

**MASTER OF SCIENCES  
IN FORENSIC SCIENCES**

**Program code: 0409**

***INTRODUCTION***

The Department of Chemistry and the Department of Biological Sciences (College of Science) offer a Master of science Degree in **Forensic Science**. English is the language of instruction and research. The aim of this program is to develop analytical and interpersonal skills along with expertise in the specific fields of forensic science. This training will best prepare the graduates in pursuing and succeeding in a career of their choice within the field of forensic science without the need for further training. The program offers two fields of study; Biological Forensic Studies, and Chemical Forensic Studies. Non-thesis option is offered. Student must choose one track (Forensic Biology or Forensic Chemistry).

***PROGRAM REQUIREMENTS***

**33 TOTAL COURSE CREDITS**

**18 COMPULSORY COURSE**

0409-510	Criminal Procedures and Testimony	(3)
0409-512	Forensic Sciences Skills	(2)
0409-513	Forensic Instrumentation	(3)
0409-514	Trends and Case Studies in Forensic Science	(2)
0409-565	Forensic Pathology	(3)
0409-593	Project	(3)
0510-501	Biostatistics and Computer in Medicine	(2)

**15 SUBDISCIPLINE COURSES**

**Student must complete all required 15 credits from one track.**

**TRACK I: FORENSIC BIOLOGY**

**6 COMPULSORY COURSES**

0409-522	Forensic Biochemistry	(3)
0409-555	Molecular Forensics	(3)

**9 ELECTIVE COURSES \***

0409-516	Advanced Forensic Microscopy	(3)
0409-517	Food Analysis	(3)
0409-524	Forensic Entomology	(3)
0409-526	Forensic Microbiology and Biohazards	(3)
0409-570	Forensic Pharmacokinetics and Pharmacodynamics	(3)

**TRACK II: FORENSIC CHEMISTRY**

**9 COMPULSORY COURSES**

0409-533	Forensic Analysis of Glass and Soil	(3)
0409-534	Drug Chemistry	(3)
0409-535	Arson, Textile and Paint Analysis	(3)

**6 ELECTIVE COURSES\***

0409-516	Advanced Forensic Microscopy	(3)
0409-517	Food Analysis	(3)
0409-537	Surface Analysis for Forensic Investigation	(3)
0409-539	Environmental Crimes	(3)
0409-570	Forensic Pharmacokinetics and Pharmacodynamics	(3)

\*Graduate students specialized in the Forensic Biology may select only one course from the Forensic Chemistry course list.

\*\*The graduate student specialized in Forensic Chemistry allowed to take 3 credit hours of 400-level courses from the Minor Forensic Science track. Students can take these courses only with the approval of the program Director.

***COURSE DESCRIPTION***

**0409-510: CRIMINAL PROCEDURES AND TESTIMONY  
CR: 3**

This course aims to examine the relationship between expertise and justice. Judicial authorities are often faced with technical issues that require expertise in specialized disciplines and sciences to assist them in understanding the evidence presented in order to draw objective and rational conclusions. This is concerning whether an event is criminal action or whether a particular person committed the crime. The course will review legal aspects of scientific and technical skills as well as expertise testimony that are often presented in criminal procedures. The approach for this course will be to review legal basis and aspects on the use of scientific and technical evidence and expertise in judicial and criminal procedures to assist in drawing the final verdict with emphasis on the importance of communicating scientific concepts to a lay person. This course will be offered by the Faculty of Law. The course will also cover basic

ethical issues related to evidence handling. In addition the course will also explore ethical issues regarding evidence handling, reporting and testimony.

**0409-512: FORENSIC SCIENCES SKILLS  
CR: 2**

This is a general theoretical course that aims to introduce students and train them in basic skills used in Forensic science and Crime scene Analysis. The course will be divided into two main parts, the first dealing with tools in Forensic Biology and the other with tools in Forensic Chemistry including mainly Forensic Microscopy and Chromatography. In addition, the course will provide an insight into the importance of computers and specialized software programs in the areas of both Forensic Biology and Chemistry. The course will also cover and practice quality assurance and report writing procedures and professional ethics emphasizing the importance of efficient communication skills of scientific concepts and testimony will be discussed and practiced. The lectures of this course will be equally shared between the Department of Biological Sciences and the Department of

Chemistry. as well as guest lecturers from the department of Forensic Sciences, Ministry of Interior.

**0409-513: FORENSIC INSTRUMENTATION**  
**CR: 3 PR: 0409-512**

Survey of forensic toxicology, with emphasis on analytical and interpretive aspects; analytical methods including, mass spectrometry, LC/MS. GC/MS, FTIR, XRD, XRF spectrometry and RAMAN nontraditional matrices, interpreting the significance of results. An in-depth treatment of classes of commonly encountered drugs of abuse and the analytical methods used in their screening, identification and quantitation will be reviewed. The lectures of this course will be equally shared between the Department of Biological Sciences and the Department of Chemistry.

**0409-514: TRENDS AND CASE STUDIES IN FORENSIC SCIENCE**  
**CR: 2**

This course will review and discuss current trends and innovative techniques in Forensic Science. The course will also involve student presentations on recent publications (seminar series) and group discussion of news-breaking case reports both local and international and studies involving the use of Forensic Science techniques as well as ethical issues and concerns arising from such cases. (Review of recent peer-reviewed research publications).

**0409-516: ADVANCED FORENSIC MICROSCOPY**  
**CR: 3 PR: 0409-513**

The course is a combined theory and practical course designed to provide an in-depth understanding of the theory and practice of microscopy as it applies to forensic trace evidence. Basic and advanced types of microscopes will be covered including light microscopy, polarized light microscopy, dark field and phase contrast microscopy, fluorescent microscopy, scanning electron microscopy, spectroscopic methods that can be interfaced with the microscope (such x-ray microanalysis) and photomicrography. Students will have the opportunity to analyze different types of trace evidence in the laboratory using a variety of microscopes.

**0409-517: FOOD ANALYSIS**  
**CR: 3 PR: 0420-513**

This course will examine the principles of chemical methods in food analysis such as oil and fat analysis. The course will also demonstrate the recent developments in the detection and analysis of inorganic poisons in food samples. It will also cover basic techniques in the analysis of food components. This course will be offered by the Biochemistry Program.

**0409-522: FORENSIC BIOCHEMISTRY**  
**CR: 3 PR: 0420-513**

This course will introduce the principles of immunology, biochemistry, toxicology techniques and their application to forensic analyses. This course will cover the following topics: Analytical Biochemistry, Enzyme Structure and Function Humoral and Cellular Immunology, Functional properties of Antibodies, Activation and Regulation, Immune Response Disorders, Immunology and Serology Laboratory Methods and toxicology. The course will include practical and laboratory techniques commonly used for the examination and identification of body fluids, enzymes and immune assays.

**0409-524: FORENSIC ENTOMOLOGY**  
**CR: 3 PR: 0409-512**

This course will introduce students and train them on the various methods of how insects can be used in forensic analysis of crime scenes and determination of time of death. The course will concentrate on how insects and related arthropods are used to determine postmortem intervals and estimate time of death in murder and unexplained death investigations. This course will include lectures and practical exercises on the examination and collection of insects, handling and reference storing of insects, taxonomic identification of forensic insects and proper methods of postmortem interval determinations as well as processing a mock crime scene for entomological evidence

**0409-526: FORENSIC MICROBIOLOGY AND BIOHAZARDS**  
**CR: 3**

This course will introduce methods and techniques used in bioterror detection and identification as well as medical intervention. Many topics will be covered including microbial forensic analysis of trace and unculturable specimens, biological

agents, collection and preservation of specimens, decontamination and removal of microbial forensic samples. A practical approach will also be used to demonstrate forensic analysis of bacterial pathogens, procedures for working in biosafety level 3 and 4 environments. The course will also include discussion of case studies such as microbial forensics investigation of the anthrax-letter attacks, viral forensics and food-borne outbreaks. Response to biological threats and legal aspects of biosecurity will also be discussed.

**0409-533: FORENSIC ANALYSIS OF GLASS AND SOIL**  
**CR: 3**

This course will examine glass and soils, refractive index measurements, polarized light observations of minerals and X-ray diffraction, XRF analysis of minerals.

**0409-534: DRUG CHEMISTRY**  
**CR: 3 PR: 0409-512**

This course will describe the chemical factors that influence toxicity and toxicity evaluation methods. Chemical and toxicological characteristics of commonly abused drugs and the mechanisms of their action will be reviewed and discussed. Dose response of drugs using micro-chemical and instrumental methods (GC/MS, LC/MS, FTIR), will be explained.

**0409-535: ARSON, TEXTILE AND PAINT ANALYSIS**  
**CR: 3 PR: 0420-513**

This course will examine arson accelerants, textile fibers polymers, plastics and paints and explosives. The course will also cover applications of HPLC to forensic chemistry analysis. Analysis of spectroscopy and GC/MS will also be covered.

**0409-537: SURFACE ANALYSIS FOR FORENSIC INVESTIGATION**  
**CR: 3 PR: 0420-513**

This course will examine the application of X-ray photoelectron spectroscopy, electron microscopy and energy dispersive spectroscopy in the analysis of evidence collected in crime investigations.

**0409-539: ENVIRONMENTAL CRIMES**  
**CR: 3 PR: 0420-513**

This course will examine the principles, standards and regulations that govern the treatment and disposal of wastes. The course will also review laws and regulations governing the violation of environment and for the protection of the environment.

**0409-555: MOLECULAR FORENSICS**  
**CR: 3**

This is a course that aims to introduce students and train them in DNA profiling techniques. The course will be divided into a theoretical part consisting of lectures and group discussion (molecular biology, DNA structure and organization, profiling theory and techniques) and practical part consisting of laboratory practicals (DNA extraction, Realtime PCR, Gene Fragment Analysis, Data Interpretation and analysis). The course will also cover recent topics in DNA profiling techniques, population genetics as well as applications in other organisms.

**0409-565: FORENSIC PATHOLOGY**  
**CR: 3**

This course aims at familiarizing the candidates with basic knowledge on the major causes of natural and unnatural death, general understanding of the medico-legal systems of death investigation, and the major causes and types of injury. The course is also designed to explain the multidisciplinary nature of forensic investigations with emphasis on the basic organizational structures involved in the forensic practice both locally and internationally, as well as the role, duties and responsibilities of all members of the forensic investigative team. Ethical issues arising in forensic science practice are also included.

**0409-570: FORENSIC PHARMOKINETICS AND PHARMODYNAMICS**  
**CR: 3 PR: 0420-513**

This course will provide knowledge in analytical chemistry, pharmacokinetics and pharmacodynamics which is important for the forensic toxicologist to understand and interpret the analytical results. The course will provide the student with the essential information to allow development of critical understanding of the role of a forensic toxicology leading to pharmacodynamics and pharmacokinetics of substances of abuse.

Focuses will be placed on the detection and quantification of drugs and poisons in biological specimens and the interpretation of the results to the purposes of the law. This course will be offered by the Health Sciences Center.

**0409-593: RESEARCH PROJECT**  
**CR: 3**

The student undertakes an independent project on a research topic of theoretical and/or experimental focus under the supervision of a faculty member listed in the supervisory list of the College of Graduate Studies. The objective is to provide the student with an opportunity to integrate and apply the knowledge gained throughout the course of study in a practical problem. The student must document the project in a scientific report following standard research writing guidelines and give a public presentation to the project examination committee.