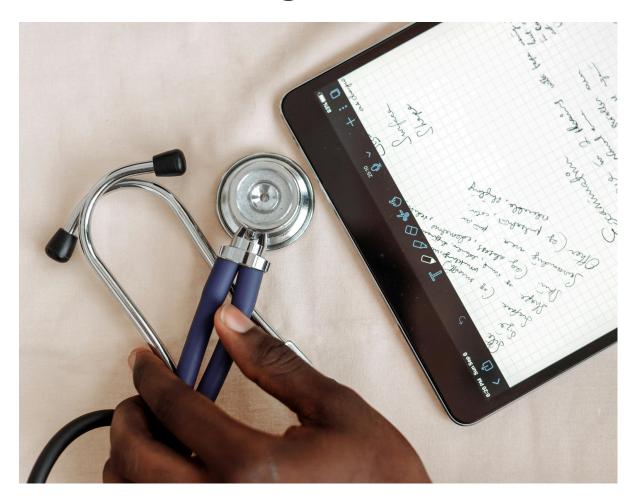
Syllabus for MD (Pathology) Programme





Atal Medical & Research University

A state University established by the Govt of H.P

Atal Medical & Research University, H.P.

(A State Govt. University)

BS Govt. Medical College & Hospital Campus, Ner Chowk, Mandi, H.P.)

Minutes of meeting of PG Board of Studies (Pathology) held on

16th May, 2023 in Conference Hall, AMRU at 11:00 AM

A meeting of PG Board of Studies (Pathology) was held on 16th May, 2023 at 11:00 AM at Conference Hall, AMRU under the Chairmanship of Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla.

Following members attended the meeting:

- 1. Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla -cum-Chairperson.
- Dr. Radhika Srinivasan, (External Expert), Professor & HOD Cytology & Gynaecological Pathology,
 PGI, Chandigarh nominated by the Hon'ble Vice Chancellor -cum-Member (through video conference)
- 3. Dr. Neelam Verma, Professor, Dept. of Pathology, IGMC, Shimla-cum-Member.
- 4. Dr. Anchana Gulati, Associate Professor, Dept. of Pathology, IGMC, Shimla, -cum-Member.
- 5. Dr. Aruna Gupta, Assistant Professor, Dept. of Pathology, Dr. RPGMC, Tanda-cum-Member.

The meeting started with the Chairperson welcoming the members.

The following decisions were taken:

- 1. Posting of the PG students for training in Laboratory Medicine for 2 weeks each respectively.
- 2. Posting in the transfusion medicine to be reduced to six weeks instead of eight weeks.
- 3. To adopt the pattern of question papers as per NMC i.e one structured long answer questions & six to eight short answer questions
- 4. In the logbook page to do minor changes in the format & 'signature of candidate' and 'consultant' to be incorporated at the bottom of the page.
- 5. To remove the points pertaining to research work & participation in CMEs from the page of logbook & to incorporate these points in the appraisal form.
- 6. To split the 15 marks allotted for Viva as follows: A. Viva on thesis: 5 marks; B: Pedagogy/teaching exercise: 10 marks.
- 7. Spotting exercise to include recent advances.
- 8. The external expert Dr. Radhika Srinivasan suggested to take up the matter with NMC to discontinue with District Residency Programme as this will interfere with the teaching & training in the subject.

The meeting ended with a vote of thanks to the chair.

Dr. Sudershan Kumar Sharma,

Professor & HOD,

Pathology, IGMC, Shimla.

Dr. Neelam Verma.

Professor, Dept. of Pathology,

IGMC, Shimla.

Dr. Aruna Gupta,

Assistant Professor, Dept. of Pathology,

Dr. RPGMC, Tanda.

Dr. Radhika Srinivasan, (External Expert), Professor & HOD, Cytology &

Gynaecological Pathology, PGI, Chandigarh.

Dr. Anchana Gulati,

Associate Professor, Dept. of Pathology,

IGMC, Shimla.

Atal Medical & Research University, H.P.

(A State Govt. University)

(SLBS Govt. Medical College & Hospital Campus, Ner Chowk, Mandi, H.P.)

Minutes of meeting of PG Board of Studies (Pathology) held on

16th May, 2023 in Conference Hall, AMRU at 11:00 AM

A meeting of PG Board of Studies (Pathology) was held on 16th May, 2023 at 11:00 AM at Conference Hall, AMRU under the Chairmanship of Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla.

Following members attended the meeting:

- 1. Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla -cum-Chairperson.
- 2. Dr. Radhika Srinivasan, (External Expert), Professor & HOD Cytology & Gynaecological Pathology, PGI, Chandigarh nominated by the Hon'ble Vice Chancellor -cum-Member (through video conference)
- 3. Dr. Neelam Verma, Professor, Dept. of Pathology, IGMC, Shimla-cum-Member.
- 4. Dr. Anchana Gulati, Associate Professor, Dept. of Pathology, IGMC, Shimla, -cum-Member.
- 5. Dr. Aruna Gupta, Assistant Professor, Dept. of Pathology, Dr. RPGMC, Tanda-cum-Member.

The meeting started with the Chairperson welcoming the members.

The following decisions were taken:

- 1. Posting of the PG students for training in Laboratory Medicine for 2 weeks each respectively.
- 2. Posting in the transfusion medicine to be reduced to six weeks instead of eight weeks.
- 3. To adopt the pattern of question papers as per NMC i.e one structured long answer questions & six to eight short answer questions
- 4. In the logbook page to do minor changes in the format & 'signature of candidate' and 'consultant' to be incorporated at the bottom of the page.
- 5. To remove the points pertaining to research work & participation in CMEs from the page of logbook & to incorporate these points in the appraisal form.
- To split the 15 marks allotted for Viva as follows: A. Viva on thesis: 5 marks; B: Pedagogy/teaching exercise: 10 marks.
- 7. Spotting exercise to include recent advances.
- 8. The external expert Dr. Radhika Srinivasan suggested to take up the matter with NMC to discontinue with District Residency Programme as this will interfere with the teaching & training in the subject.

The meeting ended with a vote of thanks to the chair.

Dr. Sudershan Kumar Sharma,

Professor & HOD,

Pathology, IGMC, Shimla.

Professor & HOD, Cytology &

Gynaecological Pathology, PGI, Chandigarh.

Dr. Radhika Srinivasan, (External Expert),

Whough Dr. Neelam Verma,

Professor, Dept. of Pathology,

IGMC, Shimla.

Dr. Aruna Gupta,

Assistant Professor, Dept. of Pathology,

Dr. RPGMC, Tanda.

Dr. Anchana Gulati,

Associate Professor, Dept. of Pathology,

IGMC, Shimla.

Atal Medical & Research University, H.P.

(A State Govt. University)

(SLBS Govt. Medical College & Hospital Campus, Ner Chowk, Mandi, H.P.)

Minutes of meeting of PG Board of Studies (Pathology) held on

16th May, 2023 in Conference Hall, AMRU at 11:00 AM

A meeting of PG Board of Studies (Pathology) was held on 16th May, 2023 at 11:00 AM at Conference Hall, AMRU under the Chairmanship of Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla.

Following members attended the meeting:

- 1. Dr. Sudershan Kumar Sharma, Professor & HOD, Pathology, IGMC, Shimla -cum-Chairperson.
- Dr. Radhika Srinivasan, (External Expert), Professor & HOD Cytology & Gynaecological Pathology,
 PGI, Chandigarh nominated by the Hon'ble Vice Chancellor -cum-Member (through video conference)
- 3. Dr. Neelam Verma, Professor, Dept. of Pathology, IGMC, Shimla-cum-Member.
- 4. Dr. Anchana Gulati, Associate Professor, Dept. of Pathology, IGMC, Shimla, -cum-Member.
- 5. Dr. Aruna Gupta, Assistant Professor, Dept. of Pathology, Dr. RPGMC, Tanda-cum-Member.

The meeting started with the Chairperson welcoming the members.

The following decisions were taken:

- 1. Posting of the PG students for training in Laboratory Medicine for 2 weeks each respectively.
- 2. Posting in the transfusion medicine to be reduced to six weeks instead of eight weeks.
- To adopt the pattern of question papers as per NMC i.e one structured long answer questions & six to eight short answer questions
- 4. In the logbook page to do minor changes in the format & 'signature of candidate' and 'consultant' to be incorporated at the bottom of the page.
- 5. To remove the points pertaining to research work & participation in CMEs from the page of logbook & to incorporate these points in the appraisal form.
- 6. To split the 15 marks allotted for Viva as follows: A. Viva on thesis: 5 marks; B: Pedagogy/teaching exercise: 10 marks.
- 7. Spotting exercise to include recent advances.

8. The external expert Dr. Radhika Srinivasan suggested to take up the matter with NMC to discontinue with District Residency Programme as this will interfere with the teaching & training in the subject.

The meeting ended with a vote of thanks to the chair.

Dr. Sudershan Kumar Sharma, Professor & HOD,

Pathology, IGMC, Shimla.

Dr. Neelam Venna,

Professor, Dept. of Pathology,

IGMC. Shimla.

Dr. Aruna Gupta,

Assistant Professor, Dept. of Pathology,

Dr. RPGMC, Tanda.

Dr. Radhika Srinivasan, (External Expert),

Professor & HOD, Cytology &

Gynaecological Pathology, PGI, Chandigarh.

video conferen

Dr. Anchana Gulati,

Associate Professor, Dept. of Pathology,

IGMC, Shimla.

ATAL MEDICAL AND RESEARCH UNIVERSITY MANDI AT NERCHOWK HIMACHAL PRADESH

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD PATHOLOGY COURSE AS PER NMC NORMS

(vide letter 11011/1/22/AC/Guidelines/22 dated 2/11/2022)

Members of subject expert group as per letter no. AMRU/Acad/BOS/Faculty/2022/-3699-3708 dated 15/05/2023 for preparation of Guidelines for competency based postgraduate training programme for MD in Pathology as per latest NMC norms:

S. NO.	Name	Designation	Signature
1	Dr. Sudarshan Kumar Sharma (Chairperson)	Professor & Head, Department of Pathology , IGMC, Shimla, Himachal Pradesh	
2	Dr. Radhika Srinivasan (External Expert) (Member)	Professor & Head, Department of Cytology and Gynaecological Pathology, PGIMER, Chandigarh.	
3	Dr. Neelam Sharma (Member)	Professor, Department of Pathology, IGMC, Shimla, Himachal Pradesh.	
4	Dr Anchana Gulati (Member)	Professor, Department of Pathology, IGMC, Shimla, Himachal Pradesh.	
5	Dr. Aruna Gupta (Member)	Associate Professor, Department of Pathology, RPGMC, Tanda, Himachal Pradesh	

PREAMBLE

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

This programme is meant to standardize Pathology teaching at postgraduate level throughout the country in order to achieve uniformity in teaching and create suitable manpower with appropriate expertise. The postgraduate student in pathology should be sufficiently trained, professionally competent and confident in handling, and processing, and diagnosis related to histopathology (surgical pathology), cytopathology, and hematology with reasonable working knowledge in blood banking, laboratory medicine, medical statistics, and ancillary techniques with understanding of general principles and methodology.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document has been prepared following NMC recommended guidelines for competency based postgraduate training programme for MD Pathology course vide notification no. 11011/1/22/AC/Guidelines/22 dated 2/11/2022.

SUBJECT SPECIFIC LEARNING OBJECTIVES

At the end of MD training programme in Pathology ,the student should achieve the following goals :

1. Knowledge of Pathology

- 1.1. Make a diagnosis based on histopathology (surgical pathology), cytopathology specimens, blood and bone Marrow examination and various tests of Laboratory Medicine (clinical pathology, clinical biochemistry) as well as Blood Banking (Transfusion Medicine).
- 1.2. Interpret clinical and laboratory data with reasonable accuracy and prepare a succinct and lucid report
- 1.3. Compose reports following standard protocols including synoptic reporting
- 1.4. Interpret and correlate clinical and laboratory data so that clinical manifestations of diseases can be explained.
- 1.5. Advise on the selection of appropriate specimens and tests necessary to arrive at a diagnosis in problematic case Including molecular tests.
- 1.6. Correlate clinical and laboratory findings with pathology findings at autopsy, identify miscorrelations and the causes of death due to diseases (apart from purely metabolic causes).
- 1.7. Maintain quality control of all tests by being part of Internal Quality Control Monitoring program.
- 1.8. Make and record observations systematically and maintain accurate records of tests and their results f reasonable periods of time. Identify problems in the laboratory, offer solutions thereof and maintain a high order of quality control.
- 1.9. Should be aware of safe and effective disposal of laboratory waste and ensure minimization risk of exposure to infection and accidents to laboratory personnel.

2. Teaching and training

- 2.1. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff Including laboratory personnel.
- 2.2. The postgraduate student should be able to teach effectively and assess undergraduate medical and allied health science students so that they become competent healthcare professionals.

3. Research

- 3.1. Plan, execute, analyze, and present research work independently or as part of a team.
- 3.2. The postgraduate student in Pathology should acquire knowledge and skills to be able to conduct a research project from the planning to the publication stage and become a lifelong learner.

4. Professionalism, Ethics and Communication skills

4.1. The postgraduate student should learn and apply principles of professionalism, ethics, and effective communication to conduct routine pathology services, research, and routine work.

SUBJECT SPECIFIC COMPETENCIES

A. COGNITIVE DOMAIN

A postgraduate student upon successfully qualifying the MD (Pathology) examination should have acquired the following BROAD theoretical competencies and should be:

- Capable of offering an accurate diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis.
- Conversant with the standard operating procedures of various laboratories including histopathology, cytopathology, hematology and laboratory medicine.
- Able to teach and share his knowledge and competence with others. The student should be imparted training in teaching methods in the subject which may enable the student to take up teaching assignments in Medical Colleges/Institutes.
- Capable of pursuing clinical and laboratory-based research. He/she should be introduced to basic research methodology so that he/she can conduct fundamental and applied research.

At the end of the course, the student should have acquired the following competencies as a diagnostician:

Surgical pathology

- Be conversant in the histogenesis and pathophysiological processes associated with various diseases.
- Should be able to identify problems in the histopathology laboratory and offer viable solutions.
- Possess the background knowledge necessary for the evaluation and reporting of Surgical Pathology.
- Conversant with the various equipment used in the histopathology laboratory.
- Should have knowledge of automation and quality assurance in histopathology.

Cytopathology

- Possess the background knowledge necessary for the evaluation and reporting of Cytopathology.
- Demonstrate familiarity with, and guide clinical/radiology residents in keeping with the clinical information on the choice of site, collection, preservation, transport, type of preparation and method of obtaining various cytological specimens.
- Conversant with the various equipment used in the cytopathology laboratory.
- Should have knowledge of automation and quality assurance in cytopathology.

Hematology

- Demonstrate ability to utilize the principles of the practice of Hematology for the planning of tests, interpretation, and diagnosis of diseases of the blood and bone marrow.
- Conversant with the various equipment used in the hematology laboratory.
- Should have knowledge of automation and quality assurance in hematology.

Laboratory medicine

- Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of altered values, and interpretation thereof.
- Possess knowledge of the following specialized organ function tests and relative utility and limitations of each and significance of altered values:
 - (i) Renal function test
 - (ii) Liver function test
 - (iii) Endocrine function test
 - (iv) Tests for malabsorption
- Principles, advantage and disadvantages, scope, and limitation of automation in laboratory.
- Learn the principle and methodology of quality control in the laboratory.

Transfusion medicine

• Possess knowledge of basic immunology, ABO and Rh groups, minor blood groups and their clinical significance, transfusion therapy, pre-transfusion testing, transfusion related infections, transfusion reactions and quality control in blood bank.

Autopsy pathology

- Conversant with the technique of autopsy.
- Possess sufficient understanding of the various disease processes so that meaningful clinicopathological

correlation can be made.

Immunopathology

- Demonstrate familiarity with current concepts of structure and function of the immune system, its aberrations, and mechanisms thereof.
- Demonstrate familiarity with the scope, principles, limitations, and interpretations of the results of ELISA techniques, HLA typing, immunofluorescence, and immunoelectrophoresis.

Immunohistochemistry and flow cytometry

- Demonstrate familiarity with the principles and procedures of performing immunohistochemistry including automation in procedure and interpretation.
- Demonstrate familiarity with the principles and procedures of performing flow cytometry.

Cytogenetics and Molecular biology

• Demonstrate familiarity with the principles of molecular biopsy especially related to the understanding of disease processes and its use in various diagnostic tests at least including but not limited to in-situ hybridization, polymerase chain reaction, Sanger Sequencing and Next generation sequencing.

Electron microscopy

- Demonstrate familiarity with the principles and techniques of electron microscopy and the working of the electron microscope.
- Demonstrate familiarity with the tissue processing and staining methods for electron microscopy, including immune-labelling techniques and use of semi-thin sections.

Enzyme histochemistry

• Demonstrate familiarity with the principles, use and interpretations of common enzyme histochemical procedures.

Quality Control

- Demonstrate familiarity with various quality control programmes running in the department, both internal and external quality.
- Demonstrate familiarity with inert and intra assay variations, batch variations, validation of chemicals and instruments.

Laboratory Safety and Good clinical lab practices

• Demonstrate familiarity with good laboratory practices and safety, record maintenance of capital equipment and consumables, purchase specifications, approximate costs of reagents and equipment, maintenance of store logbooks, etc.

Biomedical Waste Management

• Demonstrate familiarity with disposal methods for each specimen, reagents, instruments, autoclaving techniques, recycling of products and e-waste.

At the end of the course, the student should have acquired the following competencies as a teacher:

• Demonstrate familiarity with different modes, methods, and principles of teaching including microteaching.

At the end of the course, the student should have acquired the following competencies as a researcher:

- Conversant with the principles of basic and applied research methodology, literature search, study design, sample size estimation, selection of controls, and appropriate application of medical statistics.
- Possess knowledge about the methods of writing thesis and/or a research paper with the prescribed instructions, as expected of international standards.
- Conversant with the use of digital slide imaging, algorithms to evaluate findings in imaging, morphometry, and application of artificial intelligence.

B. AFFECTIVE DOMAIN

- 1. The student will show integrity, accountability, respect, compassion and dedicated patient care. The student will demonstrate a commitment to excellence and continuous professional development.
- 2. The student should demonstrate a commitment to ethical principles relating to providing patient care, confidentiality of patient information and informed consent.
- 3. The student should show sensitivity and responsiveness to patients' culture, age, gender and disabilities.
- 4. The student should demonstrate a commitment to ethical principles relating to research conduct and research publication.

C. PSYCHOMOTOR DOMAIN

- 1. Able to perform grossing of biopsy and surgical specimens including gross diagnosis and taking appropriate sections/ samples necessary for diagnosis, comprehensive staging, and ancillary testing.
- 2. Conversant in histopathology tissue processing techniques and troubleshooting, cutting of paraffin and frozen sections, making imprint smears, and staining, and immunohistochemistry.
- 3. Able to collect specimens by routinely performing non-invasive out-patient procedures such as venipuncture, finger-prick, fine needle aspiration of superficial lumps and bone- marrow aspirates, making smears and staining, and provide appropriate guidance to colleagues performing procedure such as a biopsy or an imaging guided biopsy including on-site microscopic assessment of specimen adequacy.
- 4. Perform an autopsy, dissect various organ complexes and display the gross findings.
- 5. Conversant with the function, handling, and routine care of equipment in the laboratory and quality assurance.
- 6. Able to teach and share his knowledge and competence with others. The student should be imparted training in teaching methods in the subject which may enable the student to take up teaching assignments in Medical Colleges/Institutes.
- 7. Able to pursue clinical and laboratory-based research. He/she should be introduced to basic research methodology so that he/she can independently conduct fundamental and applied research.

SYLLABUS

Course contents:

A postgraduate is supposed to acquire not only the professional competence of a well-trained specialist but also academic maturity, a capacity to reason and critically analyze scientific data as well as to keep himself abreast of the latest developments in the field of Pathology and related sciences. The study of Anatomic Pathology includes all aspects of Pathology as encompassed in the branches of General and Systemic Pathology. Only the broad outlines are provided.

A. COGNITIVE DOMAIN

A) General Pathology:

- Normal cell and tissue structure and function; cell as a unit of health and disease.
- Stem cells and their role in regenerative medicine.
- Changes in cellular structure and function in diseases.
- Causes of disease, its pathogenesis, reaction of cells, tissues, organ systems, and the body to various sub lethal and lethal injuries.
- Cellular adaptation, cell injury, and cell death.
- Mechanism, morphology and examples of cell injury, necrosis, apoptosis, autophagy, and newer forms of cell death including necroptosis and pyroptosis.
- Sub cellular and cellular responses and adaptation to injury.
- Intracellular and intercellular accumulations, pathological calcification, and cell aging.

Acute and chronic inflammation:

- Vascular and cellular events in acute inflammation, chemical mediators, outcome, and morphological patterns of acute inflammation.
- Chronic inflammation with special reference to granulomatous inflammation.
- Systemic effects and effects of deranged inflammation.
- Tissue renewal and repair: Regeneration healing and fibrosis.
- Control of normal cell proliferation and tissue growth, mechanism of tissue regeneration, repair by healing and fibrosis.
- Extracellular matrix and cell matrix interactions.

Hemodynamic disorders, thromboembolic disease, and shock:

- Edema, hyperemia, congestion, and hemorrhage.
- Normal Hemostasis, thrombosis, DIC, embolism, infarction, and shock.

Genetic Disorders

- Principles of genetics, normal karyotyping.
- Mutations, Mendelian disorders, disorders with multifactorial inheritance cytogenetic disorders involving autosomes and sex chromosomes.
- Single gene disorders with nonclassic inheritance.
- Diagnosis of genetic disorders involving molecular and genetic techniques.

Neoplasia

- Definition, nomenclature, and biology of tumor growth.
- Molecular basis of cancer with special reference to carcinogenic agents and molecular basis of multistep carcinogenesis.
- Epidemiology and clinical features of tumors.
- Grading, staging and laboratory diagnosis of cancer.

Infectious Diseases

• Pathology and general principles of microbial pathogenesis, special techniques for diagnosing bacterial, fungal, parasitic, and viral infections.

Environmental and nutritional pathology

- Common environmental and occupational exposures leading on to diseases.
- Nutritional deficiencies and obesity related disorders.

Disease of Infancy and Childhood

 Congenital anomalies, birth injuries, diseases of neonates, inborn errors of metabolism, tumor, and tumor like lesions of infancy and childhood.

Immunopathology

- Innate immunity- Role of phagocytic cells, complement, mast cells & humoral mechanisms.
- Specific Acquired Immunity- Details about antibody production & action, Brief principles about memory, Ag specificity & vaccination.
- Cell involved in Immune response- T- Lymphocytes, B-lymphocytes, macrophages, dendritic cells, and natural-killer cells.
- Cytokines with details about their properties and functions.
- Structure and function of histocompatibility molecules and disease association.
- Disorders of the immune system.
- All hypersensitivity reactions.
- Autoimmune disorders with special reference to SLE, Rheumatoid arthritis, Sjogren's syndrome, systemic sclerosis, polyarteritis nodosa and other vasculitides, Mixed connective tissue disorders and inflammatory disorders.
- Immunodeficiency syndrome Acquired with emphasis on AIDS.
- Amyloidosis including pathogenesis, special stains & clinical correlation.
- Transplant rejection in detail.
- Graft vs Host Disease.

B) Systemic Pathology:

The study of normal structure and function of various organ systems and the etiopathogenesis, gross and microscopic alterations of structure of these organ systems in disease and functional correlation with clinical features.

Blood vessels, lymphatic and veins

- Normal morphology, congenital anomalies, atherosclerosis, hypertensive vascular disease.
- Inflammatory and neoplastic diseases of all the vessels.

Heart

- Normal morphology, its blood supply and effect of aging on heart.
- Ischemic, Hypertensive, valvular, congenital heart diseases.
- Cardiomyopathies
- Myocardial disorders
- Pericardial diseases.
- Tumors of the heart.
- Heart transplantation.

Lungs and Mediastinum

- Congenital anomalies
- Obstructive and restrictive pulmonary diseases
- Diseases of vascular origin
- Infections of Lung
- Infections of Mediastinum
- Tumors of lung
- Lung transplantation
- Diseases of pleura

Thymus

Developmental, autoimmune, and inflammatory disorder and tumors.

Head and Neck

- Oral cavity: Inflammatory disease, Preneoplastic lesions and tumors.
- Diseases of teeth and supporting structures.
- Upper airways and ear Congenital anomalies, Infections, and Tumors.
- Salivary glands Infections, autoimmune disorders and tumors.

Gastrointestinal Tract

- Congenital anomalies, infections, inflammatory and vascular disorders and tumors of esophagus, stomach, small and large intestines, appendix, and anal canal.
- Diseases of the peritoneum, Omentum and Mesentery Retroperitoneum.
- Inflammatory and neoplastic lesions.

Liver

- Normal morphology with general features of hepatic disease including LFTs.
- Infectious, autoimmune drug induced metabolic and circulatory disorders of liver.
- Hepatic diseases associated with pregnancy, neonates, organ and bone marrow transplantation.
- Liver transplantation pathology.
- Cysts, Nodules, and tumors of liver.

Biliary tract and Pancreas

- Congenital anomalies, injuries, Infection, inflammation, of Gallstones and tumors of gall bladder and extra hepatic bile ducts.
- Congenital anomalies, pancreatitis, and neoplasms of pancreas.

Kidney

- · Clinical manifestations of renal diseases
- Congenital anomalies
- Diseases affecting glomeruli, tubules, interstitium and blood vessels.
- Cystic diseases of kidney
- Nephrolithiasis
- Tumors of kidney
- Kidney Transplant pathology

Lower urinary tract and male genital system

- Congenital anomalies, inflammation and tumors of bladder, ureter, urethra, penis, testis, epididymis, and Scrotum.
- Inflammation, enlargement, and tumors of prostate.

Female genital tract

- Physiology, cytology and histology of female genital tract, menstrual disorders, and hormonal abnormalities.
- Congenital anomalies, inflammation, preneoplastic and neoplastic lesions of vulva, vagina, cervix, uterus, fallopian tubes, ovaries and mesonephros.
- Gestational and placental disorders.

Breast

- Inflammations, benign epithelial lesions, and tumors of the breast.
- Diseases of male breast.

Endocrine System

- Normal hormonal levels and functions of all the endocrine glands.
- Hypo- and hyperactivity of glands of endocrine system i.e., pituitary, thyroid, parathyroid, pancreas, adrenals, and pineal gland.
- Autoimmune diseases, inflammations and tumors affecting these glands

Neuroendocrine tumors

Skin and Subcutaneous tissue

- Disorders of pigmentation and melanocytes,
- Inflammatory, vesiculobullous, and infectious disease,
- Proliferative lesions and Tumors of the epidermis, dermis, and skin appendage.

Musculoskeletal system

- Bone modeling/remodeling, growth, and development, genetic and acquired abnormalities in bone cells, matrix and structure, factures, necrosis and infections of bones, tumors and tumor-like lesions,
- Joints: Arthritis, tumor, and tumor-like lesions.
- Soft tissue: Tumors and tumor like lesions.

Peripheral nerves and skeletal muscles

- General reactions of motor units.
- Inflammatory, infectious, hereditary, metabolic, and traumatic neuropathies.
- Atrophy, dystrophy, myopathies of the skeletal muscles.
- Diseases of neuromuscular junction.
- Tumors of peripheral nerves and skeletal muscles.

Skull and Central Nervous System

- Degenerative, metabolic, toxic, demyelinating, infectious, cerebrovascular malformations, and traumatic injuries.
- Tumors.

Eye and Orbit

• Infections, inflammatory, congenital diseases and neoplasms of orbit, eyelid, conjunctiva sclera, uvea, cornea, retina, and optic nerves.

C) Hematology and Transfusion medicine

The study of Hematology includes all aspects of the diseases of the blood and bone marrow. This would involve the study of the normal, and the causes of diseases and the changes thereof.

Biology of stem cell and Hematopoiesis

- Overview of stem cell biology and cellular biology of hematopoiesis.
- Transcription factors and humoral regulation in normal and malignant hematopoiesis.
- Interaction between hematopoietic stem cells, progenitor cell and stromal compartment of bone marrow.
- Stem cell homing & mobilization.

Erythroid maturation, differentiation, and abnormality

• Pathobiology of human erythrocyte & Hemoglobin Anemia.

- Approach to anemia in adults and children in: Clinical correlation & diagnostic modalities.
- Classification of anemias (Morphological, pathophysiological, and based on erythropoiesis i.e., proliferative vs non-proliferative).
- Congenital dyserytheropoeitic anaemias (CDA).
- Iron deficiency anemia including iron metabolism and differential diagnosis from other microcytic hypochromic anemias.
- Disorder of iron metabolism including iron overload.
- Anemia of chronic disorders with special reference to infections, collagen vascular disorders, inflammation etc.
- Megaloblastic anemia and other causes of megaloblastosis.
- Definition, approach, and classification of hemolytic anemia.
- Lab diagnosis of Hemoglobin disorders and hereditary anemia like Thalassemia and related hemoglobinopathies, sickle cell anemia.
- Hemoglobin associated with altered Oxygen affinity.
- Red blood cell enzymopathy, membrane disorder, autoimmune hemolytic anemia, non- immune hemolytic anemia, paroxysmal nocturnal hemoglobinuria.
- Approach to Pancytopenia/ Cytopenia.
- Bone marrow failure syndrome.
- Porphyria.

WBC disorders, complement and immunoglobin biology

- Normal granulopoiesis.
- Acquired and congenital disorders of phagocytosis (neutrophil, monocyte, eosinophil, and macrophages.
- Disorder of leukocyte number, function, and morphology.

Storage disorder

Hematological responses to Infections

- Viral disorders Infectious mononucleosis, Hepatitis, and dengue.
- Parasitic infections Malaria, Kala azar.
- Fungal infections.
- Bacterial infections including Tuberculosis.

Hematological malignancies

- Conventional & molecular cytogenetic and immunohistochemical basis of hematological malignancies.
- Classification (WHO, ICC)
- Their basis and diagnostic approach to various hematological malignancies.
- Pathophysiology, prognostic factors, cytochemistry, cytogenetics of various leukemias.
- Pathophysiology and classification of MDS, MPN/MDS, myeloproliferative disorders.

- Pathophysiology of Non-Hodgkin's lymphoma, Clinical staging of Hodgkin's lymphoma.
- Role of molecular cytogenetics and immunohistochemistry in Hodgkin's and Non- Hodgkin's lymphoma and lymphoproliferative disorders.
- AIDS related and Transplant related lymphomas.
- Plasma cell dyscrasias and gammopathies.
- Mastocytosis.
- Role of chemotherapy and antineoplastic agents based on molecular mechanism of hematological malignancies, clinical use of hematopoietic growth factors.

Hematopoietic stem cell transplantation

- Role and indications of HST, immunodeficiency state, hematological Malignancies and Nonhematological disorders.
- Practical aspect of umbilical cord stem cells transplantation.
- Peripheral stem cell collection.
- Role of stem cell in tissue repair.
- Complications of Hematopoietic stem cell transplant.
- Gene therapy and genetic engineering.

Prenatal diagnosis of genetic hematological diseases

Hemostasis & Thrombosis

- Megakaryocyte and platelet structure.
- Molecular basis of platelet function, activation.
- Role of blood vessel, coagulation system and fibrinolytic system in hemostasis.
- Clinical and lab evaluation of bleeding and coagulation disorders.
- Clinical & diagnostic aspects of factor deficiencies including hemophilia, von Willebrand disease, DIC, Vitamin K deficiency.
- Thrombotic and non-thrombotic purpura.
- Hereditary and acquired platelet disorders and its management.
- Thrombophilia (Inherited & acquired).
- Lab evaluation and management of hypercoagulable states.

Human blood group antigen and antibody and Immuno-hematology

- Selection of donor and screening..
- Principle, indication and storage of red blood cells, WBC, platelet, and plasma transfusion.
- Various methods of component separation and plasma derivatives with special reference to Fresh frozen plasma, cryo-precipitates, platelet concentrate, single donor plasma, albumin, and Immunoglobulin.
- Graft Rejection, GVH diseases, Transfusion Reactions, Blood grouping & cross matching.
- Blood bank audit.
- Apheresis

Hematological manifestations of systemic diseases

• Liver disorders, renal disorders, infections, cancers, parasitic diseases, AIDS, pregnancy, and surgical patients.

Spleen and its disorders

Neoplastic and non -neoplastic lesions including storage disorders

D) Laboratory Medicine (Clinical Pathology including Parasitology)

- Principles of testing, indications, values with ranges in normal and diseased states in relation to:
 - o Liver function tests
 - o Renal function tests
 - o Endocrine function tests
 - o Body fluid analysis including stool, urine, semen, CSF, etc.
- Principles of laboratory automation, trouble shooting, and quality assurance.

E) Special techniques

The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields:

- Immunopathology,
- Electron microscopy,
- Histochemistry,
- Immunohistochemistry,
- Cytogenetics and in-situ hybridization,
- Molecular Biology,
- Digital Pathology and image analysis,
- Maintenance of records,
- Information retrieval, use of Computer and Internet in medicine.

F) Instrumentation and automation

- Principles, indications, working, maintenance, and troubleshooting of equipment used in various laboratories:
 - **o Histopathology laboratory** Histopathology tissue processor, microtome, water batch, embedding station, Stainer, IHC Stainer, ultramicrotome, etc.
 - **o Microscopes** Immunofluorescence, FISH, Confocal, Electron, phase contrast, polarizing microscopy, Dark field etc.
 - Cytopathology Laboratory Centrifuge, Cytocentrifuge, Cytospin apparatus, liquid-based cytology, etc.

B. PSYCHOMOTOR DOMAIN

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	I. HISTOPATHOLOGY (SI	The state of the s
	I. HISTOPATHOLOGY (SI	ORGICAL PATHOLOGY)
1	Given the clinical and operative data, identify and systematically and accurately describe the chief gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose common lesions received on an average day from the surgical service of an average teaching hospital	Independently
2	Perform a systematic gross examination of the tissues including the taking of appropriate tissue sections and in special cases as in intestinal mucosal biopsies, muscle biopsies and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.	Independently
3	Independently Identify and systematically and accurately describe the chief histomorphological alterations in the tissue received in the surgical pathology service. He/she should also correctly interpret and correlate with the clinical data to diagnose routine surgical material received on an average day	Independently
4	Identify common problems in histopathology processing techniques (poor fixation, delayed fixation, poor staining, etc.,) including automated tissue processing machine troubleshooting and rectify common problems	Independently
5	Operate and maintain common equipment in the histopathology laboratory such as microtome, water bath, cryostat, tissue processor, auto Stainer, etc.	Perform under supervision

- **o Hematology Laboratory** automated cell counter, flow cytometer, coagulometer, HPLC, Electrophoresis apparatus, immunoblot, etc.
- **o Clinical Pathology** –Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, chemiluminescence, etc.
- o Digital pathology Whole slide scanners
- o Molecular pathology PCR, Sanger sequencer, NGS sequencers, etc.
- Automation in Pathology
- Good lab practices and safety, record maintenance of capital equipment and consumables, purchase specifications, approximate costs of reagents and equipment, maintenance of store logbooks, etc.

G) Quality assurance program

- Internal and external quality assurance methods.
- Intra assay variations, batch variations, validation of chemicals and instruments.

H) Establishment Act and Rules and regulations formed by Govt. or regulatory bodies

- I) Biomedical Waste management
- Disposal methods for each: biological specimen, reagents, instruments.
- Autoclaving techniques, recycling of products and e-waste.
- J) Biostatistics, Research Methodology and Clinical Epidemiology
- K) Ethics and Medico-legal aspects relevant to Pathology
- L) Current topics and recent advances in pathology

	quality smears including collection of material for cell block preparation and decide on the type of fixative and stain in a given case	5
2	Prepare and stain good quality smears for cytopathological examination	Independently
3	Provide appropriate guidance to colleagues performing procedure such as a biopsy or an imaging guided biopsy including on-site microscopic assessment of specimen adequacy.	Independently
4	Decide on the technique of collection, preservation, transport and concentration of various exfoliative cytology specimens (such as filters, centrifuge, liquid-based cytology, cytospin, etc.)	Independently
5	Perform on-site adequacy assessment in image guided sampling procedures and decide on sample triage for routine diagnosis (type of preparation, stain, etc.) and ancillary tests including microbiological and molecular tests	Independently
6	Diagnose common cases received in a routine cytopathology laboratory and categorize them into negative, inconclusive and positive, using the correct technique of screening and dotting the slides for suspicious cells, correctly identify the type of tumor, if present, and the presence of organisms, fungi and parasites, if present	Independently
7	Perform preparations (cytospin smears, liquid-based cytology, cell blocks, etc.) of common cytological samples using equipment such as centrifuge, cytocentrifuge and liquid based cytology apparatus	Observation only

6	Process a tissue, make a paraffin	Perform under supervision .
	block and cut sections of good	
	quality on a rotary microtome	
7	Stain paraffin sections with	Independently.
	hematoxylin and eosin stain and	
	common special stains needed for	
	diagnosis	
8	Cut a frozen section, stain and	Independently.
	interpret the slide in correlation with	=
	the clinical data provided	
9	Standardize and validate new	Independently.
	antibodies for	
	immunohistochemistry with	100
	understanding of controls, clones,	
	and dilutions	
10	Perform immunohistochemistry on	Independently .
	paraffin sections using manual	
	method	
11	Identify common problems in	Independently .
	immunohistochemistry procedure	-
	(artifacts, inadequate retrieval,	
	section floating, IHC failure, etc.,)	
	and rectify such problems	
12	Decide on the appropriate	Independently.
	immunohistochemical panels for	
	diagnosis, prognosis and predictive	
	purposes in common disease	v v
	conditions based on standard	
	recommendations and interpret	
	their results	
13	Write histopathology reports,	Independently.
	including synoptic reports, wherever	
	needed, following protocols and	
	international standards. The reports	
	should be succinct and lucid, with	
	clinical notes and advice, as	and the second s
	necessary	

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	II CYTOPATHO	LOGY
1	Perform fine needle aspiration of	Independently
	superficial lumps and make good	

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	III HEMATOLOGY	
1	Perform venipuncture for peripheral blood collection and decide on appropriate collection tubes, storage, and anticoagulant based on indication	Independently
2	Prepare good quality peripheral blood smears, stain and report peripheral blood counts and other findings including reticulocyte and platelet counts on cell counter and manually	ndependently
3	Perform bone marrow aspirates and biopsy, prepare good quality smears and imprints	Perform under supervision
4	Perform bone marrow aspirate staining including stain for iron	Independently
5	Perform cytochemical characterization of leukemia with special stains on bone marrow aspirates	Perform under supervision
6	Perform and interpret coagulation profile including PT, APTT and FDP	Independently
7	Perform and interpret sickling test and osmotic fragility test	Independently
8	Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least common cases referred to the Hematology clinic, given the relevant clinical data	Independently
	Given the clinical data, interpret the results of i. Red cell indices ii. Plasma hemoglobin iii. Hemosiderin in urine iv. Hemolytic anemia profile including HPLC, Hb electrophoresis etc.	

	v. Hemoglobin and serum protein	
	electrophoresis	
	vi. Clotting time and other point of care tests for bleeding Independently	
	vii. G6PD enzyme estimation	
	viii. Platelet function tests including platelet	
		Indonesials.
	aggregation and adhesion and PF3 release	Independently
•	ix. Russell's viper venom time (RVVT)	
9	x. Coagulation Factor assays	
	xi. Serum Fibrinogen	
	xii. Screening for coagulation factor inhibitor,	
	Bethesda Assay,	
	xiii. Fibrin Degradation Products (FDP), D-	
	Dimers	
	xiv. Monitoring of anti-coagulant therapy	
	xv. Thrombophilia profile (Lupus	
	anticoagulant (LAC), Anticardiolipin Antibody	
	(ACA), Activated Protein C Resistance (APCR),	
	Protein C (Pr C), Protein S (Pr S) and	The state of the s
	Antithrombin III	
	xvi. Serum ferritin, Serum iron and total iron	-
	binding capacity	
10	Interpret flow cytometry findings in the	Independently
	immunophenotyping of leukemia, CD34	
	enumeration, CD 3/CD 19 enumeration, PNH	
	work up, etc.	,
11	Interpret results of cytogenetics and	Independently
	molecular diagnostics in the work up of	
	hematological diseases	
12	Prepare samples as appropriate for the	Observation only
	indication, and operate equipment such as	
	automated cell counter, flow cytometry,	
	coagulometers, HPLC and electrophoresis	
	apparatus	

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	IV LABORATORY MEDICINE	
1	Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step; be	Independently

	able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis	8
2	with a view to arrive at a diagnosis Perform urine analysis including physical, chemical and microscopic, examination of the sediment as well as by Dipstick methods	Independently
3	Perform macroscopic and microscopic examination of feces and identify the ova and cysts of common parasites.	Independently
4	Perform a complete examination: physical, chemical and cell content of Cerebrospinal Fluid (C.S.F), pleural and peritoneal fluid	Independently
5	Perform semen analysis and interpret results in the context of clinical and hormone findings	Independently
6	Perform quantitative estimation of blood/serum by automated techniques for common biochemical tests	Independently
7	Prepare standard solutions and reagents relevant to common biochemical tests including the preparation of normal solution, molar solution and buffers	Independently
8	Interpret and report common laboratory biochemical tests (LFT, KFT, endocrine function tests) with understanding of clinical implications	Independently
9	Operate, maintain and troubleshoot common equipment used such as photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, PCR, chemiluminescence, etc.	Perform under supervision

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	V. TRANSFUSION MEDICINE	
1	Perform selection and bleeding of donors, ABO and Rh grouping and cross match, antibody screening and titer, selection of blood for exchange transfusion	Independently
2	Resolve ABO grouping problems and outline measures for investigation of transfusion medicine	Independently

3	Perform and interpret anti-globulin test in antenatal and neonatal work up	Independently
4	Prepare blood components such as cryoprecipitates, platelet concentrates, fresh frozen plasma, single donor plasma, red blood cell concentrates, etc. and test blood for presence of pathogens including HBV, HCV, HIV, VDRL, Malaria, etc.	Observation only

Sr No.	Competency	Perform under supervision/perform independently/Observ ational only
	VI. AUTOPSY	
1	Perform an autopsy, dissect various organ complexes, and display the gross findings (Note: An improvised autopsy may also be arranged in places where full autopsy is not possible. Relevant organs from wet specimens in the museum with appropriate clinical history may be arranged for a detailed description and diagnosis. At least ten such improvised autopsies may be discussed by each candidate during the entire duration of the course)	Independently
2	Provide Provisional and Final Anatomic Diagnosis report, major findings correctly and systematically at autopsy, and the Autopsy Protocol as per prescribed instructions	Independently

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	VII. MOLECULAR BIO	DLOGY
1	Interpret results of Polymerase Chain Reaction (PCR), real time PCR, Sanger Sequencing in a given clinical context.	Independently
2	Interpret results of in-situ hybridization (fluorescent and chromogenic) in a given clinical context	Independently

3	Prepare sample by appropriate methods and perform Polymerase Chain Reaction (PCR), real time PCR,	Observation only	
	Sanger Sequencing, and in-situ hybridization including troubleshooting	1	

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	VIII IMMUNOPATHO	DLOGY
1	Interpret direct/ indirect immunofluorescence results in the context of common diseases of the skin, medical renal diseases and autoimmune diseases	Independently
2	Prepare sample by appropriate methods and perform indirect immunofluorescence on a frozen section from skin/ renal biopsy	Perform under supervision

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	IX ELECTRON MICE	ROSCOPY
1	Interpret transmission electron microscopy results in common non- neoplastic and neoplastic diseases	Independently
2	Prepare specimen by appropriate methods and process tissue for electron microscopy, interpret semithin sections and view ultra-thin sections under electron microscope	Observation only

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	X. DI	GITAL PATHOLOGY

1	Navigate and annotate whole slide scanned images	Independently
2	Select and scan slides for digitalization and perform basic image analysis functions such as length measurements, enumeration, etc.	Observation only

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	XI. TEACHING	-
1	Demonstrate different methods of teaching-learning and assessments	Independently
2	Engage and teach undergraduates and paramedical staff in the form of small group teaching and demonstrations	Independently
3	Engage in peer teaching in the form of presenting seminars and journal clubs and be able to use different modes of teaching including PowerPoint projections and charts	Independently

Sr No.	Competency	Perform under supervision/perform independently/Observational only
	XII. RESEAR	СН
1	Write the thesis (and/or a scientific paper) in accordance with the prescribed instructions, as expected of international standards	Independently

TEACHING AND LEARNING METHODS

General principles Acquisition of competencies being the keystone of doctoral medical education, such training should be skills oriented. Learning in the program, essentially autonomous and self-directed, and emanating from academic and clinical work, shall also include assisted learning. The formal sessions are meant to supplement this core effort.

All students joining the postgraduate (PG) courses shall work as full-time (junior) residents/demonstrators during the period of training, attending not less than 80% of the training activity during the calendar year, and participating in all assignments and facets of the educational process. They shall maintain a logbook for recording the training they have undergone, and details of the procedures done during laboratory and clinical postings in real time. Maintenance of e-records of such procedures is encouraged.

The three-year training programme for the MD degree may be arranged in the form of postings to different assignments/laboratories for specified periods as outlined below. The period of such assignments/postings is recommended for 36 months with breaks only for examinations and mandatory postings. Posting schedules may be modified depending on needs, feasibility and exigencies. For facilities not available in the parent institution as well as for additional knowledge and skill, extramural postings may be undertaken. Departments may vary the postings slightly based on the clinical profile of the hospital, within the time period bands given below, however at least the lower limit for each of the four main components of the course must be covered during postings.

Posting schedule:

s. no.	Section/ Subject	Duration in months
1	Surgical Pathology, Autopsy, Immunohistochemistry	11-16
2	Hematology, Laboratory Medicine, and Blood bank	8-10
3	Cytopathology	6-9
4	Basic Sciences, Immunopathology, Cytogenetics, Electron microscopy, Molecular Biology etc. and Research Techniques including Thesis	2-6
- 2	Total	36 (including exam)

Teaching-Learning methods

This should include a judicious mix of demonstrations, symposia, journal clubs, clinical meetings, seminars, small group discussion, case-based learning, simulation-based teaching, self-directed learning, integrated learning, interdepartmental meetings, and any other collaborative activity with the allied departments. Methods with exposure to the applied aspects of the subject relevant to basic/clinical sciences should also be used. The suggested examples of teaching-learning methods are given below but are not limited to these. The frequency of various below mentioned teaching-learning methods can vary based on the subject's requirements, competencies, workload and overall working schedule in the concerned subject. The Pathology resident is expected to sit in reporting every day, having seen the slides the previous day with written descriptions, which should be evaluated daily by the reporting faculty. This is the mainstay of training in all disciplines of Pathology.

A. Lectures:

Didactic lectures should be used sparingly. A minimum of 10 lectures per year in the concerned PG department is suggested. Topics to be selected as per subject requirements All postgraduate trainees will be required to attend these lectures. Lectures can cover topics such as:

- 1. Subject related important topics as per specialty requirement
- 2. Recent advances
- 3. Research methodology and biostatistics
- 4. Salient features of Undergraduate/Postgraduate medical curriculum
- 5. Teaching and assessment methodology.

Topic numbers 3, 4, 5 can be done during research methodology/biostatistics and medical education workshops in the institute.

B. Journal club:

Minimum of once in 1-2 weeks is suggested. Topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.

C. Student Seminar:

Minimum of once every 1-2 weeks is suggested. Important topics should be selected as per subject requirements and allotted for in-depth study by a postgraduate student. A teacher should be allocated for each seminar as faculty moderator to help the student prepare the topic well. It should aim

at comprehensive evidence-based review of the topic. The student should be graded by the faculty and peers.

D. Student Symposium:

Minimum of once every 3 months. A broad topic of significance should be selected, and each part shall be dealt by one postgraduate student. A teacher moderator should be allocated for each symposium and moderator should track the growth of students. The symposium should aim at an evidence- based exhaustive review of the topic. All participating postgraduates should be graded by the faculty and peers.

E. Laboratory work/ Interactive slide and gross sessions:

Minimum - once every 1-2 weeks. Laboratory work, slide and gross specimen teaching sessions should be coordinated and guided by faculty from the department. Various methods like case-based discussions, oral or written quiz, etc. are to be used. Faculty from the department should participate in moderating the teaching-learning sessions.

F. Inter-Departmental colloquium

Faculty and students must attend monthly meetings between the main Department and other department/s on topics of current/common interest or clinical cases. This includes institutional activities such as clinical combined rounds (CCR), clinic-pathological correlation conferences (CPC), and departmental activities like autopsy conferences.

G (a). Rotational clinical / community / institutional postings

Depending on local institutional policy and the subject specialty needs, postgraduate trainees may be posted in relevant departments/ units/ institutions. The aim would be to acquire more in-depth knowledge as applicable to the concerned specialty. Postings would be rotated between various units/departments and details to be included in the specialty-based Guidelines.

Few examples are listed below:

- Laboratory-based specialty units/departments e.g. Biochemistry / Microbiology/ Infection control unit/Laboratory Medicine, Hematology, Blood bank, Transplantation Immunology, Forensic Medicine, Proteomics, etc.
- Medical Education Unit (MEU) or Department of Medical Education (DOME): optional

G(b). Posting under "District Residency Programme" (DRP):

All postgraduate students pursuing MS/MD in broad specialties in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 3rd or 4th, or 5th semester of the Postgraduate programme and the rotation shall be termed as "District Residency Programme" and the PG medical student undergoing training shall be termed as "District Resident".

Every posting should have its defined learning objectives. It is recommended that the departments draw up objectives and guidelines for every posting offered in conjunction with the collaborating department/s or unit/s. This will ensure that students acquire expected competencies and are not considered as an additional helping hand for the department / unit in which they are posted. The PG student must be tagged along with those of other relevant departments for bedside case discussion/basic science exercises as needed, under the guidance of an assigned faculty. Opportunities to present and discuss infectious disease cases through bedside discussion and ward/grand rounds with specialists / clinicians in different hospital settings must be scheduled to address antimicrobial resistance issues and strategies to deal with it.

H. Teaching research skills

Writing a thesis should be used for inculcating research knowledge and skills. All postgraduate students shall conduct a research project of sufficient depth to be presented to the University as a postgraduate thesis under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.

In addition to the thesis project, every postgraduate trainee shall participate in at least one additional research project that may be started or already ongoing in the department. It is preferable that this project will be in an area different from the thesis work. For instance, if a clinical research project is taken up as thesis work, the additional project may deal with community/field/laboratory work. Diversity of knowledge and skills can thereby be reinforced.

I. Training in teaching skills

Medical Education Unit (MEU) or Department of Medical Education (DOME) should train PG students in education methodologies and assessment techniques. The PG students shall conduct UG classes in various courses and a faculty shall observe and provide feedback on the teaching skills of the student.

J. Logbook

During the training period, the postgraduate student should maintain a Logbook indicating the duration of the postings/work done in different laboratories of the Department, rotational postings in Clinical Biochemistry, Blood Bank, Central/ Emergency Laboratory, Department of Microbiology, Forensic Medicine, Radiodiagnosis, District Residency Posting (DRP) and other postings. This should indicate the procedures assisted and performed and the teaching sessions attended.

The logbook entries must be done in real time. The logbook is thus a record of various activities by the student like:

- (1) Overall participation & performance,
- (2) Attendance,
- (3) Participation in teaching sessions,
- (4) Record of completion of pre-determined activities, and
- (5) Acquisition of selected competencies.

The purpose of the Logbook is to:

- a) Help maintain a record of the work done during training,
- b) Enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,
- c) Provide feedback and assess the progress of learning with experience gained periodically.

The Logbook should be used in the internal assessment of the student, should be checked and assessed periodically by the faculty members imparting the training. The PG students will be required to produce completed logbook in original at the time of final practical examination. It should be signed by the Head of the Department. A proficiency certificate from the Head of Department regarding the clinical competence and skillful performance of procedures by the student will be submitted by the PG student at the time of the examination.

The PG students shall be trained to reflect and record their reflections in logbook particularly of the critical incidents. Components of good teaching practices must be assessed in all academic activity conducted by the PG student and at least two sessions dedicated for assessment of teaching skills must be conducted every year of the PG program. The teaching faculty are referred to the NMC Logbook Guidelines uploaded on the Website.

K. Course in Research Methodology

All postgraduate students shall complete an online course in Research Methodology within six months of the commencement of the batch and generate the online certificate on successful completion of the course.

Other aspects

- The Postgraduate trainees must participate in the teaching and training program of undergraduate students and interns attending the department.
- Trainees shall attend accredited scientific meetings (CME, symposia, and conferences) at least once a year.
- Department shall encourage e-learning activities.

- The Postgraduate trainees should undergo training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).
- The Postgraduate trainees must undergo training in information technology and use of computers.

During the training program, patient safety is of paramount importance; therefore, relevant clinical skills are to be learnt initially on the models, later to be performed under supervision followed by independent performance. For this purpose, provision of skills laboratories in medical colleges is mandatory.

ASSESSMENT

A. FORMATIVE ASSESSMENT, i.e., assessment to improve learning

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

Quarterly assessment during the MD training should be based on:

• Case presentation, case work up, case handling/management : once a week

• Laboratory performance : twice a week

• Journal club : once a week

Seminar : once a fortnight

Case discussions
 once a fortnight/month

• Interdepartmental case or seminar : once a month

Note:

- These sessions may be organized and recorded as an institutional activity for all postgraduates.
- Attendance at Scientific meetings, CME programmes (at least 02 each)

The student to be assessed periodically as per categories listed in appropriate (non-clinical/clinical) postgraduate student appraisal form (Annexure I).

B. SUMMATIVE ASSESSMENT, i.e., assessment at the end of training

Essential pre-requisites for appearing for examination include:

- 1. **Logbook** of work done during the training period including rotation postings, departmental presentations, and internal assessment reports should be submitted.
- **2**. At least **two presentations** at state/national level conference. One paper (thesis or non-thesis related work) should be published /accepted/publication draft in an indexed journal.

The summative examination would be carried out as per the Rules given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

The postgraduate examination shall be in three parts:

1. Thesis

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student in broad specialty shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. Theory examination

The examinations shall be organized based on 'Grading 'or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill, and competence at the end of the training, as given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination. The examination for M.D./ M.S shall be held at the end of 3rd academic year.

There shall be four theory papers (as per PG Regulations). *

Paper I: Basic sciences as applied to the subject (general pathology, pathophysiology, immunopathology, and molecular biology).

Paper II: (Systemic pathology – surgical and cytopathology).

Paper III: (Hematology, transfusion medicine and laboratory medicine including instrumentation and quality control).

Paper IV: Recent advances in the subject.

Pattern of theory Paper (as proposed by the committee after discussion with External Expert):

The theory question paper shall be a combination of long and short answer type questions.

There shall be:

Five questions of 10 mark each; at least one question should be a structured question to evaluate comprehensive in-depth knowledge.

Five questions of 10 mark each and each question shall have two parts of 5 marks each.

3. Practical/clinical and Oral/viva voce examination

Practical examination

Practical examination should be spread at least over two days for each student and include various major components of the syllabus focusing mainly on the psychomotor domain.

Oral/Viva voce examination on defined areas should be conducted by each examiner separately. Oral examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject focusing on psychomotor and affective domain.

The final clinical examination in broad specialty clinical subjects should include:

- Cases pertaining to major systems (e.g., one long case and three short cases),
- Stations for laboratory, procedural and communication skills,
- Logbook Records and reports of day-to-day observation during the training,
- It is emphasized that Oral/viva voce examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject.

The practical examination in Pathology should follow general guidelines outlined below which may be modified according to local university guidelines and should be spread over at least two days. The following marks distribution is suggested:

Marks Distribution (as per NMC guidelines):*

Theory (as proposed by members of Post Graduate Board of Studies for Pathology)

	Market Additional Conference of the last		
Paper I		:	100 marks
Paper II		:	100 marks
Paper III		:	100 marks
Paper IV		:	100 marks
Total Theory marks	(A)	:	400 marks
Practical	(B)	:	400 marks
Internal Assessment	(C)		100 marks
Grand Total	(A+B+C)	:	900 marks

*Guidelines regarding marks distribution of theory examination have not been mentioned in the available NMC document. The committee recommends that marks distribution may be finalized by the Academic Council of AMRU, Ner Chowk, to have uniform pattern with MD/MS courses of other subjects.

Section I: Histopathology: 150 marks

- Slides (12-15)
- Grossing/autopsy
- Long case (write a full description with clinical information provided) and/or 2 biopsy cases with ancillary tests reporting (written work only, no viva)

Section II: Cytopathology and histo/cyto techniques: 80 marks

- Slides (5-8)
- Histo/Cyto techniques
- Special stain exercise
- Immunopathology, OSPE, EM

Section III: Hematology, transfusion medicine and clinical pathology: 120 marks

- Slides
- Exercises
- Case study
- Blood bank
- Clinical pathology exercises and OSPE

Section IV: Viva, basic sciences, and communication skills: 50 marks

- Pedagogy/thesis presentation
- Oral viva
- Basic Sciences

Details of exercises in individual sections:

I. Clinical Pathology:

- Discussion of a clinical case history.
- Plan relevant investigations of the above case and interpret the biochemistry findings.
- Two investigations should be performed including at least one clinical pathology exercise like CSF, pleural tap etc. analysis and complete urinalysis.

II. Haematology:

- Discuss hematology cases given the relevant history. Plan relevant investigations.
- Perform complete hemogram and at least two tests preferably including one coagulation exercise.

- Identify electrophoresis strips, osmotic fragility charts etc., interpretation of data from auto analyzers, HPLC and flow cytometry.
- Examine, report, and discuss around ten cases given the history and relevant blood smears and/or bone marrow aspirate smears and bone marrow biopsy interpretation.

III. Transfusion Medicine:

- Perform blood grouping
- Perform the necessary exercise like cross matching.
- Coomb's test, gel cards interpretation.

IV. Histopathology and cytopathology:

- Examine, report, and discuss 12-15 cases histopathology and 5-8 cytopathology cases, given the relevant history and slides.
- Perform a Hematoxylin and Eosin stain and any special stain on a paraffin section. Should be conversant with histopathology techniques including cryostat.
- Long case (write a full description with clinical information provided) and/or 2 biopsy cases with ancillary tests reporting

V. Autopsy:

• Given a case history and relevant organs (with or without slides), give a list of anatomical diagnosis in an autopsy case.

VI. Gross Pathology

• Describe findings of gross specimens, give diagnosis, and identify the sections to be processed. The post graduate student should perform grossing in front of the examiners for evaluation.

VII. Basic Sciences:

- 10-15 spots based on basic sciences be included
- Identify electron micrographs
- Identify gels, results of PCR, immunological tests including interpretation of Immunofluorescence pictures, etc.
- Identify histochemical and immuno-histochemistry stains

VIII. Teaching exercise

- Teach on a small topic for about 10 min or present dissertation and research
- General Viva-Voce (Grand Viva): Structured viva may be done separately or combined with above exercises

RECOMMENDED BOOKS AND JOURNALS

A. Books (latest edition)

- 1. Histology for Pathologists. Stacey E Mills, Wolters Kluwer.
- 2. General Pathology JB Walter, MS Israel. ELESVIER.
- Robbin's Pathologic Basis of Disease Vinay Kumar, Abul K Abbas, Jon C. Aster, Jerrold R Turner, Elsevier.
- 4. Pathology Emanuel Rubin, John L Farber. JB Lippincott Co.
- 5. Anderson's Pathology. John M Kissane (Ed). The CV Mosby Co., St. Louis.
- 6. Ackerman's Surgical Pathology. ELESEVIER.
- 7. Diagnostic Surgical Pathology. Stephen S Sternberg. Walters Kluver
- 8. Systemic Pathology. W St. C Symmers (Series Ed) Churchill Livingstone.
- Diagnostic Histopthology of Tumours. Christopher DM Fletcher (Ed). Churchill Livingstone. Edin
- 10. Enzinger Soft Tissue Tumors. Jhon R Goldbum Andrew L Folpe, Sharon W Weiss. ELESEVIER.
- 11. Cardiovascular Pathology Malcolm D Silver Churchill Livingstone.
- 12. Pathology of Pulmonary Diseases Mario J Saldhana. JB Lippincott Co.
- 13. Spencer's Pathology of the Lung. PS Hasleton. Cambridge, Medicine.
- 14. Dahlin's Bone Tumors. K Krishnan Unni. Walters Kluver, Lippincott.
- 15. Bone Tumours Andrew G Huvos WB Saunders Co.
- 16. Greenfield's Neuropathology. J Hume Adams, Hodder education.
- 17. Rosen's Breast Pathology. Paul Peter Rosen. Walters Kluver/Lippincott.
- 18. Pathology of the Gastrointestinal Tract. S-I Chun Ming. Harvey Goldman (Eds.) Williams & Wilkins.

- Haynes and Taylor Obstetrical & Gynaecological Pathology. H Fox, M Wells. Churchill Livingstone.
- Heptinstall's Pathology of the Kidney. J Charles Jenette, Jean L Olson, Melvin M Schwartz, Fred G Silva (Eds.). Walters Kluver.
- 21. Potter's Pathology of the Fetus & Infant. Enid Gilbert-Barnes (Ed). Mosby.
- 22. Lever's Histopathology of the Skin, David Elder (Ed), Walters Kluver.
- 23. Theory and Practice of Histological Techniques, Suvarna SK, Layton C BancroftJD, ELESEVIER.
- Histotechnology A Self Instructional Text, Carson FL, American Society of Clinical Pathologists
- 25. Histochemistry Theoretical and Applied. AG Everson Pearse. Churchill Livingstone.
- 26. Manual & Atlas of Fine Needle Aspiration Cytology. Svante R Orell, Gregory F Sterrett. Churchill Livingstone.
- 27. Diagnostic Cytology and its Histopathologic Basis, Koss LG, Melamed MR. Walters Kluver.
- 28. Comprehensive Cytopathology, Bibbo M, Wilbur D. W.B. Saunders Co.
- 29. William's Hematology Beutler E, Lichtmann MA, Coller BS, Kipps TJ, McGraw Hill.
- 30. Postgraduate Hematology Hoffbrand AV, Lewis SM, Tuddenham EGD, Butterworth Heinemann. Wiley Blackwell.
- 31. Wintrobe's Clinical Hematology, Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN, Walters Kluver/Lipincott.
- 32. Practical Haematology, Dacie JV, Lewis SM, ELESEVIER.
- 33. Bone Marrow Pathology, Bain BJ, Clark DM, WILKINS BS. WILEY BLACKWELL.
- 34. Leukemia Diagnosis- A guide to the FAB Classification, Bain BJ, J.B. Lippincott.
- 35. Clinical Diagnosis and Management by Laboratory Methods, Henry JB, ELESEVIER.
- 36. Atlas and Text of Hematology 4th edition. Singh T. Avichal Publishing Company.
- 37. WHO classification of tumors. IARC Lyon

B. Recommended Journals

International Journals : At least 03 to 05

National (all indexed) Journals: At least 02

Recommended Journals

- 1. Acta Cytologica
- 2. The American Journal of Pathology
- 3. The American Journal of Surgical Pathology
- 4. The American Journal of Hematology
- 5. The American Journal of Clinical Pathology
- 6. Archives of Pathology and Laboratory Medicine
- 7. British Journal of Haematology
- 8. Blood
- 9. Diagnostic Cytopathology
- 10. Histopathology
- 11. Human Pathology
- 12. Nature and Science
- 13. Indian Journal of Cytology
- 14. Indian Journal of Pathology and Microbiology
- 15. Journal of Pathology
- 16. Journal of Clinical Pathology
- 17. Laboratory Investigation
- 18. Modern Pathology
- 19. Pathology
- 20. Seminars in Hematology
- 21. Seminars in Diagnostic Pathology
- 22. Virchows Archives
- 23. Year Book Series
- 24. Recent Advances Series
- 25. New England journal of Pathology
- 26. Lancet
- 27. Cancer

Online Journals should also be available in addition to the hard copies.

The list of journals is incomplete. It is also expected that the students make it a habit to read other journals because pathology is not confined to pathology journals alone. Specialty journals such as those related to oncology (British Journal of Cancer, International Journal of Cancer, Cancer Research, Journal of National Cancer Institute, Journal of Surgical Oncology etc.) are excellent sources of information regarding the pathology of

tumours. Similarly journals related to Cardiology, Chest Diseases, Dermatology, Endocrinology, Gynecology, Gastroenterology, Hepatology, Nephrology, Neurology, Neurosurgery, etc. are invaluable sources of material on the appropriate pathology. Further Journals such as Lancet, New England Journal of Medicine, Nature and Science are a must for every postgraduate student who wishes to keep abreast with what is new in medical science and therefore in Pathology.

Annexure I

	Student apprais	al f	orn	n fo	r Pa	thc	logy	/			
		Less than Satisfactory		Sat	Satisfactory		More than satisfactory			Comments	
		1	2	3	4	5	6	7	8	9	2
1	Scholastic aptitude and learning							=			
1.1	Has knowledge appropriate for level of training		5								
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g. Posters, publications etc)										15
1.4	Documentation of acquisition of competence (e.g. Log book)										
1.5	Performance in work based assessments					725		-			
1.6	Self-directed Learning										
2	Work related to training										
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										D

0	1	n	S.		
	£)	
4	6		1		
				_	

				0.				
2.3	Ability to work with other members of the team	150						
2.4	Participation and compliance with the quality improvement process at the work environment						£	
2.5	Ability to record and document work accurately and appropriate for level of training)					
3	Professional attributes							
3.1	Responsibility and accountability							
3.2	Contribution to growth of learning of the team							
3.3	Conduct that is ethically appropriate and respectful at all times							
4	Space for additional comments				<i>*</i> **			
5	Disposition							
	Has this assessment pattern been discussed with the trainee?	Yes No			If no	t exp	lain:	
	Name and Signature of the assesse			12				
	Name and Signature of the assessor							:00
	Dated							

Annexure II

Logbook

Name	Gender
DOB	
Address	
Phone number	
University Roll No	

candidate:				
Signature of th	ne Head of the			
Department				
				26
SECTION OF	POSTING			
w.e.f	To.	•••••••••••	••••	
Dated	Activity	Signature of the candidate	Remarks by the consultant	Signature of the consultant
			4	

Signature of the

	700		-
	- T		
ž		A	
		- ,	
		12	
			- ac
	e ¹		
	20	1	

Period/	Number	of	days	of	leave	during	Posting: