism of the formation of platelet plug	
• Describe the role of Prothrombin in blood coagulation and clot formation	
9. Clotting cascade & bleeding disorders	Interactive Lecture/ Tutorial
• Explain intrinsic and extrinsic pathways for coagulation	
• Enumerate the clotting factors	
• Describe the role of clotting factors in the coagulation	
10. Fibrinolytic mechanisms	Interactive Lecture
• Explain the fibrinolytic mechanism and the role of plasmin in the lysis of blood clots	
• Discuss the role of fibrin & anti-thrombin III in anticoagulation	
11. Hemorrhagic & thromboembolic conditions	Interactive Lecture
• Explain the following hemorrhagic and Thrombo-embolic conditions	
a) Hemophilia	
b) Thrombocytopenia	
c) Disseminated Intravascular Coagulation	
• Discuss the role of commonly used anticoagulants	
12. Genesis and general characteristics of white blood cells	Interactive Lecture
• Describe the process of leukocyte genesis	
• List the types of granulocytes and agranulocytes, their functions & normal values	
13. Functions of WBCs, Monocytes macrophage cell system	Interactive Lecture
• Explain the significance of the Reticuloendothelial system in the body's defense mechanism	
• List the various types of macrophages present in different tissues of the body	
• Discuss the role of passive immunity against infection	
14. Types and functions of lymphocytes	Interactive Lecture/ Tutorial
• List the types of lymphocytes and their sites of origin	
• Discuss the functions of T and B lymphocytes	
• Enumerate the types of T lymphocytes & their functions	

15. Immunity & its types (Innate)	Interactive Lecture
• Define immunity	
• Classify immunity	
• Describe the process of innate immunity	
16. Cell-mediated Immunity	Interactive Lecture
• Define cell-mediated immunity	
• List the cells involved in this immunity type	
• Describe the process of cell-mediated immunity	
17. Humoral immunity	Interactive Lecture
• Define Humoral immunity	
• List the cells involved in this immunity type	
• Describe the process of humoral-mediated immunity	
• List the advantages of this type of immunity	
18. Passive immunity and immunization	Interactive Lecture
• Define passive immunity & immunization	
• Differentiate between passive and active immunity	
• Describe the process of immunization and its advantages	
• Explain the Expanded Program on Immunization (EPI)	
19. Allergy and hypersensitivity	Interactive Lecture
• Discuss the types of hypersensitivity and allergic reactions including Urticaria, Anaphylaxis, and Hay fever	
• Discuss the role of IgE antibodies in immunity	
20. Peripheral Blood Film	Practical/ Small Group Discussion
• Explain the phlebotomy (venipuncture) procedure	
• Discuss the procedure of blood sampling and its main constituents	
• Enumerate Aseptic measures	
• Mention the steps of formation of thin blood smear/film	
21. Blood grouping & Cross-matching	Practical/ SGD
• Identify blood group by the use of antisera	
• Mention different types of blood groups	
• Describe ABO (classical) & Rhesus blood grouping system	
• Explain the causative mechanism of Erythroblastosis Fetalis	
• Discuss the significance of Blood Grouping & Cross Matching	
22. Bleeding time and Clotting time	Practical/ SGD
• Define bleeding time and its normal value	
• Describe Duke's and Ivy's methods of measuring bleeding time	
• List the conditions in which bleeding time is prolonged	
• Define clotting time and its normal value	
• Describe the Capillary tube and Modified Lee methods of measuring clotting time	
• List the conditions in which clotting time is prolonged	
23. Differential Leukocyte Count (DLC)	Practical / SGD
• List different types of WBCs and their normal values	
• Discuss the composition of Leishman's stain & its significance	

• Explain the methods of counting WBCs	
24. Erythrocyte Sedimentation Rate (ESR)	Practical/ Small Group Discussion
• Describe the mechanism of rouleaux formation	
• Explain the methods of determination of ESR (Westergren's & Wint robe's method)	
• Mention the normal value of ESR in males & females and its significance	

LEARNING RESOURCES

SUBJECT	*RESOURCES*
ANATOMY	**A. GROSS ANATOMY** 1. K.L. Moore, Clinically Oriented Anatomy 2. Neuro Anatomy by Richard Snell 3. https://www.kenhub.com/en/dashboard **B. HISTOLOGY** 1. B. Young J. W. Health Wheather's Functional Histology **C. EMBRYOLOGY** 1. KeithL. Moore.The Developing Human 2. Langman's Medical Embryology
BIOCHEMISTRY	**A. TEXTBOOKS** 1. Harper's Illustrated Biochemistry 2. Lehninger Principle of Biochemistry 3. Biochemistry by Devlin
PHYSIOLOGY	**A. TEXTBOOKS** 1. Textbook Of Medical Physiology by Guyton And Hall 2. Ganong'S Review of Medical Physiology 3. Human Physiology by Lauralee Sherwood 4. Berne & Levy Physiology 5. Best & Taylor Physiological Basis of Medical Practice **B. REFERENCE BOOKS** 1. Guyton & Hall Physiological Review 2. Essentials Of Medical Physiology by Jaypee 3. Textbook Of Medical Physiology by Indu Khurana 4. Short Textbook Of Physiology by Arthur 5. NMS Physiology

ASSESSMENT METHODS:

- MCQs (Multiple Choice Questions)
- **Objective Structured Practical/Clinical Examination (OSPE or OSCE)**
- MCQs and unobserved OSPE will be conducted on the LNH&MC Moodle platform
- Observed OSPE will constitute multiple examiner-based stations

Internal Evaluation

- Students will be assessed comprehensively through multiple methods.
- 20% marks of internal evaluation will be added to JSMU final exam. That 20% includes mid-module & end of module examinations, mid-term & pre-professional examinations.

Formative Assessment

Individual departments may hold quizzes or short answer questions to help students assess their learning. The marks obtained are not included in the internal evaluation

For JSMU Examination Policy, please consult the JSMU website!

More than 75% attendance is needed to sit for the internal and final examinations

LNH&MC EXAMINATION RULES & REGULATIONS

- Students must report to the examination hall/venue, 30 minutes before the exam.
- **The exam will begin sharply at the given time.**
- No student will be allowed to enter the examination hall after 15 minutes of the scheduled examination time.
- Students must sit according to their roll numbers mentioned on the seats.
- **Cell phones are strictly not allowed in the examination hall.**
- If any student is found with a cell phone in any mode (silent, switched off, or on) he/she will not be allowed to continue their exam.
- No students will be allowed to sit in the exam without University Admit Card, LNMC College ID Card, and Lab Coat
- Students must bring the following stationary items for the exam: Pen, Pencil, Eraser, and Sharpener.
- Indiscipline in the exam hall/venue is not acceptable. Students must not possess any written material or communicate with their fellow students.

SCHEDULE:

WEEKS	1ST YEAR	MONTH
WEEK 1	FOUNDATION MODULE	14th February 2024
WEEK 2		
WEEK 3		
WEEK 4		
WEEK 5		
WEEK 6		
WEEK 7		3rd April 2024
WEEK 1	BLOOD MODULE	15th April 2024
WEEK 2		
WEEK 3		
WEEK 4		11th May 2024
Mid-Term Exam*		

*Final dates will be announced later