

Program and Course Structure

School of Medical Science and Research

MD (Pathology)

Session:2021-24

Program Code:SMS0601

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. Transformative educational experience
2. Enrichment by educational initiatives that encourage global outlook
3. Develop research, support disruptive innovations and accelerate entrepreneurship
4. Seeking beyond boundaries

Core Values

- Integrity
- Leadership
- Diversity
- Community

1.2 Vision and Mission of the School

Vision of the School

To serve the society by being a premier institute that promotes a comprehensive approach to human health through excellence in academics, research and clinical care

Mission of the School

- Provide a transformative educational experience in Medical Science
- Develop skills and competencies to create global leaders in clinical care
- Promote innovative and collaborative research through intellectual and technological advancement
- Establish a center for excellence in preventive, promotive and curative health care

Core Values

- Integrity
- Leadership
- Ethics
- Community Health

1.3 Program Educational Objectives (PEO)

1.3.1 Writing Program Educational Objectives (PEO)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

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

Cognitive Domain

PEO1. 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).

PEO2. Interpret and correlate clinical and laboratory data so that clinical manifestations of diseases can be explained.

PEO3. 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).

PEO4. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.

PEO5. Plan, execute, analyse and present research work.

PEO6. 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.

PEO7. Capable of safe and effective disposal of laboratory waste.

Affective Domain

PEO8. 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.

PEO9. 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.

Psychomotor Domain

PEO10. Able to perform routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin and frozen sections, making smears, and staining.

PEO11. 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.

1.3.2 Map PEOs with Mission Statements:

PEO Statements	School	School	School	School
	Mission 1	Mission 2	Mission 3	Mission 4
PEO1: 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).	3	3	1	3
PEO2: Interpret and correlate clinical and laboratory data so that clinical manifestations of diseases can be explained	3	3	2	1
PEO3: 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).	3	2	1	1
PEO4: Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel	3	3	1	1
PEO5: Plan, execute, analyse and present research work.	2	3	3	1
PEO6: 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 contro	3	1	3	2
PEO7: Capable of safe and effective disposal of laboratory waste.	3	1	1	3
PEO8: 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.	3	2	2	1
PEO9: 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.	3	2	2	1
PEO10: Able to perform routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin and frozen sections, making smears, and staining.	3	2	2	2
PEO11: 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	2	2	3

1.3.3 Program Outcomes (PO's)

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:

PO1. 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.

PO2. 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.

PO3. 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.

Affective domain

PO4. The student will show integrity, accountability, respect, compassion and dedicated patient care. The student will demonstrate a commitment to excellence and continuous professional development.

PO5. The student should demonstrate a commitment to ethical principles relating to providing patient care, confidentiality of patient information and informed consent.

PO6. The student should show sensitivity and responsiveness to patients' culture, age, gender and disabilities.

Psychomotor domain

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

PO7. 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.

PO8. Independently prepare and stain good quality smears for cytopathologic examination

PO9. 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 90% of the cases referred to the Haematology clinic, given the relevant clinical data

PO10. 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

At the end of the program, the student should have acquired following competencies(PSOs):

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

	PEO1	PEO2	PEO3
PO1	3	3	2
PO2	2	2	1
PO3	3	2	3
PO4	3	1	3
PO5	3	3	“”
PO6	2	3	“”
PO7	1	1	2
PO8	3	2	2
PO9	2	2	3
PO10	3	1	“”

School: SMSR		Batch:
Program: MD PATHOLOGY		Current Academic Year: 2019-20
1	Programme Code	SMS0601

Syllabus

Course contents:

The study of Pathologic Anatomy includes all aspects of Pathology as encompassed in the branches of General and Systemic Pathology. Only the broad outlines are provided.

A) 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 sublethal and lethal injuries.

B) 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.

C) 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.

