



University of Health Sciences, Lahore

Department of Allied Health Sciences

Program & Outline

of

Curriculum & Syllabus

for

M.Sc. in Medical Technology

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Department of Allied Health Sciences, UHS

Introduction:

There is a general belief that access to good healthcare is an individual's right in any civilized society. To realize this belief, we not only need trained physicians, but also highly educated and skilled allied healthcare personnel who can effectively contribute to the provision of quality healthcare in all disciplines in a clinical setting. During the last two decades with the tremendous growth in economy, the quality of healthcare delivery system especially in private sector has greatly improved in Pakistan, which is evident from the establishment of some first class hospitals in the country. Also in public sector, the Government of Pakistan is determined to improve the quality of its service components in teaching hospitals by upgrading the laboratory services and providing the state-of-art equipment. But regrettably to run and manage these laboratories there is an acute shortage of qualified professionals. As such there is currently a great demand for highly trained laboratory personnel who can manage different types of healthcare facilities ranging from general hospitals to tertiary care facilities.

University of Health Sciences (UHS) Lahore, is a fast growing public university in all medical disciplines, and believes in quality health education. It would like to produce highly skilled paramedical professionals who can not only be a part of a healthcare team, but also play an important role in the management of the laboratories and auxiliary facilities. To realise above objective, the UHS is establishing the Department of Allied Health Sciences (DAHS) that will include several divisions such as medical technology, physical therapy, medical imaging and others.

Mission Statement:

UHS Department of Allied Health Sciences (DAHS) is committed to produce highly qualified professionals through comprehensive career oriented programs. Through its Master's degree program, DAHS will provide:

- an equal opportunity to all qualified individuals, enabling them to contribute effectively and make responsible decisions in running day to day affairs of a hospital laboratory and attached facility.
- students with breadth and depth of knowledge in all disciplines of allied health sciences that would allow them to work independently and become useful contributor in their own chosen field of speciality.
- students "clinical rotation" in well equipped hospital laboratories both within and outside the country to enhance their knowledge about latest diagnostic techniques and state-of-art equipment used in a clinical laboratory.
- innovative research programs, specially in the diagnostic aspects in those areas of human diseases that are highly prevalent in Pakistan
- innovative, flexible program to meet both present and future needs of the healthcare system

Programs & Outline:

The Department of Allied Health Sciences is offering the following program:

Master of Science (M.Sc.) in Medical Technology

General Information:

Medical laboratory research and diagnostic testing are currently the most exciting professions. In the last two decade many exciting breakthroughs in the diagnosis and treatment of diseases have been made. The new developments and challenges require laboratory professionals to stay on the cutting edge of their field and as such new diagnostics techniques have to be mastered; new concepts be understood and new means of managing the more complex operations of laboratories be developed. The M.Sc. degree program that is offered by the Division of Medical Technology, is especially designed to meet the educational needs of clinical laboratory scientists in both medical diagnostic and research settings. The program will provide the training to the students that is necessary to stay current with the rapidly changing technology and prepare them to assume positions of greater responsibility. The proposed M.Sc. program in medical laboratory sciences is mostly directed towards medical technologists who would like to improve their qualifications. The four disciplines included in M.Sc. in medical technology program are **clinical biochemistry, hematology & blood banking, medical microbiology & immunology and pathology together with a well balanced course in lab management and administration.** The integration of these courses will provide the students with comprehensive knowledge to meet the educational needs of students who can be employed as clinical scientists in pharmaceutical, biotechnology and medical research as well as in tertiary care hospitals.

Admission Requirements:

M.Sc. in Medical Technology at UHS is highly competitive program. For admission, a student must have first or upper 2nd class in:

- B.Sc. Medical Laboratory Technology
- M.B.B.S
- Entry Test / Interview

A detailed CV along with 2 letters of references must be submitted with the application form. Applicants with experience will be preferred.

Program of Study:

Duration of M.Sc. program in Medical Technology is 2 years, and will include classroom lectures, laboratory exercises and clinical rotation in a designated hospital and thesis in their chosen discipline of Allied Health Sciences Program. All students must complete course work and submit their research thesis within the prescribed time limit of their program study period (two years) to meet their graduation requirement.

The curriculum of M.Sc. in medical technology is designed to allow students to achieve the following objectives:

- obtain up-to-date knowledge of foundations and recent advances in biomedical and clinical sciences.
- develop the ability to apply basic knowledge of medicine and basic sciences to advanced laboratory specialties.
- demonstrate competence in research theory and methodology in order to solve laboratory problems as economically and expeditiously as possible.
- acquire quality assurance and administrative skills.

The curriculum which is well balanced is constructed to allow students either to work in a particular discipline or to move to another area of interest. In view of the fact that the medical laboratory sciences represent the application and extension of the concept and techniques of basic pre-clinical sciences, it is necessary that the recent advances in this area should also be covered.

A. Thesis Requirements:

The curriculum includes a minimum of 36 credit hours including 6 credit hours of thesis. A minimum of five core courses are mandatory for all students before they select an area of concentration (specialization). Electives can be selected from any area of specialization. Each teaching course is of 3 credit hrs.

Course	Credit hrs	Marks
Thesis (including structured Viva)	6 credit hrs	300
5 core courses (100 marks each)	15 credit hrs	500
4 courses in area of specialization (100 marks each)	12 credit hrs	400
Elective (100 marks each)	3 credit hrs	100
Total	36 credit hrs	1300

Clinical Rotation:

All students shall undergo clinical rotation in their chosen field of specialty for a period not less than nine months in an approved hospital. A satisfactory report from the concerned supervisor of student is must, as a part of graduation requirement.

Plan of Study:

Year I	Term I	All core courses
	Term II	4 courses in area of specialization

All students must pass Year I courses before promotion to Year II. The students failing theory will not be allowed to do research.

Year II	Term I	Electives Assignment of Research Topics Preparation of Research Synopsis
	Term II	Research Clinical Rotation in their area of specialization in a designated hospital

Students failing in theory in any term or final examination will be allowed to appear in supplementary examination. There will be only one chance to clear the subject (s) in which the student has failed. A student must clear all the subjects before joining the next term

Core Curriculum for M.Sc Medical Technology:

The following core courses are compulsory for all students. These courses include lectures, term paper as well as laboratory work. The core courses include general courses in:

Course	Credit hrs
Biochemistry (Bio 501)	3 credit hrs
Pathology (Path 501)	3 credit hrs
Hematology (Hem 501)	3 credit hrs
Microbiology (MBI 501)	3 credit hrs
Lab Management and administration (LMA 501)	3 credit hrs
Total	15 credit hrs

All students must pass the required core courses, before selecting area of specialization.

Specialization (Concentration Courses) in Clinical Biochemistry:

Course	Credit hrs
Clinical Biochemistry (Bio 502)	3 credit hrs
Medical Genetics (Bio 503)	3 credit hrs
Understanding Nutrition (Bio 504)	3 credit hrs
Instrumentation and analysis techniques (Bio 505)	2 credit hrs
Biostatisticals & research methods	1 credit hr
Total	12 credit hrs

Electives: (100 marks each)

The students can choose one or more electives from the following electives to meet the graduation requirements. The course will be subject to enrollment of minimum 5 students in a course offered by the different sections of the department of allied health sciences. All students must register in advance to ensure their placement in a desired/offered course.

All courses (core, specialization and elective courses) in each speciality will include laboratory exercises where required.

Electives List: (3 credit hr each)

- Pathophysiology
- Analytical Toxicology
- Human Genetics
- Human Physiology
- Endocrinology
- Topics in Clinical Chemistry
- Clinical Parasitology
- Immunology

Specialization (Concentration Courses) in Microbiology/Immunology:

Course	Credit hrs
Basic Immunology (MBI 502)	3 credit hrs
Bacteriology Mycology (MBI 503)	3 credit hrs
Virology (MBI 504)	3 credit hrs
Human clinical parasitology (MBI 505)	3 credit hrs
Total	12 credit hrs

Elective List: (3 credit hrs each)

- Air, water, soil microbiology
- Antimicrobial therapy
- Food microbiology
- Pathogenic microbiology
- Cell physiology
- Human genetics
- Biochemistry

Specialization (Concentration Courses) in Hematology & Blood Transfusion

Course	Credit hrs
Methods for blood analysis (Hem 502)	3 credit hrs
Clinical Hematology (Hem 503)	3 credit hrs
Blood Coagulation & Hemostasis (Hem 504)	3 credit hrs
Transfusion medicine (Hem 505)	3 credit hrs
Total	12 credit hrs

Electives (3 credit hrs each)

For choosing desired electives, same conditions will apply as stated previously.

- Special topics in Hematology
- Medical Genetics
- Pathophysiology
- Immunohematology
- Cytogenetics
- Laboratory Medicine

Specialization (Concentration Courses) in Pathology

Course	Credit hrs
Human Anatomy (Path 502)	3 credit hrs
Systemic Pathology I (Path 503)	3 credit hrs
Systemic Pathology II (Path 504)	3 credit hrs
Clinical Pathology (Path 505)	3 credit hrs
Total	12 credit hrs

Electives: (3 credit hr each)

For choosing desired electives, same conditions will apply as stated previously.

- Surgical Pathology
- Histology & Histochemistry
- Anatomic Pathology
- Forensic Pathology
- Immunohematology
- Clinical hematology
- Cytogenetics
- Medical genetics
- Cell physiology
- Slide seminars

The Grading System:

Achievement in a particular course is indicated by a letter grade that is translated into Grade Point Average (GPA) for that students' record kept with Controller of Examinations. Final grades are issued by the Controller of Examinations at the close of each Term.

Grade points earned in a course are determined by multiplying the point-value of the letter grade (shown in the table below) by number of semester hours of course. A cumulative average is obtained by dividing the total number of grade points by total number of semester hours taken at UHS.

Scale of Grades:

Letter Grade	Numerical Range	Grade Point Value
F	0 – 49	0.00
D	50 – 59	1.00
C	60 – 65	2.00
C ⁺	66 – 70	2.50
B	71 – 79	3.00
B ⁺	80 – 85	3.50
A	86 – 90	4.00
A ⁺	> 91	-----

To graduate, a student must have a minimum GPA of 2.50. Students who excel in academic standing with GPA of at least 3.00 will be recognized by placing them in Dean's list. All students will be issued detailed marks certificates to show their merit.

Assessment & Examination:

The UHS will follow the Term, System comprising:

Autumn – Starting on 1st Monday of September, Ending on 4th Saturday of December

Spring – Starting on 3rd Monday of January, Ending on 3rd Saturday of May

Summer Term courses can be offered, depending upon the availability of the faculty and number of students registered in the course offered by the department which will not be less than 10 students.

Assessment:

Attendance in both theory as well as in practical classes is must. Students with less than 75% attendance will not be allowed to take the final examinations. All the students will be examined in their respective disciplines and their performance shall be evaluated in four ways:

1. Class work
2. Continuous Assessment (in term of class test scheduled at a regular intervals)
3. Term paper
4. Final Examination (Cumulative)

Final Examinations:

At the end of course work / laboratory training, each student with satisfactory attendance report shall be allowed to take the final examination. The format of written examinations paper shall be in the form of MCQs, one long essay & two short essay questions (time duration: 3 hrs).

Subject Papers: (All core courses, specialization & elective subjects)

Each subject paper will consist of:

Written / Term Paper / Continuous Assessment / Practical = 50/10/20/20 = 100 marks

Thesis:

Research = 200 marks
Structured viva = 100 marks } = 300 marks

Each student will be assigned the research topic by the supervisor and shall prepare and submit synopsis for approval to Head of Department on a prescribed form.

Each student will be responsible for preparation of his / her own thesis in the subject of specialization in consultation with the supervisor as per required specifications and criterion of the UHS.

Each student shall be responsible for defending his / her research thesis, for which a panel of 3 examiners (one internal, two external examiners) shall be formed.

Description of Courses / Syllabus Offered By the Division of Medical Technology

BIOCHEMISTRY

Bio 501: General Biochemistry (3 credit hr)

This course describes comprehensive study of biologically active compounds and their metabolism; biosynthesis and relationship to biological system. Also includes a detailed presentation of bioenergetics, enzyme kinetics and buffer systems.

Bio 502: Clinical Biochemistry (3 credit hr)

This course presents a biochemical approach to integration and correlating the analytical determinations performed in a clinical biochemistry laboratory with physiological and pathological processes. The topic includes disorders related to carbohydrates, lipid and protein metabolism, fluid and electrolyte balance, acid-base physiology; pathophysiology of blood gases, hepatobiliary system, the endocrine system, cardiac markers in myocardial infarction, diagnostic enzymology, amniotic fluid chemical analysis, tumor markers and therapeutic drug monitoring.

Bio 503: Medical Genetics (3 credit hr)

This course considers the basic principles of inheritance and pattern of single gene defects, human gene structure and function, techniques of gene analysis, genetic variations in individuals and populations, gene mapping and human genome project, principles of clinical cytogenetics, the molecular and biomedical basis of genetic diseases, treatment of genetic disorders, genetics of immune system, genetic disorders with complex inheritance, cancer genetics, developmental genetics, prenatal diagnosis, genetic counseling and its implications to society and ethical issues.

Bio 504: Understanding Nutrition (3 credit hr)

Good dietary habits are essential component of lasting health. Poor nutrition leads to an increased risk of health problems, such as obesity, diabetes, high blood pressure and heart diseases. This concise course examines in depth the qualitative and quantitative requirements of nutrients (macro and micro) necessary to maintain of human health.

Lma 501: Lab Management and Administration (3 credit hr)

This course will focus on the organization & management; quality assurance; labor/personnel management; inter-personal and group relations in the health professionals and financial/budgeting affairs of healthcare facilities.

Bio 505: Instrumentation & Analytical Techniques in Biochemistry(3 credit hr)

This course will describe the basic chemistry and principles of analytical procedures including laboratory mathematics, solution calculation and preparations; qualitative absorption and emission spectroscopy; flame photometry; high pressure liquid chromatography etc. Also will describe the basic principles of chemistry analyser and other instruments used in a clinical laboratory.

Bio 506: Statistical and Research Methods in Biomedical Sciences (1 credit hr)

This concise course will explain the significance of various statistical tests (e.g. mean \pm SD; p-value; students t-test; chi square test; Fisher's exact test etc) used in research. Students will also learn basic principles of research methods.

Courses offered as electives by different Divisions of Department of Allied Health Sciences

- Pathophysiology (3 credit hrs)
- Human physiology (3 credit hrs)
- Topics in clinical chemistry (3 credit hrs)
- Analytical Toxicology (3 credit hrs)
- Endocrinology (3 credit hrs)
- Clinical parasitology (3 credit hrs)
- Human Genetics (3 credit hrs)

MICROBIOLOGY/IMMUNOLOGY

MBI 501: General Microbiology

This study of biology of bacteria and micro organisms emphasizes on techniques of isolation, observation, cultivation and identification. The role played by micro organisms in nature and in industry also considered.

MBI 502: Basic Immunology (3 credit hrs)

The fundamentals of immunology, including study of reactions between antigens and antibodies with application to the identification of microbial diseases are covered in this course.

MBI 503: Bacteriology (3 credit hrs)

This a comprehensive course dealing with pathogenesis of bacterial infections, antimicrobial chemotherapy, normal microbial flora of the human body, spore & non-spore forming gram-positive bacilli, the staphylococci, enterobacteriaceae, pseudomonas, acinetobacters, vibrios, helicobacter and associated bacteria, hemophilus species, yersinia & pasteurilla, the neisseriae, infections caused by anaerobic bacteria, legionella, mycobacteria, spiral microorganisms, rickettsia & ehrlichia, chlamydiae etc. Student will also study general course in mycology dealing with the morphology, taxonomy and phylogeny of fungi. Laboratory exercises will include cultural and biochemical reaction of selected human pathogens.

MBI 504: Virology (3 credit hrs)

This course covers the general property of viruses, pathogenesis and control of viral diseases, parvoviruses, adenoviruses, herpesviruses, poxviruses, hepatitis viruses, picomaviruses, retroviruses, influenza viruses, paramyxoviruses & rubella virus, rabies, human cancer viruses, AIDS & lentivirus. General strategies of virus replication, DNA, RNA virus replications.

MBI 505: Human Clinical Parasitology (3 credit hrs)

This course will consider biology of protozoa and helminth parasites of humans and includes introduction to tropical medicine. Lectures will focus on the life cycles of selected parasites and epidemiology and pathology of selected parasites diseases. Laboratory work focuses on clinical diagnosis, diagnostics techniques (including immuno diagnostic techniques) recognition of vectors and experimental life cycle studies using both living and preserved material.

Course offered as electives by different divisions of Department of Allied Health Sciences

- Air, Water, Soil microbiology (3 credit hrs)
- Antimicrobial therapy (3 credit hrs)
- Food microbiology (3 credit hrs)
- Pathogenic microbiology (3 credit hrs)
- Cell physiology (3 credit hrs)
- Human Genetics (3 credit hrs)
- Biochemistry (3 credit hrs)

HEMATOLOGY & BLOOD TRANSFUSION

Hem 501: General Hematology (3 credit hrs)

This introductory course in hematology that deals with basic structure and function of the hemopoietic and lymphoreticular systems; important anemias from etiological point of view and their classification based on red-cell size; hemostasis and thrombosis, hematological malignancies, and introduction to blood transfusion in its broad sense describing the current importance of blood component therapy. The basic concept of blood transfusion serology also presented in a clinical context.

Hem 502: Methods for blood analysis (3 credit hrs)

Emphasis is placed in laboratory methods for analysis; examination of bone marrow; molecular genetics and genomics for the hematologists; cytogenetics for the hematologist and molecular basis of oncology.

Hem 503: Clinical Hematology (3 credit hrs) / Slide seminars

This course is extension of Hem 502. Emphasis is placed on morphological study of blood and bone marrow aspirates of including abnormal mechanisms responsible for symptoms of different diseases, blood coagulation and platelet function.

Hem504: Blood Coagulation Hemostasis (3 credit hrs)

This course describes the basic principles of hemostasis includes the vascular component, platelet physiology and function, coagulation factors/fibrin clot formation and fibrinolysis. Hereditary and acquired forms of hemorrhagic disorders and thromboembolic disease are examined in detail along with the test procedures for their diagnosis and the initiation of proper therapy.

Hem 505: Transfusion Medicine/Blood Banking (3 credit hrs)

This course focuses on medical assessment of donors and blood collections; apheresis; laboratory testing of donated blood; preparation and storage and characteristic of blood components; blood group; laboratory detection of blood groups and pre transfusion testing; transfusion therapy; transfusion in special situations; techniques of blood

transfusion; complications of blood transfusion; transfusion transmitted diseases and therapeutic apheresis.

Course offered as electives by different divisions of the department of Allied Health Sciences

- Special topics in hematology
- Medical genetics
- Pathophysiology
- Immunohematology
- Cytogenetics
- Laboratory medicine

PATHOLOGY

Path 501: General Pathology (3 credit hrs)

The course introduces the general principles of pathology with special emphasis on cell injury and cell death; cell adaptation and accumulation; inflammation and repair; homodynamic disorders; diseases based on immunity and genetics; neoplasia.

Path 502: Human Anatomy (3 credit hrs)

This course covers dissection of the human body with particular attention to the morphological relationships of individual's organ systems. Emphasis is placed on internal anatomy as a major facet of instruction that is designed for eventual autopsy evisceration and subsequent dissection.

Path 503, 504: Systemic Pathology (6 credit hrs)

This is a comprehensive course that covers diseases of blood vessels and heart; hemopoietic and lymphoid system; respiratory system; oral cavity, salivary glands, GI tract; liver and biliary system; urinary system; male genital system; breast with special emphasis on causes of lumps; endocrine system; skin; nerves system etc.

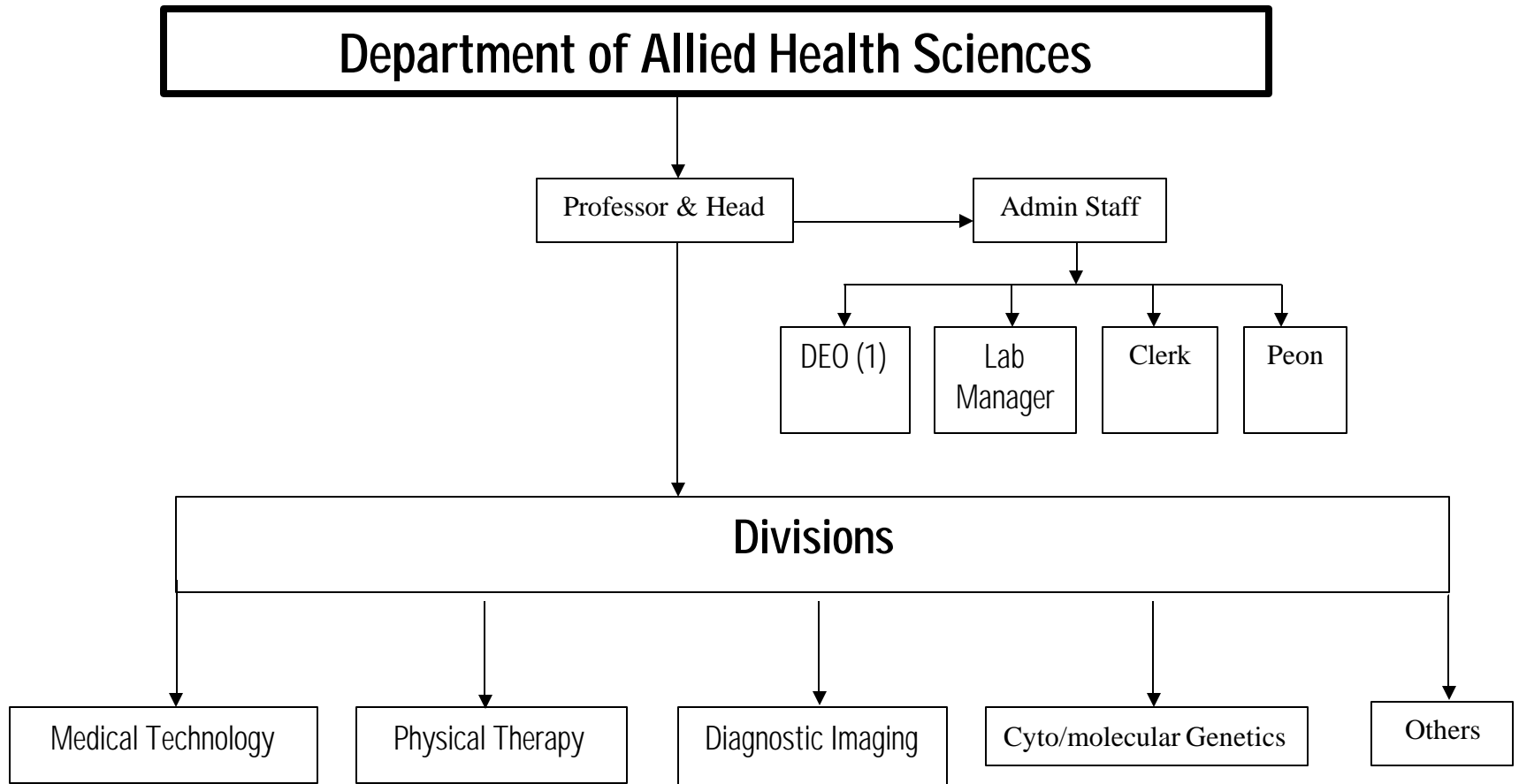
Path 505: Clinical Pathology (3 credit hrs)

Clinical relationships to disease are examined, highlighting such topics as hematology, chemistry, toxicology, serology, urine analysis, blood banking and cytology. Basic techniques and theoretical applications from a case history medical approach are emphasized.

Course offered as elective by different divisions of department of allied health sciences

- Surgical Pathology
- Histology & histochemistry
- Anatomic pathology
- Forensic pathology
- Immunohematology
- Medical genetics
- Slide seminars

Department Structure:



Division of Medical Technology

Sections

