



PRAVARA INSTITUTE OF MEDICAL SCIENCES
(DEEMED TO BE UNIVERSITY)

Loni, Tal. Rahata, Dist. Ahmednagar 413736

NAAC Re-accredited with 'A' Grade

SYLLABUS

PG Programme- Pathology

(Competency Based Post Graduate Curriculum will be implemented from 2022, i.e. PG students batch admitted from 2022 onwards)

Curriculum

MD PATHOLOGY

(COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN PATHOLOGY)

GOAL:

The goal of postgraduate medical education shall be to produce competent specialist.

- (i) Who shall recognize the health needs of the community and carry out professional obligation ethically and in keeping with the objectives of the national health policy;
- (ii) Who shall have mastered most of the competencies, pertaining to the specialty that is required to be practiced at the secondary and tertiary levels of the healthcare delivery system.
- (iii) Who shall be aware of contemporary advances and developments in the discipline concerned
- (iv) Who shall be able to organize and establish clinical laboratory.
- (v) Who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology.
- (vi) Who shall be able to teach and share his knowledge and competence with others. He / She should be imparted training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges/Institutes.

SUBJECT SPECIFIC LEARNING OBJECTIVES

The learning objectives in the cognitive, psychomotor and affective domains are:

A. Cognitive Domain

1. Diagnose routine and complex clinical problems on the basis of histopathology (surgical pathology) and cytopathology specimens, blood and bone marrow examination and various tests of Laboratory Medicine (clinical pathology, clinical biochemistry) as well as Blood Banking (Transfusion Medicine).
2. Interpret clinical and laboratory data with reasonable accuracy and prepare a succinct and lucid report. Compose reports following standard protocols including synoptic reporting.
3. Interpret and correlate clinical and laboratory data so that clinical manifestations of diseases can be explained.
4. Advise on the appropriate specimens and tests necessary to arrive at a diagnosis in a problematic case.
5. 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).
6. Maintain quality control of all tests by being part of Internal Quality Control Monitoring program. Make and record observations systematically and maintain accurate records of tests and

- their results for reasonable periods of time. Identify problems in the laboratory, offer solutions thereof and maintain a high order of quality control.
7. Capable of safe and effective disposal of laboratory waste.
 8. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel. 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.
 9. Plan, execute, analyse and present research work independently or as part of a team. 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 life-long learner.
 10. Able to supervise and work with subordinates and colleagues in a laboratory.

B. Affective Domain

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor Domain

1. Able to perform routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin and frozen sections, making smears, and staining.
2. 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, and provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an imaging guided biopsy.
3. Perform an autopsy, dissect various organ complexes and display the gross findings.
4. Should be familiar with the function, handling and routine care of equipments in the laboratory.

SUBJECT SPECIFIC COMPETENCIES:

A. Cognitive domain:

A post graduate student upon successfully qualifying in the MD (Pathology) examination should have acquired the following broad theoretical competencies and should be:

1. Capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis and overall wellbeing of the ill.
2. Conversant with the standard operating procedures of various laboratories including histopathology, cytopathology, hematology and laboratory medicine.
3. 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.
4. 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.

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.

C. Psychomotor domain

At the end of the course, the student should have acquired skills, as described below:

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.

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

A. Surgical Pathology

Knowledge

1. The student should be able to demonstrate an understanding of the histogenetic and patho-physiologic processes associated with various lesions.
2. Should be able to identify problems in the laboratory and offer viable solutions.
3. Possess the background knowledge necessary for the evaluation and reporting of Surgical Pathology.
4. Should be conversant with the various equipments used in the histopathology laboratory. Should have knowledge of automation and quality assurance in histopathology.

Skills

1. Given the clinical and operative data, the student should be able to identify, and systematically and accurately describe the chief gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose at least 80% of the lesions received on an average day from the surgical service of an average teaching hospital.
2. A student should be able to demonstrate ability to 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.

3. The student should be able to identify and systematically and accurately describe the chief histo-morphological alterations in the tissue received in the surgical pathology service. He/she should also correctly interpret and correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day.
4. Be conversant with automatic tissue processing machine and the principles of its running.
5. Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.
6. Stain paraffin sections with at least the following:
 - a. Haematoxylin and eosin
 - b. Stains for collagen, elastic fibers and reticulin
 - c. Iron stain
 - d. PAS stain
 - e. Acid fast stains
 - f. Any other stains needed for diagnosis.
7. Demonstrate understanding of the principles of:
 - a. Fixation of tissues
 - b. Processing of tissues for section cutting
 - c. Section cutting and maintenance of related equipment
 - d. Differential (special) stains and their utility
8. Cut a frozen section using cryostat, stain and interpret the slide in correlation with the clinical data provided.
9. Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtypes.

B. Cytopathology

Knowledge

1. Should possess the background necessary for the evaluation and reporting of cytopathology specimens.
2. Demonstrate familiarity with the following, keeping in mind the indication for the test.
 - a) Choice of site from which smears may be taken
 - b) 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. (urine sample, gastricsmear, colonic lavage etc.)
 - c) Be conversant with the principles and preparation of solutions of stains.
3. Should be Conversant with the various equipment used in the cytopathology laboratory.
4. Should have knowledge of automation and quality assurance in cytopathology.

Skills

1. Independently prepare and stain good quality smears for cytopathologic examination.
2. Be conversant with the techniques for concentration of specimens: i.e. various filters, centrifuge and cytocentrifuge.
3. Independently be able to perform fine needle aspiration of all lumps in patients; make good quality smears, and be able to decide on the types of staining in a given case.
4. Given the relevant clinical data, he/she should be able to independently and correctly: Diagnose at least 75% of the cases received in a routine laboratory and categorize them into negative, inconclusive and positive.
5. Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.
6. Indicate correctly the type of tumour, if present
7. Identify with reasonable accuracy the presence of organisms, fungi and parasites

C. Haematology**Knowledge**

1. Should demonstrate the capability of utilising the principles of the practice of Haematology for the planning of tests, interpretation and diagnosis of diseases of the blood and bone marrow.
2. Should be conversant with various equipments used in the Haematology laboratory.
3. Should have knowledge of automation and quality assurance in Haematology.
4. Correctly plan a strategy of investigating at least 90% of the cases referred for special investigations in the Hematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.

Skills

1. Correctly and independently perform the following special tests, in addition to doing the routine blood counts:
 - a. Haemogram including reticulocyte and platelet counts.
 - b. Bone marrow staining including stain for iron
 - c. Blood smear staining
 - d. Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase
 - e. (LAP), PAS, Sudan Black, etc.
2. Hemolytic anemia profile including HPLC, Hb electrophoresis etc.
3. Coagulation profile including PT, APTT, FDP.
4. BM aspiration and BM biopsy
 - a. Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving
5. Demonstrate familiarity with the principle and interpretation of results and the utility in diagnosis of the following:
 - a. Platelet function tests including platelet aggregation and adhesion and PF3 release
 - b. Thrombophilia profile:
 - c. Lupus anticoagulant (LAC),
 - d. Anticardiolipin Antibody (ACA), Activated Protein C
 - e. Resistance (APCR), Protein C (Pr C), Protein S (Pr S) and
 - f. Antithrombin III (AT III)
 - g. Immunophenotyping of leukaemia
 - h. Cytogenetics, Molecular diagnostics.
6. Arrive at a correct diagnosis in at least 90% of the cases referred to the Haematology clinic, given the relevant clinical data.

D. Laboratory Medicine**Knowledge**

1. Possess knowledge of the normal range of values of the chemical content of body fluids, significance of the altered values and its interpretation.
2. Possess knowledge of the principles of following specialized organ function tests and the relative utility and limitations of each and significance of the altered values.
 - a) Renal function tests
 - b) Liver function tests
 - c) Endocrine function tests
 - d) Tests for malabsorption
3. Know the principles, advantages and disadvantages, scope and limitation of automation in the laboratory.

4. Know the principles and methodology of quality control in the laboratory.

Skills:

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 able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.
2. Demonstrate familiarity with and successfully perform:
 - a. routine urinalysis including physical, chemical and microscopic, examination of the sediment.
 - b. Macroscopic and microscopic examination of faeces and identify the ova and cysts of common parasites.
 - c. Complete examination: physical, chemical and cell content of Cerebrospinal Fluid (C.S.F), pleural and peritoneal fluid;
 - d. Semen analysis.
 - e. Examination of peripheral blood for commonly occurring parasites.
 - f. Independently and correctly perform at least the following quantitative estimations by manual techniques and/or automated techniques.
 - Blood urea
 - Blood sugar
 - Serum proteins (total and fractional)
 - Serum bilirubin (total and fractional)
 - g. Demonstrate familiarity with the following quantitative estimations of blood/serum by Automated Techniques:
 - h. Serum cholesterol, Uric acid, Serum Transaminases (ALT and AST/SGOT and SGPT), etc.
3. Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and buffers.
4. Explain the principles of Instrumentation, use and application of the instruments commonly used in the labs eg. Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, flow cytometer, PCR, chemiluminescence.

E. Transfusion Medicine (Blood Banking)**Knowledge**

1. The student should possess knowledge of the following aspects of Transfusion Medicine.
2. Basic immunology
3. ABO and Rh groups
4. Clinical significance of other blood groups
5. Transfusion therapy including the use of whole blood and RBC concentrates
6. Blood component therapy
7. Rationale of pre-transfusion testing.
8. Infections transmitted in blood.
9. Adverse reactions to transfusion of blood and components
10. Quality control in blood bank

Skills

The student should be able to correctly and independently perform the following:

1. Selection and bleeding of donors
2. Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.
3. ABO and Rh grouping.
4. Demonstrate familiarity with Antenatal and Neonatal work up.

- a. Direct antiglobulin test
- b. Antibody screening and titre
- c. Selection of blood for exchange transfusion
5. Demonstrate familiarity with principle and procedures involved in:
 - a. Resolving ABO grouping problems.
 - b. Identification of RBC antibody.
 - c. Investigation of transfusion reaction.
 - d. Testing of blood for presence of:
 - i. HBV (Hepatitis B Virus Markers).
 - ii. HCV (Hepatitis C Virus Markers)
 - iii. HIV (Human Immunodeficiency Virus Testing)
 - iv. VDRL
 - v. Malaria

F. Autopsy Pathology

Knowledge

1. Should be aware of the technique of autopsy.
2. Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological correlation can be made.
3. Demonstrate ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions. Correctly identify all major lesions which have **caused, or contributed to the patient's death, on macroscopic examination alone and on microscopy in at least 90% of the autopsies in an average teaching hospital.**
4. In places where non-medico-legal autopsies are not available each student should be made to observe at least five medico-legal autopsies.
5. Write correctly and systematically Provisional and Final Anatomic Diagnosis reports.

G. Basic Sciences (in relation to Pathology)

1. Immunopathology

Knowledge

- a) Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.
- b) Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in clinical and experimental studies relating to immunology.
 1. ELISA techniques
 2. Radioimmunoassay
 3. HLA typing
- c) Interpret simple immunological tests used in diagnosis of diseases and in research procedures.
 1. Immunoelectrophoresis
 2. Immunofluorescence techniques especially on kidney and skin biopsies
 3. Anti-nuclear antibody (ANA)
 4. Anti-neutrophil cytoplasmic antibody (ANCA)

b) Electron Microscopy

Knowledge

- a) Demonstrate familiarity with the principles and techniques of electron microscopy and the working of an electron microscope (including Transmission and Scanning Electron microscope: TEM and SEM).
- b) Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

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

c) Enzyme Histochemistry**Knowledge**

- a) Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures (Alkaline Phosphatase, Acid Phosphatase, Glucose-6-Phosphate Dehydrogenase, Chloroacetate Esterase).

d) Immunohistochemistry and flow cytometry**Knowledge**

- a) Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase-antiperoxidase) and AP-AAP (Alk. Phosphatase-anti-Alk. Phosphatase) ABC (Avidin-Biotin Conjugate) systems; employing monoclonal and polyclonal antibodies including automation in procedure and interpretation..
- b) Be aware of the limitations of immuno-histochemistry.
- c) Demonstrate familiarity with the principles and procedures of performing flow cytometry.

Skills (desirable)

1. Be able to perform immuno-histochemical staining using paraffin section with at least one of the commonly used antibodies (Cytokeratin or LCA) using PAP method.

e) Cytogenetics and Molecular biology**Knowledge**

- a) Demonstrate familiarity with the principles of molecular biology 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,
- b) Should understand the principles of molecular biology especially related to the understanding of disease processes and its use in various diagnostic tests.
- c) Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).
- d) Should be conversant with the principle and steps and interpretation of Polymerase Chain Reaction (PCR), Western Blot, Southern Blot, Northern Blot, Sanger Sequencing, Next generation sequencing and Hybridisation procedures.

f) Tissue Culture**Knowledge**

- a) Demonstrate familiarity with methods of tissue culture.

g) Principles of Medical Statistics**Knowledge**

- a) Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies.

H. Quality Control

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

I. Laboratory Safety and Good clinical lab practices

1. Demonstrate familiarity with 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.

J. Biomedical Waste Management

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

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

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

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

1. 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.
2. Possess knowledge about the methods of writing thesis and/or a research paper with the prescribed instructions, as expected of international standards.

M. Conversant with the use of digital slide imaging, algorithms to evaluate findings in imaging, morphometry, and application of artificial intelligence.

Syllabus

Course contents:

- ❖ **It is difficult to give a precise outline of the Course Contents for post graduate training. A post graduate 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.
- ❖ **A brief outline of what is expected to be learnt during the MD Course is under following head:**
 - **General Pathology:**
 - Normal cell and tissue structure and function.
 - The changes in cellular structure and function in disease.
 - Causes of disease and its pathogenesis.
 - Reaction of cells, tissues, organ systems and the body as a whole to various sub lethal and lethal injuries.
 - **Systemic Pathology:**
 - The study of normal structure and function of various organ systems and the aetiopathogenesis, gross and microscopic alterations of structure of these organ systems in disease and functional correlation with clinical features.
 - **Haematology**
 - The study of Haematology 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.
 - **Laboratory Medicine (Clinical Biochemistry/Clinical Pathology including Parasitology).**
 - **Transfusion Medicine (Blood Banking).**
 - **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
- Molecular Biology
- Maintenance of records
- Information retrieval, use of Computer and Internet in medicine.
- Quality control, waste disposal

❖ **COGNITIVE DOMAIN:**

A. General Pathology:

a. Normal cell and tissue structure and function:

- i. The changes in cellular structure and function in diseases.
- ii. Causes of disease, its pathogenesis, reaction of cells, tissues, organ systems, and the body to various sub lethal and lethal injuries.
- iii. Cellular adaptation, cell injury, and cell death.
- iv. Mechanism, morphology and examples of cell injury, necrosis, apoptosis, autophagy, and newer forms of cell death including necroptosis and pyroptosis.
- v. Sub cellular and cellular responses and adaptation to injury.
- vi. Intracellular and intercellular accumulations, pathological calcification, and cell aging.

b. Acute and chronic inflammation:

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

c. Hemodynamic disorders, thromboembolic disease, and shock:

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

d. Genetic Disorders

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

e. Neoplasia

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

f. Infectious Diseases

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

g. Environmental and nutritional pathology

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

- h. Disease of Infancy and Childhood**
- i. Congenital anomalies, birth injuries, diseases of neonates, inborn errors of metabolism, tumor, and tumor like lesions of infancy and childhood.
- i. Immunopathology**
- i. Innate immunity- Role of phagocytic cells, complement, mast cells & humoral mechanisms.
 - ii. Specific Acquired Immunity- Details about antibody production & action, Brief principles about memory, Ag specificity & vaccination.
 - iii. Cell involved in Immune response- T- Lymphocytes, B-lymphocytes, macrophages, dendritic cells, and natural-killer cells.
 - iv. Cytokines with details about their properties and functions.
 - v. Structure and function of histocompatibility molecules and disease association.
 - vi. Disorders of the immune system.
 - vii. All hypersensitivity reactions.
 - viii. 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.
 - ix. Immunodeficiency syndrome – Acquired with emphasis on AIDS.
 - x. Amyloidosis including pathogenesis, special stains & clinical correlation.
 - xi. Transplant rejection in detail.
 - xii. 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 function and correlation with clinical features.
- a. Blood vessels, lymphatic and veins**
- i. Normal morphology, congenital anomalies, atherosclerosis, hypertensive vascular disease.
 - ii. Inflammatory and neoplastic diseases of all the vessels.
- b. Heart**
- i. Normal morphology, its blood supply and effect of aging on heart.
 - ii. Ischemic, Hypertensive, valvular, congenital heart diseases.
 - iii. Cardiomyopathies
 - iv. Myocardial disorders
 - v. Pericardial diseases.
 - vi. Tumors of the heart.
- c. Lungs and Mediastinum**
- i. Congenital anomalies
 - ii. Obstructive and restrictive pulmonary diseases
 - iii. Diseases of vascular origin
 - iv. Infections of Lung
 - v. Infections of Mediastinum
 - vi. Tumors of lung
 - vii. Lung transplantation
 - viii. Diseases of pleura
 - ix. Thymus – Developmental, autoimmune, and inflammatory disorder and tumors.
- d. Head and Neck**
- i. Oral cavity: - inflammatory disease, Preneoplastic lesions and tumors.
 - ii. Diseases of teeth and supporting structures.
 - iii. Upper airways and ear – congenital anomalies, infections, and tumors.

- iv. Salivary glands – Infections autoimmune disorders and tumors.
- e. **Gastrointestinal Tract**
 - i. Congenital anomalies, infections, inflammatory and vascular disorders and tumors of esophagus, stomach, small and large intestines, appendix, and anal canal.
 - ii. Diseases of the peritoneum, Omentum and Mesentery Retroperitoneum.
 - iii. Inflammatory and neoplastic lesions.
- f. **Liver**
 - i. Normal morphology with general features of hepatic disease including LFTs.
 - ii. Infectious, autoimmune drug induced metabolic and circulatory disorders of liver.
 - iii. Hepatic diseases associated with pregnancy, neonates, organ and bone marrow transplantation.
 - iv. Liver transplantation pathology.
 - v. Cysts, Nodules, and tumors of liver.
- g. **Biliary tract**
 - i. Congenital anomalies, injuries, Infection, inflammation, of Gallstones and tumors of gallbladder and extra hepatic bile ducts. Pancreas.
 - ii. Congenital anomalies, pancreatitis, and neoplasms of pancreas.
- h. **Kidney**
 - i. Clinical manifestations of renal diseases
 - ii. Congenital anomalies
 - iii. Diseases affecting glomeruli, tubules, interstitium and blood vessels.
 - iv. Cystic diseases of kidney
 - v. Nephrolithiasis
 - vi. Tumors of kidney
 - vii. Kidney Transplant pathology
- i. **Lower urinary tract and male genital system**
 - i. Congenital anomalies, inflammation and tumors of bladder, ureter, urethra, penis, testis, epididymis, and Scrotum.
 - ii. Inflammation, enlargement, and tumors of prostate.
- j. **Female genital tract**
 - i. Physiology, cytology and histology of female genital tract, menstrual disorders, and hormonal abnormalities.
 - ii. Congenital anomalies, inflammation, preneoplastic and neoplastic lesions of vulva, vagina, cervix, uterus, fallopian tubes, ovaries and mesonephron.
 - iii. Gestational and placental disorders.
- k. **Breast**
 - i. Inflammations, benign epithelial lesions, and tumors of the breast.
 - ii. Diseases of male breast.
- l. **Endocrine System**
 - i. Normal hormonal levels and functions of all the endocrine glands.
 - ii. Hypo and hyperactivity of glands of endocrine system i.e., pituitary, thyroid, parathyroid, pancreas, adrenals, and pineal gland.
 - iii. Autoimmune diseases, inflammations and tumors affecting these glands,
 - iv. Neuroendocrine tumors,
- m. **Skin and Subcutaneous tissue**
 - i. Disorders of pigmentation and melanocytes,
 - ii. Inflammatory, vesiculobullous, and infectious disease,
 - iii. Proliferative lesions and Tumors of the epidermis, dermis, and skin appendage.

- n. Musculoskeletal system**
 - i. Bone Modelling, growth, and development, genetic and acquired abnormalities in bone cells, matrix and structure, fractures, necrosis and infections of bones, tumors and tumor-like lesions,
 - ii. Joints: Arthritis, tumor, and tumor-like lesions.
 - iii. Soft tissue: Tumors and tumor-like lesions.
 - o. Peripheral nerves and skeletal muscles**
 - i. General reactions of motor units.
 - ii. Inflammatory, infectious, hereditary, metabolic, and traumatic neuropathies.
 - iii. Atrophy, dystrophy, myopathies of the skeletal muscles.
 - iv. Diseases of neuromuscular junction.
 - v. Tumors of peripheral nerves and skeletal muscles.
 - p. Skull and Central Nervous System**
 - i. Degenerative, metabolic, toxic, demyelinating, infectious, cerebrovascular malformations, and traumatic injuries.
 - ii. Tumors.
 - q. Eye and Orbit**
 - i. Infections, inflammatory, congenital diseases and neoplasms of orbit, eyelid, conjunctiva, sclera, uvea, cornea, retina, and optic nerves.
- C. Hematology and Transfusion medicine**
- i. 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**
 - ii. Overview of stem cell biology and cellular biology of hematopoiesis.
 - iii. Transcription factors and humoral regulation in normal and malignant hematopoiesis.
 - iv. Interaction between hematopoietic stem cells, progenitor cell and stromal compartment of bone marrow.
 - v. Stem cell homing & mobilization.
- b. Erythroid maturation, differentiation, and abnormality**
- i. Pathobiology of human erythrocyte & Hemoglobin Anemia.
 - ii. Approach to anemia in adults and children in: Clinical correlation & diagnostic modalities.
 - iii. Classification of anemias (Morphological, pathophysiological, and based on erythropoiesis i.e., proliferative vs non-proliferative).
 - iv. Iron deficiency anemia including iron metabolism and differential diagnosis from other microcytic hypochromic anemias.
 - v. Disorder of iron metabolism including iron overload.
 - vi. Anemia of chronic disorders with special reference to infections, collagen vascular disorders, inflammation etc.
 - vii. Megaloblastic anemia and other causes of megaloblastosis.
 - viii. Definition, approach, and classification of hemolytic anemia.
 - ix. Lab diagnosis of Hemoglobin disorders and hereditary anemia like Thalassemia and related hemoglobinopathies, sickle cell anemia.
 - x. Hemoglobin associated with altered Oxygen affinity.
 - xi. Red blood cell enzymopathy, membrane disorder, autoimmune hemolytic anemia, non-immune hemolytic anemia, paroxysmal nocturnal hemoglobinuria.
 - xii. Approach to Pancytopenia/ Cytopenia.
 - xiii. Bone marrow failure syndrome.
 - xiv. Porphyria.

- c. WBC disorders, complement and immunoglobulin biology**
 - i. Normal granulopoiesis.
 - ii. Acquired and congenital disorders of phagocytosis (neutrophil, monocyte, eosinophil, and macrophages).
 - iii. Disorder of leukocyte number, function, and morphology.
 - iv. Storage disorder
- d. Hematological responses to Infections**
 - i. Viral disorders - Infectious mononucleosis, Hepatitis, and dengue.
 - ii. Parasitic infections - Malaria, Kala azar.
- e. Hematological malignancies**
 - i. Conventional & molecular cytogenetic and immunohistochemical basis of hematological malignancies.
 - ii. Classification (WHO, ICC).
 - iii. Their basis and diagnostic approach to various hematological malignancies.
 - iv. Pathophysiology, prognostic factors, cytochemistry, cytogenetics of various leukemias.
 - v. Pathophysiology and classification of MDS, MPN/MDS, myeloproliferative disorders.
 - vi. Pathophysiology of Non-Hodgkin's lymphoma, Clinical staging of Hodgkin's lymphoma.
 - vii. Role of molecular cytogenetics and immunohistochemistry in Hodgkin's and Non-Hodgkin's lymphoma and lymphoproliferative disorders.
 - viii. AIDS related and Transplant related lymphomas.
 - ix. Plasma cell dyscrasias and gammopathies.
 - x. Mastocytosis.
 - xi. Role of chemotherapy and antineoplastic agents based on molecular mechanism of hematological malignancies, clinical use of hematopoietic growth factors.
- f. Hematopoietic stem cell transplantation**
 - i. Role and indications of HST, immunodeficiency state, hematological Malignancies and Non-hematological disorders.
 - ii. Practical aspect of umbilical cord stem cells transplantation.
 - iii. Peripheral stem cell collection.
 - iv. Role of stem cell in tissue repair.
 - v. Complications of Hematopoietic stem cell transplant.
 - vi. Gene therapy and genetic engineering.
- g. Prenatal diagnosis of genetic hematological diseases**
- h. Hemostasis & Thrombosis**
 - i. Megakaryocyte and platelet structure.
 - ii. Molecular basis of platelet function, activation.
 - iii. Role of blood vessel, coagulation system and fibrinolytic system in hemostasis.
 - iv. Clinical and lab evaluation of bleeding and coagulation disorders.
 - v. Clinical & diagnostic aspects of factor deficiencies including hemophilia, von Willebrand disease, DIC, Vitamin K deficiency.
 - vi. Thrombotic and non-thrombotic purpura.
 - vii. Hereditary and acquired platelet disorders and its management.
 - viii. Thrombophilia (Inherited & acquired).
 - ix. Lab evaluation and management of hypercoagulable states.

- i. Human blood group antigen and antibody and Immuno-hematology**
 - i. Selection of donor and screening..
 - ii. Principle, indication and storage of red blood cells, WBC, platelet, and plasma transfusion.
 - iii. 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.
 - iv. Graft Rejection, GVH diseases, Transfusion Reactions, Blood grouping & cross matching.
 - v. Blood bank audit.
 - vi. Apheresis
 - j. Hematological manifestations of systemic diseases**
 - i. Liver disorders, renal disorders, infections, cancers, parasitic diseases, AIDS, pregnancy, and surgical patients.
 - ii. Spleen and its disorders
- D. Laboratory Medicine (Clinical Pathology including Parasitology)**
- a. Principles of testing, indications, values with ranges in normal and diseased states in relation to:**
 - i.** Liver function tests
 - ii.** Renal function tests
 - iii.** Endocrine function tests
 - iv.** Body fluid analysis including stool, urine, semen, CSF, etc.
 - v.** Principles of laboratory automation, trouble shooting, and quality assurance.
- E. Special techniques**
- a.** The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields:
 - i.** Immunopathology,
 - ii.** Electron microscopy,
 - iii.** Histochemistry,
 - iv.** Immunohistochemistry,
 - v.** Cytogenetics and in-situ hybridization,
 - vi.** Molecular Biology,
 - vii.** Digital Pathology and image analysis,
 - viii.** Maintenance of records,
 - ix.** Information retrieval, use of Computer and Internet in medicine.
- F. Instrumentation and automation**
- a. Principles, indications, working, maintenance, and troubleshooting of equipment used in various laboratories:
 - b. Histopathology laboratory – Histopathology tissue processor, microtome, water bath, embedding station, Stainer, IHC Stainer, ultramicrotome, etc.
 - c. Microscopes – Immunofluorescence, FISH, Confocal, Electron, etc.
 - d. Cytopathology Laboratory – Centrifuge, Cyto centrifuge, Cytospin apparatus, liquid-based cytology, etc.
 - e. Hematology Laboratory – automated cell counter, flow cytometer, coagulometer, HPLC, Electrophoresis apparatus, immunoblot, etc.
 - f. Clinical Pathology – Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, chemiluminescence, etc.
 - g. Digital pathology – Whole slide scanners
 - h. Molecular pathology – PCR, Sanger sequencer, NGS sequencers, etc.
 - i. Automation in Pathology.

- j. Good lab practices and safety, record maintenance of capital equipment and consumables, purchase specifications, approximate costs of reagents and equipment, maintenance of storelogbooks, 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 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**

❖ **PSYCHOMOTOR DOMAIN:**

Demonstrate following predominant Psychomotor domain competencies

Sr. No.	Competency	Perform under supervision/ perform independently/ Observation only
I.	HISTOPATHOLOGY (SURGICAL 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.	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
6.	Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome	Perform under supervision
7.	Stain paraffin sections with hematoxylin and eosin stain and common special stains needed for diagnosis	Independently
8.	Cut a frozen section, stain and interpret the slide in correlation with the clinical data provided	Independently
9.	Standardize and validate new antibodies for immunohistochemistry with understanding of controls, clones, and dilutions	Independently

	10.	Perform immunohistochemistry on paraffin sections using manual method	Independently
	11.	Identify common problems in immunohistochemistry procedure (artifacts, inadequate retrieval, section floating, IHC failure, etc.,) and rectify such problems	Independently
	12.	Decide on the appropriate immunohistochemical panels for diagnosis, prognosis and predictive purposes in common disease conditions based on standard recommendations and interpret their results	Independently
	13.	Write histopathology reports, including synoptic reports, wherever needed, following protocols and international standards. The reports should be succinct and lucid, with clinical notes and advice, as necessary.	Independently
II CYTOPATHOLOGY			
	1.	Perform fine needle aspiration of superficial lumps and make good quality smears including collection of material for cell block preparation and decide on the type of fixative and stain in a given case	Independently
	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
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	Independently
	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
9.	Given the clinical data, interpret the results of <ul style="list-style-type: none"> 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 vii. G6PD enzyme estimation viii. Platelet function tests including platelet aggregation and adhesion and PF3 release ix. Russell's viper venom time (RVVT) 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 Antithrombin III (AT III)) xvi. Serum ferritin, Serum iron and total iron binding capacity 	Independently
10.	Interpret flow cytometry findings in the immunophenotyping of leukemia, CD34 enumeration, CD 3/CD 19 enumeration, PNH work up, etc.	Independently
11.	Interpret results of cytogenetics and molecular diagnostics in the work up of hematological diseases	Independently
12.	Prepare samples as appropriate for the indication, and operate equipment such as automated cell counter, flow cytometry, coagulometers, HPLC and electrophoresis apparatus	Observation 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 able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.	Independently
2.	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
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 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
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 (see Note)
	2.	Provide Provisional and Final Anatomic Diagnosis report, major findings correctly and systematically at autopsy, and the Autopsy Protocol as per prescribed instructions.	Independently
VII	MOLECULAR BIOLOGY		
	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, Sanger Sequencing, and in-situ hybridization including troubleshooting	Observation only
VIII	IMMUNOPATHOLOGY		
	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

IX	ELECTRON MICROSCOPY	
	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 semi-thin sections and view ultra-thin sections under electron microscope	Observation only
X.	DIGITAL 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
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
XII.	RESEARCH	
	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**

- Acquisition of competencies being the keystone of doctoral medical education, such training will 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.
- **Rotation:(Postings to laboratories/assignments)**
 1. The three-year training programme for the MD degree will be arranged in the form of postings to different assignments/laboratories for specified periods as outlined below.
 2. The period of such assignments/postings is for 36 months with breaks only for examinations and mandatory postings.
 3. **Posting schedules may be modified depending on needs, feasibility and exigencies.**
 4. For facilities not available in the parent institution as well as for additional knowledge and skill, extramural postings may be undertaken.
 5. Posting under “District Residency Programme” (DRP):
 - a. All postgraduate students pursuing MS/MS 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).
 - b. Such rotation shall take place in the 3rd or 4th or 5th semester of the Postgraduate programme.
 - c. The rotation shall be termed as “District Residency Programme”
 - d. The PG medical student undergoing training shall be termed as “District Resident”.

Sr. 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

➤ **Post Graduate Training-Teaching-Learning methods:**

- This will 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 will also be used.
- **The Pathology resident is expected to sit in reporting every day, having seen working 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:

- a. Didactic lectures- Minimum of 10 lectures per year
- b. Lectures can cover topics such as:
 - i. Subject related important topics as per specialty requirement
 - ii. Recent advances
 - iii. Research methodology and biostatistics
 - iv. Salient features of Undergraduate/Postgraduate medical curriculum
 - v. Teaching and assessment methodology.

B. Journal club: Minimum of once in 1-2 weeks.

- a. Topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals.
- b. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.

C. Student Seminar: Minimum of once every 1-2 weeks

- a. Important topics will be allotted for in-depth study by a postgraduate student.
- b. That will be graded by the faculty and peers.

D. Student Symposium: Minimum of once every 3 months.

- a. All participating postgraduates should be graded by the faculty and peers.

E. Laboratory work/ Interactive slide and gross sessions:

- a. Minimum - once every 1-2 weeks.
- b. Laboratory work, slide and gross specimen teaching sessions

F. Interdepartmental colloquium

G. Teaching research skills

- a. Writing a thesis should be used for inculcating research knowledge and skills.
- b. 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.
- c. 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.

H. Training in teaching skills:

- a. MEU/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.

➤ **Logbook:**

- During the training period, the postgraduate student should maintain a Logbook indicating the duration of the postings; /work done in areas of posting.
- 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:
 - Overall participation & performance,
 - Attendance,
 - Participation in sessions,
 - Record of completion of pre-determined activities, and
 - Acquisition of selected competencies.
- The purpose of the Logbook is to:
 - Help maintain a record of the work done during training,
 - Enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,
 - Provide feedback and assess the progress of learning with experience gained periodically.
- The Logbook will be used in the internal assessment of the student.
- The Logbook will 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

➤ **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

FORMATIVE ASSESSMENT, i.e., during the training:

1. Formative assessment will be continual and will assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.
2. General Principles
 - a. Internal Assessment will be frequent, cover all domains of learning and will be used to provide feedback to improve learning;
 - b. it will also cover professionalism and communication skills.
3. The Internal Assessment will be conducted in theory and practical/clinical examination.
4. Quarterly assessment during the MD training should be based on:
 - a. Journal based / recent advances learning
 - b. Patient based /Laboratory or Skill based learning
 - c. Self directed learning and teaching
 - d. Departmental and interdepartmental learning activity
 - e. External and Outreach Activities / CMEs
5. **The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I)**

SUMMATIVE ASSESSMENT:

❖ **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 Post Graduate examination shall be in three parts:-**

1. **Thesis (Dissertation):**
2. **Theory:**
3. **Practicals and viva voce Examination:**

❖ 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.

A. Dissertation:

- a. Students should submit a Thesis or Dissertation six months prior to examinations as a partial fulfillment to the award of the degree of MD (Pathology).
- b. 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.
- c. Thesis / Dissertation is compulsory. Every candidate is required to carry out the work on a selected research project under the guidance of a recognized postgraduate teacher. The results of such work shall be submitted in the form of a Dissertation.
- d. The Dissertation is aimed at training the candidate in research methods and techniques. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical

analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

- e. It includes identification of a problem, formulation of a hypothesis, search and review of relevant literature, getting acquaintance with recent advances, designing of research study, collection of data, critical analysis of results and drawing conclusions.
- f. The title of the topic along with the plan of work not exceeding 500 words in prescribed Performa should be submitted to the University with the recommendation of guide. Prior approval by the local Ethical Committee is essential.

B. EXAMINATION PATTERN:

THEORY:

TOTAL: 400 marks.

Four Papers 100 marks each:

Paper I	General Pathology, Pathophysiology, Immunopathology and , 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 and applied aspects

Each Paper will be:

Full Questions : 3X20 Marks each - 60

Short Notes : 4X10 Marks Each - 40

Practicals and viva voce Examination:

Two Days Practical Examination

Sr No	Practical	Marks
1	Clinical Pathology & Laboratory Medicine	60
	Discuss the given case and Plan Relevant investigations & interpret the biochemical results	25
	Complete Urine Analysis	25
	Biochemistry exercise or fluid analysis (CSF / Pleural fluid/ Ascitic fluid)	10
2	Haematology	90
	Clinical test discussion along with Routine Haemogram & Two special test (at least one coagulation test)	40
	Identify electrophoresis strips / osmotic fragility charts etc. or Interpretation of data from autoanalysers/ HPLC / flow cytometry.	10
	Haematology Slides (10 slides) - blood smears and /or bone marrow aspirate smears and bone marrow biopsy	40
3	Transfusion medicine	10
	a Perform blood grouping / Perform Coomb's test / Perform cross matching	
	b Gel cards interpretation.	
4	Histopathology	110
	Histopathology (12 – 15 Histopathology Slides)	80
	Cytopathology (5 - 8 Cytology slides)	
	Report the case whose clinical information and slides provided	20
	OR	
	Report two histopathology slides with ancilliary test provided	
	Histotechniques	10
5	Autopsy	30
6	Gross Pathology (Grossing)	30

7	Basic Sciences		20	
	a	Spots on Immuno-histochemistry / immuno-fluorescence/ FISH/ PCR/ Electronmicrophotograph / immunological tests / gels etc.		10
	b	Teaching exercise		10
11	Grand Viva (a) Viva on dissertation; Log book and research methodology (b) General Viva –Voce		50	
TOTAL			400	

6. RECOMMENDED TEXT BOOKS; REFERENCE BOOK AND JOURNALS:

a. Books (latest edition)

1. Cotran, Kumar, Collins. Robin's Pathologic Basis of Disease
2. Ivan Damjanov, James Linder. Anderson's Pathology,
3. Juan Rosai, Ackerman's Surgical Pathology
4. Christopher D.M.Fletcher. Diagnostic Histopathology of tumours
5. Jurgen Ludwig, Hand book of Autopsy Practice;
6. Theory & practice of Histological Techniques edited by John. D.Bancroft
7. Histology for Pathologists. Stephen S. Sternberg (Ed), Raven Press, New York.
8. Diagnostic Surgical Pathology. Stephen S Sternberg. Lippincott, William Wilkins. Philadelphia.
9. Bone Marrow Pathology, Bain BJ, Clark DM, Lampert IA, Blackwell Science, Oxford.
10. Gradwohl's Clinical laboratory methods and diagnosis
11. Henry J.B Clinical Diagnostics and Management by Laboratory Methods, 22nd edition, 2012 published by W.B. Saunders & Company.
12. Lewis S.M, Bain D.J, Bates I, Dacie & Lewis Practical Haematology
13. Atlas and Text of Haematology by Tejinder Singh
14. Hoffbrand A.V, Catovsky D, Tuddenham G.D, Postgraduate Haematology .
15. Firkin F , Chesterman C, Penington D, de Gruchy's Clinical Haematology in Medical Practice
16. Greer J.P, Foerster J, Jukens J et. Al, Wintrobe's Clinical Haematology,
17. Mollison P.L, Blood transfusion in clinical medicine
18. Orell, Sterrett- Walters and Whittaker, Fine Needle Aspiration Cytology (Manual & Atlas)
19. Leopold G Koss, Diagnostic cytology and its histopathologic basis
20. Marluce Bibbo, Comprehensive cytopathology
21. Winnifred Grey, Grace T Mckee, Diagnostic cytopathology
22. Sudha R.Kini , Colour Atlas of differential diagnosis in exfoliative and aspiration cytopathology
23. Praful B. Godkar ,Clinical Biochemistry – Principles & practice, published by Bhalani Publishing House, Bombay
24. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics Edited by Carl Burt Edward R. Ashwood David E. Bruns,
25. Varley's Practical Clinical Biochemistry edited by Alan H. Gowen lock with assistance of Janet R Mc Mullay and Donald M. Mclauchlan

26. Parasitology (Protozoology & Helminthology.) in relation to clinical medicine – K.D.Chatterje published by Chatterjee Medical Publication.
27. Bailey & Scott Diagnostic Microbiology
28. WHO Classifications of tumours & tumour like lesions, published by IARC Press
29. Recent advances in Histopathology, Haematology etc.
30. Lever's Dermatopathology
31. Novak's Gynecologic and Obstetric Pathology with Clinical and Endocrine
32. Relations by Edmund R. Novak
33. Bone Pathology by H. Jaffe
34. MacSween's Pathology of the liver
35. Iochim's Lymph Node Pathology
36. Text Book on Breast Pathology by Tavasoli
37. Text Book on Thyroid Pathology by Geetha Jayaram
38. Heptinstall's Pathology of the Kidney
39. Enzinger's Soft Tissue Tumours

JOURNALS:

1. Acta Cytologica
2. The American Journal of Pathology
3. American Journal of Surgical Pathology, published by Lippincott & Raven
4. The American Journal of Hematology
5. The American Journal of Clinical Pathology
6. Archives of Pathology and Laboratory Medicine
7. Blood
8. British Journal of Haematology, published by Blackwell Sciences.
9. CANCER, International journal of American Cancer Society, published by John Wile & sons Inc.
10. Diagnostic Cytopathology published by Wiley Liss, inc, publication
11. Histopathology
12. Human Pathology
13. Haematology/Oncology Clinics of North America, published by W.B. Saunders &Company.
14. Journal of Cytology, published by I.AC.
15. I.C.M.R. Bulletin, published by ICMR
16. Indian Journal of Pathology & Microbiology, published by IAPM.
17. Indian Journal of Pathology and Microbiology
18. Indian Journal of Cancer, published by Indian Cancer Society.
19. Journal of Pathology
20. Journal of Clinical Pathology, published by B.M.J.
21. Laboratory Investigation
22. LANCET, published by Elsevier
23. Modern Pathology
24. Pathology
25. Seminars in Hematology
26. Seminars in Diagnostic Pathology
27. Virchows Archives
28. Year Book Series
29. Recent Advances Series

Annexure 1

Student appraisal form for broad specialty non-clinical disciplines											
Period of Training :											
	Elements	Less than Satisfactory			Satisfactory			More than satisfactory			Comments
		1	2	3	4	5	6	7	8	9	
1	Scholastic aptitude and learning										
1.1	Has knowledge appropriate for level of training										
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)										
1.4	Documentation of acquisition of competence (eg Log book)										
1.5	Performance in work based assessments										
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										
2.3	Ability to work with other members of the team										
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										
5	Disposition										
	Has this assessment pattern been discussed with the trainee?										
	If not explain.										
	Name of the assessed								Sign		
	Name of the assessor								Sign		
	Date										




 Registrar
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