1. Laboratory Medicine (Clinical Biochemistry/Clinical Pathology including Parasitology).
2. Transfusion Medicine (Blood Banking).
3. The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields.
 - a) Immunopathology
 - b) Electron microscopy
 - c) Histochemistry
 - d) Immunohistochemistry
 - e) Cytogenetics
 - f) Molecular Biology
 - g) Maintenance of records
 - h) Information retrieval, use of Computer and Internet in medicine.
 - i) Quality control, waste disposal

C) 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.

4. Laboratory Medicine (Clinical Biochemistry/Clinical Pathology including Parasitology).
5. Transfusion Medicine (Blood Banking).
6. The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields.
 - a) Immunopathology
 - b) Electron microscopy
 - c) Histochemistry
 - d) Immunohistochemistry
 - e) Cytogenetics
 - f) Molecular Biology
 - g) Maintenance of records
 - h) Information retrieval, use of Computer and Internet in medicine.
 - i) Quality control, waste disposal

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 analyse scientific data as well as to keep himself abreast of the latest developments in the field of Pathology and related sciences. A brief outline of what is expected to be learnt during the MD Course is given under each head.

Surgical Pathology

Knowledge

The student should be able to demonstrate an understanding of the histogenetic and patho-physiologic processes associated with various lesions. Should be able to identify problems in the laboratory and offer viable solutions.

Autopsy Pathology

Knowledge

Should be aware of the technique of autopsy.

Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological correlation can be made.

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.**

In places where non-medico-legal autopsies are not available each student should be made to observe at least five medico-legal autopsies.

Write correctly and systematically Provisional and Final Anatomic Diagnosis reports.

Cytopathology

Knowledge

Should possess the background necessary for the evaluation and reporting of cytopathology specimens.

Demonstrate familiarity with the following, keeping in mind the indication for the test.

- (i) Choice of site from which smears may be taken
- (ii) Type of samples
- (iii) Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)
- (iv) Be conversant with the principles and preparation of solutions of stains

Haematology

Knowledge

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.

Should be conversant with various equipments used in the Haematology laboratory.

Should have knowledge of automation and quality assurance in Haematology.

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.

Laboratory Medicine

Knowledge

Possess knowledge of the normal range of values of the chemical content of body fluids, significance of the altered values and its interpretation.

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.

- (i) Renal function tests

- (ii) Liver function tests
- (iii) Pancreatic function tests
- (iv) Endocrine function tests
- (v) Tests for malabsorption

Know the principles, advantages and disadvantages, scope and limitation of automation in the laboratory.

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

Transfusion Medicine (Blood Banking)

Knowledge

The student should possess knowledge of the following aspects of Transfusion Medicine.

Basic immunology

ABO and Rh groups

Clinical significance of other blood groups

Transfusion therapy including the use of whole blood and RBC concentrates

Blood component therapy

Rationale of pre-transfusion testing.

Infections transmitted in blood.

Adverse reactions to transfusion of blood and

components Quality control in blood bank

Basic Sciences (in relation to Pathology)

a) Immunopathology

Knowledge

Demonstrate familiarity with the 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 the following procedures employed in clinical and experimental studies relating to immunology.

- (a) ELISA techniques
- (b) Radioimmunoassay
- (c) HLA typing

Interpret simple immunological tests used in diagnosis of diseases and in research procedures.

- (i) Immunoelectrophoresis
- (ii) Immunofluorescence techniques especially on kidney and skin biopsies
- (iii) Anti-nuclear antibody (ANA)
- (iv) Anti-neutrophil cytoplasmic antibody (ANCA)

b) Electron Microscopy**Knowledge**

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)

Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

c) Enzyme Histochemistry**Knowledge**

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**Knowledge**

Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase-anti-peroxidase) and AP-AAP (Alk. Phosphatase-anti-Alk. Phosphatase) ABC (Avidin-Biotin Conjugate) systems; employing monoclonal and polyclonal antibodies.

Be aware of the limitations of immuno-histochemistry.

e) Molecular Biology**Knowledge**

Should understand the principles of molecular biology especially related to the understanding of disease processes and its use in various diagnostic tests.

