

Dow University of Health Sciences

HEMATOLOGY- I MODULE STUDY GUIDE 2023 First Year MBBS



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INTRODUCTION

WHAT IS A STUDY GUIDE?

A study guide provides a focus for different educational activities in which the students are engaged. It equips students with information on the topic of study and assists in management of student learning. Furthermore, it imparts relevant information about the organization of the module and thus helps students organize their educational activities accordingly. Another important purpose of a study guide is the dissemination of information about rules and policies and teaching and assessment methods.

HOW DOES A STUDY GUIDE HELP LEARNERS?

- Includes information on organization and management of the module.
- Advises the learners about representatives (from various departments) who can be contacted in case of need.
- Defines the objectives which are expected to be achieved at the end of the module.
- Elaborates the learning strategies which will be implemented during the module.
- Informs learners about the learning resources in order to maximize their learning.
- Provides information on the assessment methods that will be held to determine every student's achievement of objectives.

CURRICULUM MODEL:

Integrated modular curriculum is followed at Dow University of Health Sciences for MBBS program. This implies that instead of studying basic and clinical sciences separate and apart, students will experience a balanced and integrated combination of basic and clinical sciences in the form of a system –based modules.

The modular curriculum followed by Dow University of Health Sciences is integrated both in the vertical and the horizontal directions. However, in order to prepare the students for clinical teaching with a sound background knowledge of the basic sciences, the curriculum has been divided in three spirals.

The three spirals are:

1. Spiral -1 Basic Sciences
2. Spiral -2 Clinical Sciences
3. Spiral -3 Integrated Supervised Practical Training

The Basic Sciences Spiral is spread over the first two years and clinical sciences spiral is distributed

over the next two years. In the final year students are given practical hands on training in the role similar to that of a shadow house officer. They are encouraged to refer to the theoretical teaching of the first four years for their practical training. The whole curriculum is divided into modules, each module being related to a particular system for example. Cardiovascular 1 module is in the Basic Sciences Spiral and Cardiovascular 2 module is in the Clinical Sciences Spiral.

TEACHING & LEARNING METHODOLOGIES:

The following teaching/ learning methods may be used to facilitate the learning process:

1. **Interactive Lectures:** Lectures are considered as an efficient means of transferring knowledge to large audiences.
2. **Small Group Discussion:** Small group discussion such as case- based learning (CBL) is a form of and interactive learning which helps students develop discussion skills and critical thinking.
3. **Practical:** Practical related to Basic Sciences are held to facilitate student learning.
4. **Skills:** Skills sessions are scheduled parallel with various modules at fully equipped skills lab in which students observe and learn skills relevant to the respective modules.
5. **Self-Directed Learning:** Students have a measure of control over their own learning. They diagnose their needs, set objectives in accordance to their specific needs, identify resources and adjust their pace of learning

5 YEAR CURRICULAR ORGANIZATION

Spiral	year	Modules				
First Spiral	I	FND1- Foundation Cell, Genetics & Cell Death (Basics of Anatomy, Physiology, Biochemistry, Gen. Pathology, Gen. Pharmacology, Community Medicine & Behavioral Sciences, 9 Weeks		HEM1- Blood Module Immunity, Inflammation, Tissue repair, Antimicrobials & Neoplasia 9 Week		
		LCM1- Locomotion Bones, Joints, Nerves & Muscles, 9weeks		RSP1- Respiratory	CVS1- Cardiovascular	
	II	NEU1- Nervous System 8 weeks		HNN1- Head & Neck &	END1- Endocrinology	
		GIL 1-GIT and Liver 8 weeks		EXC1- Renal and Excretory	REP1- Reproductive System 5 weeks	
Second Spiral	III	Foundation 2 2 wks	IDD 1- Infectious diseases 6 weeks	HEM2- Hematology 5 weeks	RSP2- Respiratory System 5 weeks	CVS2- Cardiovascular System 4 weeks
		GIL 2-GIT and Liver (including Nutritional Disorders) 8weeks		EXC2- Renal & Excretory System 4 weeks	END2- Endocrinology 5 weeks	
	IV	ORT2- Orthopedics, Rheumatology, Trauma 7 weeks		PMR-Physical Medicine & Rehabilitation DPS-Dermatology Plastic Surgery / Burns		REP2- Reproductive System 8 Weeks
		NEU2- Neurosciences and Psychiatry 8 weeks		ENT* 4 weeks	OPHTHALMOLOG Y/EYE 4 weeks	
Third Spiral	V	Clinical Rotation 9:45 to 3:00 (with Ambulatory, Emergency, Intensive care) In Medicine, Pediatrics, Cardiology and Neurology units <ul style="list-style-type: none"> ▪ Lecture on problem-based approach, twice a week ▪ Ward tutorial twice a week ▪ Student research presentation once a week 			Clinical Rotation 9:45 to 3:00 (Inpatient, Ambulatory, Emergency, Intensive care and Operation Theatres) In Surgery, Gynecology & Obstetrics, Orthopedics and Neurosurgery. <ul style="list-style-type: none"> ▪ Lecture on problem based approach, twice a week ▪ Ward tutorial twice a week ▪ Student research presentation once a week 	

