

Department of **MEDICAL LABORATORY SCIENCES** **[MLS]**

DEPARTMENT OF MEDICAL LABORATORY SCIENCES

Medical Laboratory Sciences offers opportunities for those interested in biological and chemical sciences, leading to a career in the health service or in research. Medical laboratory scientists are professionals who perform laboratory tests and analyses that assist physicians in the diagnosis and treatment of patients. They also assist in research and the development of new laboratory tests. The various studies include chemical and physical analysis of body fluids (clinical chemistry and urinalysis); examination of blood and its component cells (haematology); isolation and identification of bacteria, fungi, viruses and parasites (clinical microbiology and parasitology); testing of blood serum for antibodies indicative of specific diseases (immunology and serology) and collection, storage of blood, pretransfusion testing and other immunohaematological procedures (blood banking). In addition, medical laboratory scientists prepare tissues for histopathological, cytological and cytogenetic examination. They must know the theory and scientific fundamentals as well as the procedures for testing. Medical laboratory scientists work in hospital clinical laboratories, medical schools, research institutions, public health agencies and related organizations.

MISSION AND OBJECTIVES

Mission

The mission of the Department of Medical Laboratory Sciences is to educate and train skillful, knowledgeable and committed Medical Laboratory Scientists who have breadth of knowledge and competence in the various aspects of Medical Laboratory Sciences, who shall adhere to professional ethics, and who can contribute successfully as Medical Laboratory Scientists in the health care team. The Department also aims to contribute to the development of the Medical Laboratory Sciences profession and allied health services in Kuwait, both in the Kuwait health care delivery system and in private hospitals, by providing consultancy and other services.

Objectives

The key objectives, therefore, are:

1. To develop, monitor, evaluate review and maintain an undergraduate curriculum that provides:
 - An essential core of knowledge and skills
 - Opportunities to develop clinical competence through laboratory practice in the Faculty and hands-on experience in Ministry of Health hospitals and clinics
 - A grounding in Laboratory Management and Quality Assurance
 - A thorough grounding in professional ethics in Medical Laboratory Sciences
2. To foster the requisite professional attitudes and values in students, who shall adhere to professional ethics and demonstrate concern, responsibility and the ability to interact appropriately with other care providers, administrators, patients and their families.
3. To provide students with the necessary support and guidance in terms of counselling, and feedback on academic and clinical performance.
4. To use alternative learning modes, including:
 - Computer-assisted learning
 - Problem-based learning
 - Research projects
 - Student presentations
5. To have well-functioning laboratories in the following areas:
 - Haematology
 - Clinical Chemistry
 - Biochemistry

- Histology and Cytology
 - Microbiology
 - Diagnostic Molecular Biology and Immunology
6. To develop and provide postgraduate programs, short courses, lectures, workshops and seminars for Ministry of Health staff that meet the changing health care needs of Kuwait and keep them abreast of the state-of-the-art.
 7. To recruit well qualified and experienced teaching and support staff who will act as role models for students and keep themselves abreast with scientific advances in the field and apply the state-of-the-art in all endeavours: teaching, curriculum development and assessment, research, clinical supervision and community service.
 8. To provide consultancy services to hospitals and clinics in the public sector health care delivery system and in the private sector.

PROGRAMME REQUIREMENTS

The total number of credit hours required for graduation is 124. The programme for the B.Sc. Degree in Medical Laboratory Sciences is as follows:

1 UNIVERSITY REQUIREMENTS (19 Credits)

	Credit Hours
0410-115 Finite Maths	3
0788-181 English Language	5
0788-182 English Language	5
0788-250 English Language	3
Elective	3

2 FACULTY REQUIREMENTS (23 Credits)

0490-101 Biology	3
0711-105 Introduction to Health Informatics	3
0700-106 First Aid and Emergency Care	3
0480-107 Statistics for Medical Sciences	3
0420-110 Chemistry	3
0420-111 Chemistry Lab.	1
0430-121 Physics	3
0430-125 Physics Lab.	1
0510-220 Psychology of Medical Care (AH)	3