Should be conversant with the principle and steps and interpretation of Polymerase Chain Reaction (PCR), Western Blot, Southern Blot, Northern Blot and Hybridisation) procedures.

f) Cytogenetics**Knowledge**

Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).

g) Tissue Culture**Knowledge**

Demonstrate familiarity with methods of tissue culture.

Principles of Medical Statistics**Knowledge**

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

ASSESSMENT

FORMATIVE ASSESSMENT:

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

During the three year training period,

A record of all theoretical, practical and experimental work done by the post graduate student and its assessment will be kept and shall be available for examiners at the time of the final practical and viva voce examination and there will be periodical examinations during the course of training. The prefinal theory and practical examination will be conducted by the faculty of the 11 concerned colleges. During last six months the post graduate student will have weekly assessment tutorials conducted by the faculty. All activities will be evaluated.

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.

Quarterly assessment during the MD training should be based on:

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT:

The summative examination would be carried out as per the Rules given in POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.

The Post Graduate examination will be in three parts:

1. Thesis:

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. 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. 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 shall be allowed to appear for the Theory 12 and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. **Theory**

The examinations shall be organised on the basis of '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. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers.

Paper I: General Pathology, Pathophysiology, Immunopathology and Cytopathology

Paper II: Systemic Pathology

Paper III: Haematology, Transfusion Medicine (Blood Banking) and Laboratory Medicine

Paper IV: Recent advances and applied aspects

3. **Practicals/Clinical and Oral/viva voce Examination:**

The practical/clinical examination should consist of the following and should be spread over two days.

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 biochemistry exercise/clinical pathology exercise like CSF, pleural tap etc. analysis and complete urinalysis.

II. Haematology:

- Discuss haematology 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 autoanalysers, 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:

- Examine, report and discuss 12-15 cases histopathology and 5-8 cytopathology cases, given the relevant history and slides.
- Perform a Haematoxylin and Eosin stain and any special stain on a paraffin section. Should be conversant with histopathology techniques including cryostat.

V. Autopsy:

- Given a case history and relevant organs (with or without slides), give a list of anatomical diagnosis in a 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.
- Identify histochemical and immuno-histochemistry stains
- Teaching exercise 10 min

All practical exercises are to be evaluated jointly by all the examiners.

An oral question-answer session should be conducted at the end of each exercise.

- a) Viva on dissertation and research methodology
- b) General Viva-Voce

Recommended Reading:

Books (latest edition)

1. Rosai and Ackerman's Surgical Pathology
2. Atlas and Text of Haematology by Tejinder Singh
3. Orell's Atlas of Aspiration Cytology
4. Lever's Dermatopathology
5. Novak's Gynecologic and Obstetric Pathology with Clinical and Endocrine Relations by Edmund R. Novak
6. Bone Pathology by H. Jaffe
7. MacSween's Pathology of the liver

8. Iochim's Lymph Node Pathology
9. Text Book on Breast Pathology by Tavasoli
10. Text Book on Thyroid Pathology by Geetha Jayaram
11. Theory and Practice of Histological Techniques by Bancroft
12. Gray's Diagnostic Cytopathology
13. Sternberg's Diagnostic Surgical Pathology
14. Dacie's Practical Haematology
15. Wintrobe's Haematology
16. Heptinstall's Pathology of the Kidney
17. Enzinger's Soft Tissue Tumours

Journals 03-05 international Journals and 02 national (all indexed) journals

Annexure I

Postgraduate Students Appraisal Form Pre / Para /Clinical Disciplines

Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory	Satisfactory	More Than Satisfactory	Remarks
		1 2 3	4 5 6	7 8 9	
1	Journal based / recent advances learning				
2	. Patient based /Laboratory or Skill based learning				
3	Self directed learning and teaching				

4	Departmental and interdepartmental learning activity				
5	External and Outreach Activities /				
6	CMEs				
7	Thesis / Research work				
8	Log Book Maintenance				

Publications
Yes/ No

 Remarks* _____

_____ *REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD