

Master of Science in Forensic Science
Program code: 040010

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

34 (34) TOTAL COURSE CREDITS

19 (34) COMPULSORY COURSE

0409-509	Basics of Biology and Chemistry	(3)
0409-510	Criminal Procedures and Testimony	(3)
0409-511	Crime Scene Strategy and Forensic Processes	(3)
0409-513	Forensic Instrumentation	(3)
0409-515	Forensic Biology	(4)
0480-585	Statistical Methods in Research	(3)

6 (12) Elective Courses *

0409-516	Advanced Forensic Microscopy	(3)
0409-517	Food Analysis	(3)
0409-526	Forensic Microbiology and Biohazards	(3)
0409-533	Forensic Analysis of Glass and Soil	(3)
0409-534	Drug Chemistry	(3)
0409-537	Surface Analysis for Forensic Investigation	(3)
0409-539	Environmental Crimes	(3)
0409-540	Principles of Cybersecurity	(3)

*For non-thesis option: Students may substitute up to 3 credits from the (400,500 or 600 level) courses with the approval of the program committee. All students are advised to utilize this option by taking the course 2000-501 "Scientific Writing and Communication skills" (3).

9 (3) COMPULSORY COURSES

0409-593	*Project	(3)
0409-597	Thesis	(0)
0409-598	Thesis	(0)
2000-599	Thesis	(9)

COURSE DESCRIPTION

0409-509: BASICS OF BIOLOGY AND CHEMISTRY
CR: 3

(including laboratory skills) for a forensic student. It lectures will cover: (1) atomic structure; (2) bonding and molecular structure; (3) intermolecular forces; (4) polarity and solubility; (5) organic compounds and their functional groups; (6) chemical analysis; (7) acids, bases, pH and pKa, (8) composition and structure of DNA and RNA; (9) DNA packaging in prokaryotes and eukaryotes; (10) mitosis and meiosis; (11) DNA replication and repair; (12) protein synthesis, transcription, RNA splicing and translation. The laboratory will cover: (1) laboratory health and safety; (2) evidence packaging and documentation; (3) dilutions; buffers; weighing; pipetting: gel preparation; and (4) basic calculations for these activities.

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.

0409-511: CRIME SCENE STRATEGY AND FORENSIC PROCESSES
CR: 3

Introduction about the importance of maintaining objectivity, emphasizing that every action the crime scene investigator performs has an underlying purpose: to both recover evidence and the overall scene context. Assessing the crime scene, including search patterns and dealing with chemical and biological hazards. Practice crime scene photography; scene sketching and documentation; and the role of crime scene analysis and reconstruction. Learn about bloodstain pattern analysis and discussion of the body position and locations in the crime scene. Finally, Understanding the nature of physical evidence, including fingerprint, biological, trace, hair and fiber, impression, and other forms of evidence.

0409-513: FORENSIC INSTRUMENTATION
CR: 3

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.

0409-515: FORENSIC BIOLOGY
CR: 3

The forensic process that starts from the detection, identification and retrieval of the biological evidence at the crime scene is described thoroughly. The characterization of the biological specimen is reviewed in depth to assess the nature of the committed crime. The student will then be exposed to an in depth focus on the forensic process that starts from the extraction of DNA evidence to the generation of a DNA profile and its evaluation in terms of population genetics and DNA statistics to finally be able to assess the evidence and present it in court. Various DNA markers will be utilized for the generation of these profiles, parentage testing, forensic phenotyping,

lineage characterization and non-human DNA typing.

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.

0409-526: FORENSIC MICROBIOLOGY AND BIOHAZARDS

CR: 3

This course will introduce methods and techniques used in biothreat 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

Identify the principles of forensic drug chemistry and the difference between natural and synthetic drugs, learn about clandestine laboratories particularly used for drugs production, extraction and isomers, define diluents, adulterants and highlight the importance of drug profiling, understand the mechanism of presumptive color test, familiarize the students with common microscopic techniques used to identify drugs, describe the current challenges and opportunities in forensic drug chemistry in particular new designer drugs in addition provide basic knowledge on the subject of performance enhancement drugs (PEDs) and doping within sports for both humans and animals.

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.

0409-540: PRINCIPLES OF CYBERSECURITY

CR: 3

The course is for students with no background in computing or cybersecurity. The course introduces the basic concepts of computers and networks and sheds the light on the problem of securing the user experience and systems. A high-level overview of cryptographic tools and their impact on user security is introduced.

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.

0409-593: PROJECT
CR: 3

0409-597: THESIS
CR: 0

0409-598: THESIS
CR: 0

2000-599: THESIS
CR: 9