3 PROFESSIONAL REQUIREMENTS (82 Credits)

Credit Hours

0700-155 Anatomy I	3
0530-152 Physiology I	3
0712-210 Introduction to Biochemistry	3
0712-211 Introduction to Histology and Cytology	2
0712-212 Introduction to Cell Biology	2
0712-213 Introduction to Haematology	2
0712-297 Introduction to Microbiology	3
0712-340 Histology	3
0712-342 Medical Biochemistry	4
0712-343 Molecular Biology and Genetics	2
0712-344 Immunology	2
0712-351 Medical Microbiology	4
0712-353 Medical Parasitology	3
0712-358 Histopathology & Cytology Methods I	3
0712-364 Clinical Microbiology & Serology	2
0712-365 Haematology I	4
0712-366 Clinical Chemistry I	3
0712-367 Clinical Chemistry II	3
0712-441 Haematology II & Practicum	3
0712-442 Immunohaematology & Practicum I	2
0712-449 Clinical Correlations I	1
0712-450 Clinical Microbiology I & Practicum	3

0712-457 Clinical Parasitology & Practicum	2
0712-458 Histopathology & Cyto. Methods II & Prac.	3
0712-462 Clinical Haematology Practicum	2
0712-463 Clinical Microbiology Practicum	3
0712-464 Immunohaematology & Practicum II	1
0712-465 Histopathology & Cyto. Methods III & Prac.	2
0712-466 Clinical Correlations II	2
0712-467 Clinical Chemistry III	3
0712-468 Clinical Chemistry IV	2
0712-470 Student Project	2

PROGRAMME TIMETABLE

FIRST YEAR

Semester One

Semester Two

Course	CH	Course	CH
110/111 Chem. & Chem. Lab.	4	121/125 Phys. + Phys. Lab.	4
or 121/125 Phys. & Phys. Lab.		or 110/111 Chem. & Chem. Lab.	
115 Finite Mathematics	3	182 English Language	5
181 English Language	5	101 Biology	3
Elective	3	106 First Aid & Emergency Care	3
	Total 15		Total 15

SECOND YEAR

Semester One

Semester Two

Course	CH	Course	CH
105 Intro. to Health Informatics	3	107 Stats for Medical Sciences	3
155 Anatomy	3	152 Physiology I	3
210 Intro. to Biochemistry	3	212 Intro. to Cell Biology	2
211 Introduction to Histology and Cytology	2	213 Intro. to Haematology	2
250 English Language	3	220 Psych. of Med. Care (AH)	3
		297 Intro. to Microbiology	3

Total 14		Total 16 THIRD YEAR	
Semester One		Semester Two	
Course	CH	Course	CH
340 Histology	3	343 Molecular Bio. & Genetics	2
342 Medical Biochemistry	4	353 Medical Parasitology	3
344 Immunology	2	358 Histopath. & Cyto. Methods I	3
351 Medical Microbiology	4	364 Clinical Microbiology & Serology	2
366 Clinical Chemistry I	3	365 Haematology I	3
		367 Clinical Chemistry II	3
	Total 16	Total	16

FOURTH YEAR

Semester One		Semester Two	
Course	CH	Course	CH
441 Haematology II & Prac.	3	462 Clinical Haematology & Prac.	2
442 Immunohaem. & Prac. I	3	463 Clinical Microbiology Prac.	3
449 Clinical Correlations I	1	464 Immunohaem. & Prac. II	1
450 Clinical Micro. & Prac.	3	465 Histopathology and Cytology 2 Methods III and Practicum	2
457 Clin. Parasitology & Prac.	2	466 Clinical Correlations II	2
458 Histopathology & Cyto. Methods II & Practicum	3	468 Clinical Chemistry IV	2
467 Clinical Chemistry III	3	470 Student Project Practicum	2
	Total 18	Total	14

MEDICAL LABORATORY SCIENCES COURSE DESCRIPTIONS

YEAR ONE, SEMESTER ONE

0420-110 CHEMISTRY (3-0-3) (Faculty of Science)

Stoichiometry; electronic structure of atoms, periodic table; chemical bonds, introduction to chemistry of elements; chemical thermodynamics, chemical kinetics; chemical equilibria, acids and bases in aqueous solutions.

0420-111 CHEMISTRY LAB (0-3-1) (Faculty of Science)

Corequisite: 110 Chemistry

0410-115 FINITE MATHEMATICS (3-0-3) (Faculty of Science)

Algebra of sets. Simple coordinate systems and graphs. Geometric approach to linear programming. Basic ideas of simplex method. Probability and applications to medical sciences. Statistics.

