

**MASTER OF SCIENCE  
MEDICAL LABORATORY SCIENCES**

***INTRODUCTION***

The Department of **Medical Laboratory Sciences** (MLS) (College of Allied Health Sciences) offers a Master of Science program in Medical Laboratory Sciences (MLS). Both full-time and part-time students are accepted to the program. The Master's program in MLS was developed to cater for the need of graduates in MLS and related areas for higher studies. The most distinct feature of this proposed program will be its unique professional and practical training. The outcome of this program will certainly make a valuable contribution towards raising the standard of hospital laboratory service and the quality of health care system in Kuwait. Language of instruction is English.

*According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.*

***PROGRAM REQUIREMENTS***

The program requirements are:

**33 TOTAL COURSE CREDITS**

**21 COMPULSORY COURSES (Credits in parenthesis)**

0712-500 General Microbiology	(2)
0712-501 Medical Microbiology	(1)
0712-510 Clinical Chemistry I	(2)
0712-511 Clinical Chemistry II	(1)
0712-520 Haematology I	(2)
0712-521 Haematology II	(1)
0712-530 Methods in Histology and Histopathology	(2)
0712-531 Methods in Diagnostic Cytology	(1)
0712-540 Statistics for Biomedical Science	(2)
0712-541 Laboratory Management and Quality Control	(1)
0712-542 Research Methods	(1)
0712-543 Research Techniques in Medical Laboratory Sciences	(3)
0712-544 Seminar Topics in Laboratory Medicine	(1)
0712-545 Hospital Internship	(1)

**3 ELECTIVE COURSES (1 credit each)**

Students are required to select 3 electives, from any one of the following disciplines

**Microbiology**

- 0712-502 Environmental Microbiology
- 0712-503 Antimicrobial Agents and Chemotherapeutics
- 0712-504 Advanced Techniques in Diagnostic Microbiology
- 0712-505 Medical Virology
- 0712-506 Advanced Techniques in Parasitology
- 0712-507 Clinical Mycology
- 0712-508 Immunology

**Clinical Chemistry**

- 0712-512 Biochemical Markers
- 0712-513 Therapeutic Drug Monitoring
- 0712-514 Inborn Errors of Metabolism
- 0712-515 Molecular Biology and Genetics
- 0712-516 Human Genetics
- 0712-517 Cancer Genetics
- 0712-518 Genomics and Bioinformatics
- 0712-519 Seminar Topics in Molecular Biology and Genetics

**Haematology**

- 0712-522 Blood and Bone marrow Cell Morphology
- 0712-523 Haemoglobinopathies and Thalassemia
- 0712-524 Haemophilia and von Willebrand's Disease
- 0712-525 Immunohematology and Blood banking

**Histology and Cytology**

- 0712-532 Cytopathology and Cytopreparatory Techniques
- 0712-533 Diagnostic Methods in Histopathology
- 0712-534 Methods in Immunohistochemistry
- 0712-535 Principles and Methods in Electron Microscopy
- 0712-536 Seminar Topics in Cell Biology

**9 COMPULSORY (Thesis)**

- 0712-597 (0)
- 0712-598 (0)
- 2000-599 (9)

***COURSE DESCRIPTION***

**0712-500: GENERAL MICROBIOLOGY  
CR: 2**

This course through a series of lectures and practical demonstrations, introduces the students to the basics of microbiology laboratory practice in a

diagnostic laboratory. This course will also cover laboratory safety measures, sterilization procedures, quality control measures particularly relevant to microbiology.

**0712-501: MEDICAL MICROBIOLOGY  
CR: 1**

The course mainly deals with isolation and identification procedures of various microorganisms from different clinical samples adopting conventional and current molecular based techniques. The course includes laboratory diagnostic procedures for bacterial, viral, parasitic and fungal infections.

**0712-502: ENVIRONMENTAL  
MICROBIOLOGY  
CR: 1 PR: General  
Microbiology**

This course covers information regarding the microbial load in various environmental samples that are close to human beings, their importance in causing human infections and how they are transmitted to man.

**0712-503: ANTIMICROBIAL AGENTS  
AND CHEMOTHERAPEUTICS  
CR: 1 PR: Graduate standing**

This course presents information on the classes of antimicrobial agent and their modes of action. Methods for antimicrobial susceptibility testing and the mechanisms responsible for and detection of antimicrobial resistance are included.

**0712-504: ADVANCED TECHNIQUES IN  
DIAGNOSTIC MICROBIOLOGY  
CR: 1**

This course presents recent advances in methods used for the detection, growth and identification of pathogenic microorganisms.

**0712-505: MEDICAL VIROLOGY  
CR: 1**

This course includes the diagnosis of various viral infections, antigen and antibody detection and tissue culture techniques for viral isolation/identification.

**0712-506: ADVANCED TECHNIQUES IN  
PARASITOLOGY  
CR: 1**

This course deals with recent developments in parasitology including immunological diagnostic methods, culture techniques and susceptibility testing. Genetic and antigenic analysis and vaccine preparation are also included.

**0712-507: MEDICAL MYCOLOGY  
CR: 1**

This course includes isolation and identification of various fungi from suspected cases of fungal infection, their antimicrobial susceptibility. It also includes the pathogenesis of fungal infections.

**0712-508: IMMUNOLOGY  
CR: 1**

This course provides the student with advanced information concerning the immune system and the nature of interaction between antigens and antibodies and the cell mediated laboratory techniques in immunology are emphasized.

**0712-510: CLINICAL CHEMISTRY I  
CR: 2**

This course covers various aspects of hospital clinical biochemistry laboratory service. It includes role of clinical biochemistry in laboratory medicine, staffing and organization of biochemistry laboratory, identifying appropriate biochemical test protocols and methods, evaluation of biochemical data and biochemical profiles in health and disease.

**0712-511: CLINICAL CHEMISTRY II  
CR: 1 PR: CLINICAL  
CHEMISTRY  
366, 367, 467 and 468 or  
equivalent courses**

This course combines some routine biochemical measurements with update of investigations in a number of special areas of laboratory medicine. It covers pregnancy, prenatal and neonatal screening, clinical endocrinology, laboratory measurements in extremes of age, and current trends in clinical biochemistry.

**0712-512: BIOCHEMICAL MARKERS  
CR: 1 PR: 510 and 511 511 or  
equivalent courses**

Biochemical markers are considered to be systemic indicators of the presence of a disease, a certain stage of a disease, progression of a disease, or the predisposition for developing a disease. A number of such indicators have been evaluated in recent years and are now playing an important role in the diagnosis and management of patients, especially those with cancer, cardiac and bone diseases. The course will cover those markers that are considered useful in the aforementioned three clinical conditions.

**0712-513: THERAPEUTIC DRUG MONITORING**  
**CR: 1 PR: 510 and 511 or equivalent courses**

Drug levels in body fluids are determined for a number of reasons. They include ensuring that the levels are within the required therapeutic range, checking on drug compliance, relating drug levels with known adverse effects, screening for drug overdose and for the presence of drugs of abuse. The lecture course covers the major factors that affect drug levels in body fluids, drug measurements, their clinical significance and aspects of toxicity.

**0712-514: INBORN ERRORS IN METABOLISM**  
**CR: 1 PR: 510 and 511 or equivalent courses**

Inborn errors in metabolism results from inherited genetic defect that can cause reduced synthesis of an enzyme protein or altered amino acid composition of that protein. This diminished or missing enzyme causes a block on a metabolic pathway, thereby deficiencies, and can also produce toxic metabolites. Monitoring biochemical profiles can assist in the diagnosis and management of these conditions.

**0712-515: MOLECULAR BIOLOGY AND GENETICS**  
**CR: 1 PR: 510 and 511 or equivalent courses**

This course provides the students with a comprehensive overview of molecular biology and molecular genetic concepts and methodology. Its focus is on applications of molecular biology in medical diagnosis and disease investigation in order to enhance the student's ability to carry out independent research in molecular biology. In this course, emphasis is given on theoretical and practical aspects of clinical application of molecular biology and the essential techniques in molecular biology and genetic engineering.

**0712-516: HUMAN GENETICS**  
**CR: 1 PR: 510 and 511 or equivalent courses**

This course deals with the detection, expression, transmission, and molecular manipulation of human traits. Emphasis is given to medical genetics.

**0712-517: CANCER GENETICS**  
**CR: 1 PR: 510 and 511 or equivalent courses**

The course deals with the recent advances in cancer genetics. Topics include cancer cell growth, metastasis, angiogenesis, molecular basis of carcinogenesis, cancer diagnosis, experimental therapeutics and genetic counseling.

**0712-518: GENOMICS AND BIOINFORMATICS**  
**CR: 1 PR: 510 and 511 or equivalent courses**

The goal of this course is to introduce the basic principles and methods involved in mapping and sequencing genomes, the genomics-based infrastructures of information and biological materials that are being developed as the various genome projects progress, and examine how these new tools and resources are being applied to specific research problems.

**0712-519: SEMINAR TOPICS IN MOLECULAR BIOLOGY AND GENETICS**  
**CR: 1 PR: 510 and 511 or equivalent courses**

This course is designed to introduce students to the critical reading of current scientific literature focusing on a particular area of molecular biology and genetic research. It includes presentation of research papers by the students and intensive discussion of the methodology and conclusions of the papers.

**0712-520: HAEMATOLOGY I**  
**CR: 2 PR: 365, 441, 442 and 464 or equivalent courses**

This course covers the fundamentals of haematopoiesis and the regulation of blood cell production. The mechanisms in the development of common anaemias and leukemic transformation, and the laboratory investigation of disorders of red and white blood cells are emphasized. The practical component of the course is focused on test performance and clinical laboratory data interpretation. This course also focuses on introductory topics in immunohematology and blood banking.

**0712-521: HAEMATOLOGY II**

**CR: 1 PR: Graduate standing**

This course covers both routine and advanced methods used in the laboratory investigation of haemostatic disorders and in monitoring treatment of abnormal bleeding and thrombophilia. Emphasis is given to the common disorders of platelets, blood vessels and coagulation that result in bleeding disorders.

**0712-522: BLOOD AND BONE MARROW CELL MORPHOLOGY**

**CR: 1 PR: 520 and 521 or equivalent courses**

The preparation, staining and identification of the cells of the blood and bone marrow form the basis of this course. The identification of abnormal cells and abnormal pattern of cells and their relationship to disease processes are emphasized.

**0712-523: HAEMOGLOBINOPATHIES AND THALASSEMIA**

**CR: 1 PR: 520 and 521 or equivalent courses**

The genetics, classification and laboratory diagnosis of qualitative and quantitative abnormalities of haemoglobin form the basis of this course. Interpretation of laboratory findings underpinning these disorders forms the focus of the laboratory exercises.

**0712-524: HAEMOPHILIA AND VON WILLEBRAND'S DISEASE (1CH)**

**CR: 1 PR: 520 and 521 or equivalent courses**

This course covers the genetics abnormalities and molecular mechanisms leading to abnormal bleeding in haemophilia A, haemophilia B and von Willebrand's disease. Routine and advance diagnostic methods used in the identification and monitoring of patients with these disorders underpin the laboratory aspects of the course.

**0712-525: IMMUNOHEMATOLGY AND BLOOD BANKING**

**CR: 1 PR: 520 and 521 or equivalent courses**

This course focuses on structure of blood group systems. Essential pretransfusion testing including antibody identification and compatibility testing, blood collection, processing and storage. Blood

components and their indications for transfusion; clinical application associated with complication of blood transfusion, hemolytic disease of the newborn, and transfusion therapy for selected patient population. Role of blood bank in hematopoietic stem cells transplantation.

**0712-530: METHODS IN HISTOLOGY AND HISTOPATHOLOGY**

**CR: 2 PR: Histology and Cytology 340, 358, 458 and 465 or equivalent courses**

This course is designed to introduce students to the most recent techniques applied in diagnostic histology and research. It also includes the special techniques applied in histology that are used for the study of different body tissues.

**0712-531: METHODS IN DIAGNOSTIC CYTOLOGY**

**CR: 1 PR: Histology and cytology 340, 358, 458 and 465**

This course includes the various advanced techniques used in the diagnostic cytology laboratory. Emphasis will be given on the cytology of neoplastic diseases.

**0712-532: CYTOPATHOLOGY AND CYTOPREPARATORY TECHNIQUES**

**CR: 1 PR: 530 and 531 or equivalent courses**

This course is intended to provide the student with a comprehensive knowledge of the basic and molecular techniques used for the diagnostic applications of exfoliative and aspiration cytology. This course covers the preparation and identification of recognized normal and abnormal cytological findings encountered in a particular organ accompanied by appropriate histopathological correlations and consideration of possible differential diagnosis.

**0712-533: DIAGNOSTIC METHODS IN HISTOPATHOLOGY**

**CR: 1 PR: 530 and 531 or equivalent courses**

This course involves lectures and practicals on special staining methods in histopathology. This course provides a detailed understanding of the principles and methods of various staining

techniques used to identify specific substances present in normal and abnormal histological preparations. In addition, this course also deals with the applications of molecular biology methods in diagnostic histopathology.

**0712-534: METHODS IN IMMUNOHISTOCHEMISTRY**  
**CR: 1 PR: 530 and 531 or equivalent courses**

The course involves lectures and practicals on Immunohistochemistry Techniques used in surgical Pathology and Cytopathology. It includes those used on non neoplastic as well as neoplastic diseases of the different body systems.

**0712-535: PRINCIPLES AND METHODS IN ELECTRON MICROSCOPY**  
**CR: 1 PR: 530 and 531 or equivalent courses**

This course is intended to give the student a good understanding of the basic techniques of transmission and scanning electron microscopy. In addition to the theoretical knowledge, practical sessions are given to familiarise with the working of different instruments used in tissue processing and staining for electron microscopy.

**0712-536: SEMINAR TOPICS IN CELL BIOLOGY (1CH)**  
**CR: 1 PR: 530 and 531 or equivalent courses**

The aim of this course is to integrate the information obtained through course work with critical analysis of the current advances in cell biology research. Furthermore, it provides a platform to develop effective communication skills in presenting and discussing research data before an audience.

**0712-540: STATISTICS FOR BIOMEDICAL SCIENCE**  
**CR: 2**

This course covers the basic concepts in statistics with emphasis on data collection, application of appropriate statistical methods and data presentation. A laboratory component is given consisting of problem solving and data interpretation drawn from examples in biomedical sciences.

**0712-541: LABORATORY MANAGEMENT AND QUALITY CONTROL**  
**CR: 1**

This course covers the basic principles in laboratory management and quality control.

**0712-542: RESEARCH METHODS**  
**CR: 1 PR: Project 470 or equivalent courses**

This course addresses the important issues that may concern orderly and systematic inquires in medical laboratory sciences and their ethical dimensions. It presents a sequential description of such studies, from the definition of a research topic in the context of relevant existing knowledge, through design of investigations, choice of measurements and their validation, and finally to the evaluation of the findings and their dissemination.

**0712-543: RESEARCH TECHNIQUES IN MEDICAL LABORATORY SCIENCES**  
**CR: 3**

The course provides the student with information concerning the theoretical principles and practical uses of the major types of laboratory instruments and techniques used in the field of Medical Laboratory Sciences. In this course the students get hands-on experience in the various laboratory instruments and techniques used in laboratory medicine. The course consists of tutorials and demonstrations. This course also involves clinical rotation in all hospital laboratories, where the student will conduct case studies on the methods used in the clinical laboratory to investigate patients admitted with different clinical presentations.

**0712-544: SEMINAR TOPICS IN LABORATORY MEDICINE**  
**CR: 1**

This course is designed to introduce students to the critical reading of current scientific literature focusing on a particular area of research in laboratory medicine. It includes presentation of research papers by the students and intensive discussion of the methodology and conclusions of the papers. In particular, this course provides a platform to develop effective communication skills in presenting and discussing research data before an audience.

**0712-545: HOSPITAL INTERNSHIP**  
**CR: 1PR: Graduate standing**

This involves clinical rotation based on the chosen sub-specialty, in any one of the following topics such as Advanced Microbiology, Advanced Clinical Chemistry, Advanced Clinical Hematology and Advanced Clinical Histopathology and Cytology. During the course, the student will conduct and report an audit of a

single laboratory discipline, based on their choice of specialization.

- 0712-597: THESIS**  
**CR: 0**
- 0712-598: THESIS**  
**CR: 0**
- 2000-599: THESIS**  
**CR: 9**