OVERVIEW

Program	MBBS	
Year	One	
Module Title	Hematology	
Module Code	HEM-1	
Duration	8 weeks	
Contact Hours	Anatomy	8.5
	Biochemistry	17.5
	Physiology	36
	Pathology	50
	Pharmacology	7
	Community medicine	16.5
	Behavioral Sciences	3
	Medicine	4
	CBL	7.5
	Skill Lab	4.5
Total Hours	Hematology Module	154.5

Chart Title



- Anatomy
- Biochemistry
- Physiology
- Pathology
- Pharmacology
- Community medicine
- Behavioral Sciences
- Medicine
- CBL
- Skill Lab

INTEGRATED MODULE COMMITTEE

RESPONSIBILITIES	NAMES	DESIGNATION	EMAILS
Chairperson Curriculum Review Committee & Chief Module coordinator	Prof Naheed Khan	Chairperson & Professor Anatomy	naheed.khan@duhs.edu.pk
Coordinator	Dr. Sabahat Babar		sabahat.babar@duhs.edu.pk
Co-coordinators	Dr Afshan Mehboob		afshan.khan@duhs.edu.pk
Department	RESOURCE PERSON	DESIGNATION	EMAILS
Medical education	Dr Munizha Nisar	Medical Simulation Facilitator	munizha.nisar@duhs.edu.pk
	Dr Nooreen Adnan	Senior Lecturer	nooreen.adnan@duhs.edu.pk

MODULE DESCRIPTION:

This module has been designed for students to introduce them to the basic concepts of Hematology. This module includes Gross anatomy, Histology, Embryology, Physiology, Biochemistry, Microbiology Pathology, Pharmacology, Medicine, Behavioral sciences and Community medicine.

Lectures, tutorials, small group sessions including CBL and practical are important components of this module. Clinical skills such as administering medication through different routes and venipuncture is included in this module. You will be able to develop problem solving skills to apply your medical knowledge to practical situations by means of group and individual tasks. This study guide has been developed to assist you and keep you focused to achieve your goals.

Welcome to the Hematology module and it is hoped that students will be able to achieve the desired module learning outcomes.

RATIONALE:

A student stepping into a medical school requires knowledge of blood, immunity and inflammation as it is very essential, because blood is responsible for the supply of micro-nutrients and Oxygen delivery to the tissues, maintenance of homeostasis, body responses and defense mechanisms against injurious agents and various diseases encountered in daily life. This will eventually lead to develop critical thinking for integration and application of basic knowledge for clinical application.

LEARNING OUTCOMES:

- Describe the composition of blood in relation to its biochemistry and physiology
- Describe the basic concepts of hemodynamic disorders.
- Classify different types of anemia on the basis of its pathophysiology
- Recognize ABO/RH blood grouping system
- Practice history taking of a patient presented with blood disorders
- Explain hemostasis and thrombolysis.
- Explain the process of hematogenesis and describe major red cell disorders.
- Describe pathophysiology of bleeding and coagulation disorders & identify their different types.
- Describe the pharmacology of drugs used in anemia and bleeding disorders.
- Describe immunology on the basis of its pathophysiology.
- Differentiate between Acute & chronic inflammation and the pathophysiology involved in the process.
- Explain the phenomenon of immunity, inflammatory response and their role in protecting the body against different injuries and infections.
- Describe the process of cell division, tissue repair and regeneration.
- Describe Mendelian disorders.
- Differentiate between different types of Hypersensitivity reactions.
- Describe the mechanism of Autoimmune and immunodeficiency disorders.
- Define Neoplasia and describe its related pathophysiology.
- Describe the basis of diagnosis of cancers and its therapy.
- Explain the basics of sterilization and disinfection and bacterial, parasitic and serological lab diagnosis with examples.

DISCIPLINE-WISE LEARNING OBJECTIVES AND CONTENTS**PHYSIOLOGY****Learning Objectives:**

- Characterize blood as connective tissue composed of formed elements, plasma, and solutes.
- Explain the triggers and process of erythropoiesis along with destruction and recycling of erythrocyte
- Discuss the structure and function of hemoglobin, its dietary sources, daily iron requirement, iron metabolism (absorption, transport, storage, excretion), iron-related disorders, and hemoglobin recycling.
- Classify different types of anemia based on their pathophysiology, and define the blood indices (MCV, MCH, MCHC) explaining how they are calculated.
- Summarize hematological changes, causes, and investigations in iron deficiency, as well as hepcidin's role in chronic inflammation-related anemia. Also, distinguish between beta-thalassemia and alpha-thalassemia.
- Discuss hemoglobin S-induced sickling, its symptoms, and therapeutic strategies. Also, cover aplastic anemia diagnosis and management, B12/folate metabolism's role in hematopoiesis, and macrocytosis causes.
- Learn about the ways in which anemia reduces cardiac output, how the cardiovascular system adapts to anemia, and how anemia can lead to heart failure.
- Differentiate between absolute and pseudo-polycythemia, listing primary and secondary causes of polycythemia. Additionally, explain cellular oxygen sensing mechanisms and the factors leading to elevated erythropoietin levels.
- Discuss white blood cell structure, functions, production, and the roles of various immune cells, along with the differential white blood cell count and potential diagnoses for neutrophil leukocytosis and eosinophilia.
- Illustrate the signs, symptoms, and stages of inflammation, emphasize the significance of emigration, chemotaxis, and phagocytosis in countering bacterial invaders, and differentiate between the functions of natural killer cells and phagocytes.
- Define leukopenia, leukocytosis, leukemia, and AIDS, compare leukocytosis and leukopenia, and explain their causes, pathophysiology, clinical features, and the concept of a leukemoid reaction with specific triggers.
- Define and classify immunity (cellular and humoral), compare innate and adaptive immunity (response time, specificity, memory, location), and describe innate immunity components
- Define antigen, antibody, opsonization, and clones; describe antibody structure and function; explain the complement cascade; and distinguish primary from secondary infection responses
- Outline the cell-mediated immune response steps, including the functions of helper, cytotoxic, and memory T cells and CD4/CD8 proteins. Explain antigen recognition by B and T lymphocytes and briefly compare class I and class II MHC molecules.
- Explain the development of self-recognition, self-tolerance, and the concepts of positive selection, negative selection, and anergy in immune response regulation.
- Define allergy, hypersensitivity, and autoimmunity, classify hypersensitivity reactions, and compare antibody and T lymphocyte roles, distinguishing them from immunity.
- Name the four major ABO blood types, two natural antibodies, and define Landsteiner's law; differentiate the antibodies in each ABO type and explain their importance in transfusion therapy.
- Assess newborn hemolytic disease risk based on Rh phenotypes, explain anti-Rh IgG antibody roles, and contrast placental crossing with anti-A and anti-B antibodies.
- Emphasize the importance of blood grouping and cross-matching in transfusions, explain precautions, define hemolysis, and discuss its risk post-mismatched transfusion
- Define hemostasis and elucidate its steps, including platelet structure, function, origin, and the processes of vascular spasm and platelet plug formation.
- Explain blood coagulation pathways, vitamin K-dependent factor modifications, and the roles of cofactors V and VIII in coagulation

- Detail the prevention of clotting in normal vessels, enzymes, and blockers of fibrinolysis, activation of fibrinolysis at injury sites, and the inhibitory functions of activated protein C and antithrombin in coagulation.
- Explain five hemostasis screening tests, differentiate primary hemostasis from plasma coagulation defects in terms of symptoms, and predict test outcomes for severe hemophilia A with von Willebrand factor deficiency.

Topics/ Contents:

Lectures: (1 hour each)

- Composition and function of blood
- Plasma Proteins: Albumin, globulin, Fibrinogen and their Functions
- Erythropoiesis
- Factors affecting erythropoiesis
- Hemoglobin synthesis, degradation and Iron metabolism
- Classification of anemia and Red cell indices
- Effects of Anemia on Cardiac Output and CVS
- Microcytic anemia
- Normocytic and Macrocytic anemia
- Polycythemia
- Genesis, classification & functions of WBCs
- Leukopenia, Leukocytosis, Leukemia, AIDS
- Inflammation
- Immunity & its classification; Innate immunity
- Immunity & its classification; Humoral Immunity
- Cell mediated immunity
- Tolerance of the Acquired Immunity System
- Allergy & Hypersensitivity
- Blood group - ABO system
- Blood group - Rh system
- Blood transfusion and its complications
- Hemostasis – Platelets
- Hemostasis – Clotting cascade
- Hemostasis - Fibrinolytic mechanism

Practicals: (1.5 Hour each)

- To determine Hemoglobin by Sahli's Hemoglobinometer.
- Determine erythrocyte sedimentation rate (ESR)
- To determine differential leukocyte count (DLC)
- a) To determine the blood group of a human subject
- b) To perform cross-matching of two blood samples
- To determine the bleeding time (BT)

- To determine the clotting time (CT)

Tutorials:

- Humoral Immunity
- Anemia
- Hemostasis – Clotting cascade

ANATOMY**Learning Objectives:**

- Define Hematopoiesis and the development of various types of blood cells.
- Identify the structure and function of lymph nodes.
- Identify the structure, function and histological appearance of tonsils and thymus.
- Enumerate histological features and functions of spleen
- Enlist histological features of spleen and tonsils
- Understand the structure and function of immune system and lymphoid tissue
- Differentiate between different types of Hypersensitivity reactions

Topics/ Contents:**Lectures (1 hour each)**

- Embryological development of blood element: Hematogenesis.
- Introduction to Lymphoid Tissue and Immune System, Histology of Lymph Node
- Histology of Tonsils and Thymus
- Histology of Spleen
- Lymphoid tissue histology

Practical:

- Histology of Spleen
- Histology of Lymph Node & Thymus
- Histology of spleen and tonsils

BIOCHEMISTRY**Learning Objectives:**

- Discuss the components of plasma and their role in human body
- Correlate the basic structure of Hemoglobin as essential for RBCs normal function
- Discuss role of heme iron Vitamin B12/Folic acid/ B6 and Iron metabolism
- Explain abnormalities of Hb synthesis, Porphyria & its different types of variants of hemoglobin
- Explain the mechanism of qualitative and quantitative disorders of R.B.C. (Hyperbilirubinemia)
- Discuss the structure and classification of immunoglobulins

- Define immunity and its types
- Describe the mechanism of hemostasis, explain the role of platelets in homeostasis and coagulation

Topics/Contents:**Lectures: (1 hour each)**

- Composition of blood plasma and cellular components
- Haemoglobin Synthesis, Structure and functions and oxygen dissociation curve
- Metabolism of RBCs
- Haematological manifestation of vitamins Vit. B 12/Folic acid/ B6 deficiency
- Sources and biochemical importance of iron
- Porphyria
- Heme Degradation (bile salt metabolism)
- Hemoglobinopathies and Thalassemia
- Vit. K and its disorders
- Structure, types and functions of immunoglobulin

Practicals

Serum protein electrophoresis

Hb electrophoresis

Tutorials:

Lactic acidosis

Role of iron in relation to anemia

Interpretation of iron profile

PATHOLOGY:**Learning Objectives:**

- Recall the composition body fluids and basics of fluid dynamics.
- Describe homeostasis and its importance
- Explain the etiology of Edema, Effusion, Hyperemia, Congestion and explain their mechanisms.
- Describe effusion and its types.
- Explain hyperemia and outline the mechanism of congestion.
- Describe embolism, its types and complications
- Explain mechanism of Hypoxia and ischemia
- Describe the pathology of infarction.
- Describe shock and its types
- Explain the organization of Immune System.
- Enlist components of immune system and explain their roles.
- Explain the mechanism of innate and adaptive immune response.
- Describe MHC, different classes, structure, expression and gene defects.
- Explain the role of complement system and its working mechanisms.
- Describe the chemical mediators released during acute and chronic inflammation.
- Explain morphological pattern & clinical outcomes of acute and chronic inflammation.

- Describe the types, signs, symptoms and mechanisms of hypersensitivity reaction.
- Explain the pathophysiology of autoimmunity
- Enlist the lab investigations related to common diseases associated with immunity.
- Describe the role in immunity in transplant reaction
- Describe the basic process of cell division and its role in the body.
- Describe regeneration in cells and tissues
- Describe the process of tissue repair
- Review the various components of ECM & its role in healing
- Explain the role of growth factors & cytokines in tissue repair and regeneration.
- List the factors that affect wound healing.
- Recall the process of hematogenesis and related it to the common pathologies.
- Classify anemia from different perspectives.
- Discuss the major hematological laboratory testing for anaemias and interpret lab findings.
- Describe the pathogenesis of neoplasia
- Explain the nomenclature of cancers and major terminology associated with cancers.
- Differentiate between benign and malignant tumors
- Explain the routes of metastasis
- Describe the role of carcinogenic agents and their cellular interactions.
- Describe various methods used for sterilization and disinfection and their application, in healthcare settings.
- Describe the process staining of bacteria with examples
- Explain the process and principles of bacterial culture and sensitivity.
- Describe major types of agars used in Microbial diagnosis.
- Explain the basic principles of serological tests, and their application in the diagnosis of various pathological conditions
- List the signs and symptoms of malaria and explain the pathogenesis
- Describe the types of hereditary disorders and briefly explain common Mendelian disorders.

Topics/ Contents:

Lectures:

- Edema and Effusion, Hyperemia and Congestion
- Hemostasis, Hemorrhagic, Thrombotic Disorders
- Embolism
- Infarction and Shock
- Mendelian Disorders
- Cell mediated immunity
- Complement system and its role in immunity
- Antigen- Antibody reactions
- Sterilization and Disinfection
- Acute Inflammation
- Pathogenesis of Parasitic Infections
- Morphology of Acute Inflammation
- Chronic inflammation
- Tissue Repair and Regeneration
- The cell cycle
- Extracellular Matrix and Healing by Connective Tissue Deposition
- Growth Factors and Cytokines

- Local and Systemic Factors Affecting Tissue Renewal
- Morphology of Chronic Inflammation (Granuloma Formation)
- Malaria and Life Cycle of Malarial Parasites
- Hypersensitivity Reactions Type 1+2
- Hypersensitivity Reactions Type 3+4
- Introduction to Neoplasia: Nomenclature of Tumors + Terminologies
- Classification of Tumors, Difference between Benign and Malignant Tumors
- Carcinogenic Agents and their Cellular Interactions
- MHC and Transplant

Practical:

- Normal Red Cell Indices and Anemia
- Bone Marrow Changes with Aging and Disease (Hemopoiesis, Aplastic anaemia)
- Sensitivity Testing in Bacteria
- Mediators of Inflammation
- Acid fast Staining
- Diagnostic Tests Based on Serology
- Hypersensitivity Reactions and Autoimmunity
- Benign and Malignant Tumors
- Healing and repair
- Gram Staining
- Bleeding Diseases

Tutorials:

- Microcytic anemia
- Macrocytic Anemia
- Anaphylaxis
- Antibody Mediated Immune response
- Interpretation of Autoimmune Serology 16

PHARMACOLOGY**Learning Objectives:**

- Describe the basis of diagnosis of cancers and its therapy.
- Describe the pharmacology of drugs used in anemia and bleeding disorders.