0788-181 ENGLISH LANGUAGE (10-0-5)

181 English is the first of three required English Language courses offered in the Faculty. It is a reading-based, multi-skills course intended to advance students' abilities to study content area courses in English. The macro-skills of reading, writing, listening, speaking and grammar are broken down into their component parts to give the students the opportunity to acquire fluency and accuracy in the language of the health sciences.

YEAR ONE, SEMESTER TWO

0430-121 PHYSICS (Faculty of Science) (3-0-3)

Methods of physics, elementary maths, motion and particle dynamics, mechanics of extended objects, conservation of energy, kinetic theory of gases. Liquids, vibrations and waves, ear and hearing, electricity and conduction in solids, ions and ionic conduction.

0430-125 PHYSICS LAB (Faculty of Science) (0-3-1) Corequisite: 121 Physics

0788-182 ENGLISH LANGUAGE (10-0-5)

182 English expands on the content of the five basic language learning skills introduced in 181 English. Students read and listen to materials of a scientific/medical nature, discuss the topics with their classmates to broaden their

comprehension, and then write about the topics they have discussed to show they are able to communicate comprehensibly. Grammar instruction is explicit and includes the grammar of science and medicine.

Prerequisite: 181 English

0490-101 BIOLOGY (2-3-3)

(Faculty of Science)

Cellular basis of life: differences in size and complexity of cells as illustrated by viruses, bacteria, protozoa and various types of metazoan cells. Structure and metabolic activities of a generalized eukaryotic cell. Chemical composition and functions of the cell membrane; role of mitochondria, structure of GER and SER and their relation to the Golgi apparatus; structure of the nuclear membrane. Central role or enzymes in cells. Structure of DNA and RNA. Genetic code and protein synthesis. Mitosis and meiosis. Mendelian genetics and inherited diseases. Interactions between eukaryotic cells and bacteria and viruses. Cell mediated immunity. Organization of cells into tissues.

0700-106 FIRST AID AND EMERGENCY CARE (2-2-3)

This course is designed to provide students with basic knowledge of first aid and the skills needed to provide early interventions and care in the event of a health emergency. It enables students to plan an assessment for each casualty, using a methodological two-stage system, first to check and treat life-threatening conditions (primary survey), then to call for help. An overall view of the basic fundamentals of first aid is presented with an emphasis on decision making in emergency situations.

Prerequisite: 180 English Language

YEAR TWO, SEMESTER ONE

0711-105 INTRODUCTION TO HEALTH INFORMATICS (2-2-3)

This course is designed to introduce the students to the fundamentals of information technology and systems from the perspective of health informatics. It provides the students with a wide spectrum of computer-related concepts and skills to ensure that they are capable of employing appropriate technologies and tools to manage health information as it relates to their respective discipline. The course covers a variety of topics including: computer concepts, computer technology and information systems, statistical software, communication technology, database design and management, and clinical, business, and specialty clinical systems applications.

Delivery methods employed for this course combine didactic theory supplemented by lab sessions that will provide hands-on applications of learned theory.

0700-155 ANATOMY (2-3-3)

This course provides an introduction to human morphology at the cell, tissue, and organ system levels of organization. The course is taught through theoretical lectures and practical demonstrations.

Prerequisite: 181 English Language

0712-210 INTRODUCTION TO BIOCHEMISTRY (2-3-3)

This course provides the student with the foundations of biochemistry. The absorption, metabolism, and utilization of essential body nutrients at the cellular level are covered.

Prerequisites: 110/111 Chemistry and Lab.

0712-211 INTRODUCTION TO HISTOLOGY AND CYTOLOGY (1-3-2)

The course provides a basic understanding of the organization of cell tissue, organs and organ systems of the body. Emphasis is given on the development, structure and function of different tissues. In addition, it includes topics that provide the fundamental principles of tissue processing and staining.

**Prerequisites: 110/111 Chemistry and Lab.
106 First Aid and Emergency Care**

0788-250 ENGLISH (6-0-3)

Language and study skills are perfected using authentic health sciences journal articles relevant to the students' majors. Report writing style, abstract writing, bibliography and referencing techniques are taught.

Prerequisite: 182 English Language

YEAR TWO, SEMESTER TWO

0480-107 STATISTICS FOR MEDICAL SCIENCES (3-1-3)
(Faculty of Science)

Relevance and principles of Biostatistics with application in Medicine and Biology. Descriptive statistics, sampling and sampling distributions. Estimation of parameters, probability and probability distribution, with emphasis on the normal. Tests of hypotheses for one or two means and one or two proportions. Measures of association between two continuous variables (correlation and regression) and two discrete variables (chi-square). Non-parametric tests commonly used in medicine.
Prerequisite: 115 Finite Mathematics

0530-152 PHYSIOLOGY I (2-2-3)

(Faculty of Medicine)

The course provides a basic understanding of the physiology of the cell, body fluids, nerves, muscles, blood, functions of the cardiovascular system, respiratory system, renal system, gastrointestinal system, endocrine system and reproductive system. Emphasis is placed on the interactions of the systems.

Prerequisite: 155 Anatomy I

0712-212 INTRODUCTION TO CELL BIOLOGY (2-0-2)

The course deals with cell structure and function at the molecular level. Emphasis is given to the basic principles of the major techniques used in clinical diagnosis and medical research.

Prerequisites: 155 Anatomy I, 211 Introduction to Histology and Cytology

0712-213 INTRODUCTION TO HAEMATOLOGY (1-3-2)

The course introduces the student to the fundamentals in haematopoiesis, the principles of blood collection and processing and basic haematology. Emphasis is given to laboratory techniques and quality assurance, blood and bone marrow smears, staining methods, blood cell morphology and cytochemistry, and screening tests for bleeding abnormalities.

Prerequisite: 210 Introduction to Biochemistry Corequisites: 152 Physiology, 212 Introduction to Cell Biology

0510-220 PSYCHOLOGY OF MEDICAL CARE A.H. (2-2-3)

(Faculty of Medicine)

The first part of the course provides an overview of Psychology as the basic science concerned with individual human behaviour and mental processes. Empirical studies and theoretical models of basic processes such as learning, memory and perception are introduced. Factors that motivate behaviour are considered, as well as contemporary models that describe and seek to explain the major dimensions of temperament and personality variation.

The second part of the course draws on the material taught in the first part to clarify issues relating to patients' compliance and satisfaction with the medical care they receive. Psychological factors which influence the behaviour and expectations of health professionals and the efficacy of the care they provide are also considered. The special needs of certain patients are highlighted. This includes reference to children, the aged, the dying, the physically handicapped and mentally retarded. Current theories linking stress and illness, methods for reducing stress, and research into pain and pain management are presented. The relationship between sociodemographic variables and health will also be considered.

Prerequisite: 182 English Language

0712-297 INTRODUCTION TO MICROBIOLOGY (2-3-3)

History of microbiology. Classification of micro-organisms. Structure and ultrastructure of bacteria, fungi, protozoa and viruses. Growth of bacteria and fungi, replication of viruses. Requirements for the laboratory cultivation of bacteria, fungi and viruses. Bacterial metabolism and genetics. Micro-organisms in the environment and their public health significance. Introduction to host/parasite relationships. Host responses to infection.

Prerequisite: 210 Introduction to Biochemistry Corequisite: 212

Introduction to Cell Biology

YEAR THREE, SEMESTER ONE

0712-342 MEDICAL BIOCHEMISTRY (3-3-4)

The course is designed to provide the students with an understanding of biochemical structure and function at the molecular level, and to show how metabolic dysfunction contributes to disease.

Prerequisite: All Year Two courses

0712-351 MEDICAL MICROBIOLOGY (3-3-4)

Bacteriology: introduction to the systematic study of bacteria, medical virology: introduction to methods of demonstration and isolation of viruses, characteristics of major groups of animal viruses. Medical mycology: general features of fungi, isolation and recognition of major fungal pathogens of man.

Prerequisite: All Year Two courses Corequisite: 344 Immunology

0712-340 HISTOLOGY (2-3-3)

General principles for preparing tissues for histological examination including fixation, tissue processing and microtomy. Theory and application of routine staining techniques. Microscopic anatomy of organs and tissue systems.

Prerequisites: All Year Two courses

0712-344 IMMUNOLOGY (1-3-2)

The course is designed to introduce the principles of immunology and the functioning of the human immune system, both at the physiologic and cellular levels, and to identify the most important applications in the clinical laboratory.

Prerequisites: All Year Two Courses

0712-366 CLINICAL CHEMISTRY I (2-3-3)

An introductory course in clinical chemistry, structured to give the students a basic understanding of clinical chemistry and basic skills in clinical chemistry laboratory techniques.

Prerequisite: All Year Two courses Corequisite: 342 Medical Biochemistry

YEAR THREE, SEMESTER TWO**0712-343 MOLECULAR BIOLOGY AND GENETICS (1-3-2)**

The course provides an introduction to basic concepts of Mendelian genetics and the molecular structure of genes, and the genetic basis of hereditary disease and cancer. It also includes inheritance patterns of single gene, polygenic and chromosomal disorders in humans. It introduces the concepts and practice of recombinant molecular biology and includes practical laboratory experience of modern molecular techniques.

Prerequisite: All Year Three, Semester One courses

0712-353 MEDICAL PARASITOLOGY (2-3-3)

Characteristics and life cycles of parasites of medical importance: helminthesnematodes, trematodes and cestodes; protozoa. Arthropods as agents and vectors of human disease. Laboratory investigation of parasitic diseases.

Prerequisite: All Year Three, Semester One courses

0712-358 HISTOPATHOLOGY AND CYTOLOGY METHODS I (2-3-3)

Introduction to theoretical and practical aspects of special staining procedure for demonstration of specific structures in Histopathology. Introduction to various cytological methods of specimen collection and laboratory preparation and introduction to the concept of diagnostic cytology for various organs. Pathology topics introducing the concept of disease and the uses of demonstrating disease.

Prerequisite: 340 Histology 11

0712-365 HAEMATOLOGY I (2-3-3)

The focus of this course is on (a) the mechanisms in blood cell development, (b) the classification and laboratory features of anaemias, leukemias and haemostatic disorders, (c) routine and special tests in Haematology, (d) quality control, (e) blood and bone marrow cell morphology and (f) blood collection procedures. The course also contains an introduction to immunohaematology and blood banking, and an introduction to correlation of laboratory data with haematologic disorders.

Prerequisites: All Year Three, Semester One courses

0712-364 CLINICAL MICROBIOLOGY & SEROLOGY (1-3-2)

Methods for the recovery of bacteria from clinical specimens and for the serological diagnosis of disease. Examination of blood, CSF, pus, other body fluids, respiratory tract specimens, urine, faeces, genital tract specimens. Serological methods for brucellosis, enteric fever, streptococcal disease, syphilis. Antibiotic susceptibility testing.

Prerequisites: All Year Three, Semester One courses

0712-367 CLINICAL CHEMISTRY II (2-3-3)

This course complements 366 Clinical Chemistry I and equips students with theory and laboratory skills for hospital laboratory rotation in Year Four.

Prerequisites: All Year Three, Semester One courses

YEAR FOUR, SEMESTER ONE

0712-442 IMMUNOHAEMATOLOGY AND PRACTICUM I (1-4-3)

This course focuses on genetics in blood banking, and the structure of ABO and non ABO blood group systems. Blood grouping and pre transfusion testing. Complications of blood transfusions. Blood collection, processing and storage. Blood components and their indications for transfusion.

Prerequisites: All Year Three, Semester Two courses

0712-441 HAEMATOLOGY II AND PRACTICUM (1-6-3)

The theoretical aspects of this course include investigation of anaemias: blood loss, iron deficiency, megaloblastic, aplastic, sideroblastic, thalasseмии and haemoglobinopathies, and anaemias of chronic disorders and malignancies. Laboratory investigation of acute and chronic leukaemias, myeloproliferative lymphoproliferative, immunoproliferative disorders and lymphomas. Investigation of patients with haemostatic defects in a clinical laboratory. Methods for the procurement of blood specimen, for testing, by phlebotomy techniques.

Prerequisites: All Year Three, Semester Two courses

0712-449 CLINICAL CORRELATIONS I (1-0-1)

Principles of test selection and use for diagnosis of disease, screening and patient management. Calculation of sensitivity, specificity pretest and post-test probabilities. Discussion of significance of the normal range, cut-off points and the use of combinations of tests. Case studies from Microbiology, Haematology, Clinical Chemistry and Cytology to illustrate the correct use of laboratory tests.

Prerequisites: All Year Three, Semester Two courses

0712-450 CLINICAL MICROBIOLOGY I AND PRACTICUM (1-6-3)

Laboratory investigation of clinical specimens for the detection of bacteraemia meningitis, upper and lower respiratory tract infections, wound infections, genitourinary tract infections, gastrointestinal tract infections and identification of the causative organism. Rotation in a clinical microbiology laboratory.

Prerequisites: All Year Three, Semester Two courses

0712-457 CLINICAL PARASITOLOGY AND PRACTICUM (1-3-2)

Examination of clinical specimens for protozoan and helminth parasites. Clinical signs and pathogenesis of parasitic diseases endemic in Kuwait and the Gulf or frequently imported into the region. Host responses to parasitic infection. Rotation in a clinical parasitology laboratory.

Prerequisites: All Year Three, Semester Two courses

0712-458 HISTOPATHOLOGY & CYTOLOGY METHODS II AND PRACTICUM (1-6-3)

Rotation through routine histopathology and cytology laboratory introducing the students to the preparation of specimens for routine diagnostic procedures. The theory aspect will concentrate on special laboratory procedures including immunohistology, plastic histology, electron microscopy and enzyme histochemistry, cell and tissue culture and the general cytological techniques for collection and preparation of various cell samples. **Prerequisites: All Year Three, Semester Two courses**

0712-467 CLINICAL CHEMISTRY III (2-3-3)

This course involves rotation through a routine clinical chemistry laboratory, and theory classes to provide further training on understanding laboratory methods and interpretation of test results.

Prerequisites: All Year Three, Semester Two courses

YEAR FOUR, SEMESTER TWO

0712-462 CLINICAL HAEMATOLOGY PRACTICUM (0-6-2)

Laboratory haematology data interpretation. Case studies of anaemias, leukemias and bleeding disorders. Principles of methods used in the laboratory investigation of haemostatic, leukocyte and red cell disorders. Screening tests, routine laboratory tests and special diagnostic tests for haematologic investigation in a clinical laboratory.

Practical experience is reinforced by seminars on related topics.

Prerequisites: All Year Four, Semester One courses

0712-463 CLINICAL MICROBIOLOGY PRACTICUM (0-9-3)

The students are assigned to a clinical microbiology laboratory and are completely responsible for processing of simulated specimens including microscopic evaluation, choice of culture media and techniques, identification and susceptibility testing of significant isolates and issue of the final report.

Prerequisites: All Year Four, Semester One courses

0712-464 IMMUNOHAEMATOLOGY AND PRACTICUM II (0-3-1)

Rotation in a clinical laboratory reinforces the theoretical and practical aspects of immunohaematology. Case studies: haemolytic diseases of the new born, transfusion reactions, autoimmune haemolytic anaemia, resolution of single/multiple alloantibodies, cross-matching, resolving QC problems will be covered.

Prerequisites: All Year Four, Semester One courses

0712-468 CLINICAL CHEMISTRY IV (1-5-2)

Full-time rotation with full practical involvement in the preanalytical, analytical and post analytical stages of hospital clinical chemistry work.

Prerequisites: All Year Four, Semester One courses 0712-465

HISTOPATHOLOGY & CYTOLOGY METHODS III & PRACTICUM (0-6-2)

The course is a progression of Histopathology & Cytology Methods II (458) and is designed to give further practice in the application of histopathology & cytology methods within the hospital laboratory. Emphasis is placed on special histological staining and cytological procedures and is supported by tutorials and case discussions.

Prerequisites: All Year Four, Semester One courses

0712-466 CLINICAL CORRELATIONS II (2-0-2)

The course is a progression of Clinical Correlations I (449) and presents patient case studies consisting of relevant medical history and pertinent laboratory findings. The student learns the step-wise procedure in the advanced type of problem solving through a structured learning experience. **Prerequisites: All Year Four, Semester One courses**

0712-470 STUDENT PROJECT PRACTICUM (0-6-2)

Students select an area of medical laboratory science and carry out a small research project under supervision. This will provide training in scientific research methodology including organising and planning the study, collection of samples, analysis, presentation and interpretation of data. Instruction will also be given on clinical laboratory administration.

Prerequisites: All Year Four, Semester One courses