Topics/Contents:**Lectures: (1 Hour each)**

- Agents used to treat anaemia: Haematopoietic growth factors
- Coagulants /Anticoagulants
- Thrombolytic/ Fibrinolytics
- Modalities of anticancer drugs

Practicals / Tutorials:

- Antiplatelets /Anticoagulants
- Thrombolytic/ Fibrinolytics

COMMUNITY MEDICINE.**Learning Objectives:**

- To introduce Basic Concepts and integration of Epidemiology and Biostatistics
- Relate the concepts of Epidemiology and Biostatistics, their scope & utilization by health practitioners
- Differentiate the dynamics of disease transmission (host, agent and environment interaction) and the Measures of Occurrence of disease: (Incidence & Prevalence).
- Delineate screening for diseases
- Compute sensitivity, specificity, positive and negative predictive value using 2x2 table.
- Detect the purpose and method of outbreak investigation.
- Recognize the uses of measures of central tendency and dispersion in data.
- Compute the measures of central tendency and dispersion.
- Define basic quantitative and qualitative study designs in epidemiology
- Apply the concepts of normal distribution of population and sampling distribution of sample mean.
- Construct and interpret point estimate and confidence interval of population mean.
- Select appropriate research topic
- Formulate research objective, research question and Hypothesis.
- Identify various sampling techniques.
- Make decisions for healthcare using biostatistics and epidemiology as well as national, regional and local surveillance data.

Topics/Contents:**Lectures: (1 Hour each)**

- Introduction to epidemiology
- Outbreak Investigation
- Screening (Sensitivity & Specificity)
- Screening (PPV & NPV)
- Introduction to study Design (And Qualitative Research Design)
- Introduction to Biostatistics, types of variables
- Measurement of Central Tendency & Dispersion
- Normal Distribution Curve
- Standard Error and Estimation of 95% Confidence Interval

Tutorials:

- Introduction to Research methodology, topic selection
- Objective Writing, Research Question and Hypothesis
- Sampling technique
- Study design

- Human Subject Research Ethics & Plagiarism

MEDICINE

Learning Objectives:

- List clinical features in a patient with anemia and enlist different types of anemia
- Evaluate the patients by history, physical examination and management of a patient with bleeding disorder.
- State the diagnostic approach, history and physical examination, imaging to diagnose the splenomegaly and define its clinical features.
- Identify clinical features of different autoimmune diseases.

Topics/Contents:

Lectures: (1 hour each)

History and clinical findings in an anemic patient.

History, Examination and Management of a patient with bleeding Disorder.

History and Approach to a patient with Lymphadenopathy and Splenomegaly

Introduction to Autoimmune Disease.

BEHAVIOURAL SCIENCES.

Learning Objectives:

Recognize common psychosocial aspects and associated them with clinical conditions.

Topics/Contents:

Lectures (1hour each)

- Social psychology and medical education
- Assessment in Psychiatry: Components of Diagnosis, Categorical diagnosis, Explanatory diagnosis, Treatment decisions
- Psychiatric interview: As psychotherapeutic and psycho educational intervention, Psychometric Assessment

SKILLS LAB

Learning Objectives:

- Demonstrate the correct site and method to perform the procedure for administering medications
- Demonstrate the correct site and method to perform the procedure for obtaining blood samples
- Demonstrate the correct site and method to perform the procedure for administering medications, fluids and blood products

Topics / Contents: (Small Group / Hands on activity)

- I/M injection
- Venepuncture
- I/V cannulation

CBL (Case Based Learning)

S. No	CBL Topic	CBL Objectives
CBL 1	Anemia	Interpret the report of Complete Blood Count. Identify abnormalities in a Complete Blood Count. Describe different types and causes of anemia. Understand Iron deficiency anemia.
CBL 2	Thalassemia	Correlate the changes in structure and function of the different types of Hemoglobin in health and in disease states. Correlate different Hb electrophoresis pattern Relate normal and abnormal hemostatic mechanisms with the coagulation cascade Relate blood and blood components transfusion and transfusional reactions
CBL 3	Lymphadenopathy	Define Lymphadenopathy Identify different causes of lymphadenopathy Describe the mechanism of lymphadenopathy Explain different types of lymphnodes
CBL 4	Bleeding Diseases	Learn the clinical approach to bleeding disorders, specifically platelets disorders versus coagulation disorders Discuss and differentiate between extrinsic and intrinsic pathways.
CBL 5	Hypersensitivity Reaction	Describe different types of hyper-sensitivity reactions List the examples of different hyper sensitivity reactions Understand the mechanism of anaphylaxis

ASSESSMENT

Assessment will be done in two parts:

At the end of module

- Module Exam (Theory) -20%
- Module Exam Practical Internal Evaluation- 20%

At the end of Year

- Annual Exam (Theory) -80%
- Annual Exam (OSPE, Viva)-80%

MCQs (Multiple choice questions), OSPE (Objective Structured Practical Exam) and structured viva will be the main assessment tool.

Learning Resources

S. No	Subject	Readings
1	ANATOMY	<ul style="list-style-type: none"> • Moore KL, Dalley AF. Clinically oriented anatomy. South Asia ed. India. Wolters Kluwer; 2018 Jul 12. • Drake R, Vogl AW, Mitchell AW, Tibbitts R, Richardson P. Gray's Atlas of Anatomy E-Book. Elsevier Health Sciences; 2020 Feb 27. • CLINICAL ANATOMY BY REGIONS (REFERENCE BOOK) Richard S. SNELL 9th EDITION • LAST'S ANATOMY: REGIONAL & APPLIED (REFERENCE BOOK) Chummy S. Sinnatamby 12th or Latest EDITION • ATLAS OF HUMAN ANATOMY FRANK H NETTER 6th EDITION
2	EMBRYOLOGY	<ul style="list-style-type: none"> • LANGMAN'S MEDICAL EMBRYOLOGY T.W. SADLER 13th EDITION • THE DEVELOPING HUMAN CLINICALLY ORIENTED EMBRYOLOGY (REFERENCE BOOK) MOORE & PERSAUD & TORCHIA 10th EDITION
3	HISTOLOGY	<ul style="list-style-type: none"> • MEDICAL HISTOLOGY LAIQ HUSSAIN SIDDIQUI 5TH or Latest EDITION • WHEATERS FUNCTIONAL HISTOLOGY BARBARA YOUNG 5th EDITION • BASIC HISTOLOGY(TEXT AND ATLAS) (REFERENCE BOOK) LUIZ JUNQUEIRA, JOSE CARNEIRO Latest EDITION
4	PHYSIOLOGY	<ul style="list-style-type: none"> • GUYTON AND HALL TEXTBOOK OF MEDICAL PHYSIOLOGY GUYTON AND HALL 13th EDITION
5	BIOCHEMISTRY	<ul style="list-style-type: none"> • LIPPINCOTT'S ILLUSTRATED REVIEWS SERIES DENISE R. FERRIER 6th EDITION • HARPERS ILLUSTRATED BIOCHEMISTRY (REFERENCE BOOK) • VICTOR RODWELL, DAVID BENDER, KATHLEEN M. BOTHAM, PETER J. KENNELLY, P. ANTHONY WEIL 28th EDITION
6	COMMUNITY MEDICINE	<ul style="list-style-type: none"> • PUBLIC HEALTH AND COMMUNITY MEDICINE SHAH, ILYAS, ANSARI 7th EDITION

7	PATHOLOGY	<ul style="list-style-type: none">• ROBBINS BASIC PATHOLOGY KUMAR & ABBAS 9TH EDITION• ROBBINS & COTRAN PATHOLOGIC BASIS OF DISEASE (REFERENCE BOOK) KUMAR & ABBAS & ASTER 9th EDITION
8	MICROBIOLOGY	<ul style="list-style-type: none">• REVIEW OF MEDICAL MICROBIOLOGY AND IMMUNOLOGY WARREN LEWINSON 14th EDITION
9	PHARMACOLOGY	<ul style="list-style-type: none">• LIPPINCOTT'S ILLUSTRATED REVIEW PHARMACOLOGY KAREN WHALEN 6th or Latest Edition• BASIC AND CLINICAL PHARMACOLOGY (REFERENCE BOOK) BERTRAM G. KATZUNG 11th EDITION