FORENSIC SCIENCES

As part of the Columbian College of Arts and Sciences’ natural, mathematical, and biomedical sciences programs, forensic sciences provides an understanding of the integration of forensic disciplines with the investigation of criminal activity, while providing an overview of the analytical methods, procedures, equipment, and data used by forensic specialists. Coursework emphasizes the identification and analysis of evidence as well as the interpretation and reporting of the results.

The master of forensic sciences (M.F.S.) degree program offers concentrations in forensic chemistry, forensic molecular biology, friction ridge analysis, and forensic toxicology. Students also may complete the master of forensic sciences degree without selecting a concentration. The master of science (M.S.) degree is offered in the following fields of study: crime scene investigation, friction ridge analysis, and high-technology crime investigation. The M.S. in the field of high-technology crime investigation degree program is offered at the Graduate Education Center in Arlington, Virginia.

In addition, graduate certificates are offered in bloodstain pattern analysis, digital investigations, forensic investigation, and latent print examination.

GRADUATE

Master's programs

• Master of Forensic Sciences (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/ma)
• Master of Forensic Sciences in the field of forensic molecular biology (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/mfs-forensic-molecular-biology)
• Master of Forensic Sciences in the field of forensic chemistry (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/mfs-forensic-chemistry)
• Master of Forensic Sciences in the field of forensic toxicology (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/mfs-forensic-toxicology)
• Master of Science in the field of crime scene investigation (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/ms-crime-scene-investigation)
• Master of Science in the field of digital forensics (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/ms-digital-forensics)

Combined program

• Dual Bachelor of Science with a major in chemistry/Master of Forensic Sciences with a concentration in forensic chemistry (http://bulletin.gwu.edu/arts-sciences/chemistry/combined-bs-mfs-forensic-chemistry)

Certificate programs

• Graduate certificate in digital investigations (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/certificate-digital-investigations)
• Graduate certificate in forensic investigation (http://bulletin.gwu.edu/arts-sciences/forensic-sciences/certificate-forensic-investigation)

FACULTY

Professors I.S. Lurie (Research), W.F. Rowe (Acting Chair), M.S. Schanfield, E.A. Vincze, V. Weedn

Assistant Professors I. Marginean


COURSES

Explanation of Course Numbers

• Courses in the 1000s are primarily introductory undergraduate courses
• Those in the 2000s to 4000s are upper-division undergraduate courses that can also be taken for graduate credit with permission and additional work
• Those in the 6000s and 8000s are for master’s, doctoral, and professional-level students
• The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

Note: FORS 2118 Introduction to Computer Systems for Security Professionals and FORS 2119 Introduction to Network Systems for Security Professionals are available only to students conditionally admitted to programs offered by the Department of Forensic Sciences; credit does not apply to any degree programs at GW. FORS 2118 Introduction to Computer Systems for Security Professionals, FORS 2119 Introduction to Network Systems for Security Professionals, and FORS 6259 Computer Related Law–FORS 6291 Computer Forensics III: Advanced Techniques are offered off campus only.

FORS 2104. Introduction to Forensic Sciences. 3 Credits.
Topics in the application of science to the criminal justice system, including personal identification, analysis of drugs, forms of trace evidence, identification of biological fluids, forensic pathology, and forensic toxicology. Prerequisites: two semesters of a laboratory science other than astronomy and permission of instructor.
FORS 2104W. Introduction to Forensic Sciences. 3 Credits.
Topics in the application of science to the criminal justice system, including personal identification, analysis of drugs, forms of trace evidence, identification of biological fluids, forensic pathology, and forensic toxicology.

FORS 2118. Introduction to Computer Systems for Security Professionals. 3 Credits.
Aspects of computer systems and software that directly relate to media analysis, i.e., storage, memory, the structure of file systems, and system peripherals that may contain evidence. Laboratory fee.

FORS 2119. Introduction to Network Systems for Security Professionals. 3 Credits.
Aspects of network tools, administrative tools, network protocols, and fundamentals of TCP/IP that can be used to carry out a network-based attack. Development of a working knowledge of how information is processed and can be intercepted on the Internet/Intranet. Laboratory fee.

FORS 2190. Topics in Forensic Science. 3 Credits.
Prerequisite: Any combination of two courses from BISC 1005–BISC 1006 or CHEM 1003–CHEM 1004 and junior standing.

FORS 6004. Fundamentals of Forensic Science I. 3 Credits.
This course will survey crime scene investigation techniques, medicolegal death investigation, and patterned evidence examination. This will satisfy the 10 hours instruction for a FEPAC accredited MFS degree in the core topics of crime scene investigation, physical evidence concepts, and pattern evidence. This course will help students prepare for the American Board of Criminalistics (“ABC”) examination in the disciplines of firearms and toolmarks, fingerprints, and questioned documents. Lectures will be given by faculty members and guest lecturers who are subject matter experts on the topic presented. This course includes three four hour laboratories (mass spectrometry, microscopy, DNA). This is a required course for MFS and CSI students. This course, along with FORS 6005 Fundamentals of Forensic Science II, replaces FORS 6213, Elements of Forensic Science (3 Credits). Prerequisites: None.

FORS 6005. Fundamentals of Forensic Science II. 3 Credits.
This course will survey the traditional crime laboratory (criminalistics) disciplines—specifically forensic drug chemistry, forensic toxicology, trace evidence, fire debris, explosives, and forensic molecular biology. This will satisfy the 10 hours instruction for a FEPAC accredited MFS degree in the core topics of analytical chemistry and instrumental methods of analysis, drug chemistry/toxicology, microscopy and materials analysis, and forensic biology. This course will help students prepare for the American Board of Criminalistics (“ABC”) examination in the disciplines of forensic biology, trace evidence, fire debris, controlled substances, and toxicology/ blood alcohol determinations. Lectures will be given by faculty members and guest lecturers who are subject matter experts on the topic presented. This course includes three four hour laboratories (mass spectrometry, microscopy, DNA). This is a required course for MFS and CSI students. This course, along with FORS 6004 Fundamentals of Forensic Science I, replaces FORS 6213, Elements of Forensic Science (3 Credits). Prerequisites: None.

FORS 6010. Bloodstain Pattern Analysis I. 3 Credits.
Human blood in flight and the patterns it makes on target surfaces. Crime scene investigation, crime scene analysis, and crime scene reconstruction. Laboratory fee. Restricted to graduate students. Recommended background: FORS 6251 and FORS 6256.

FORS 6011. Bloodstain Pattern Analysis II. 3 Credits.
Continuation of the concepts learned in FORS 6010. Serving as an expert witness; refining blood pattern analysis and documentation skills; effectively communicating observations, analysis, and conclusions in the courtroom. Laboratory fee. Restricted to graduate students. Prerequisites: FORS 6010. Recommended background: FORS 6251 and FORS 6256.

FORS 6020. Ethics, Professional Responsibility, and Quality Assurance. 2 Credits.
Issues of forensic science laboratory professional responsibility, including ethics, public policy, and quality assurance. Satisfies 10 hours of instruction for a Forensic Science Education Programs Accreditation Commission (FEPAC) accredited MFS degree in the core topics of ethics and professional responsibility and quality assurance; also assists in preparation for the American Board of Criminalistics examination in the area of ethics. Taken online during the summer session.

FORS 6101. Forensic Biology. 3 Credits.
Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic biology and serology. Laboratory fee.

FORS 6202. Instrumental Analysis. 3 Credits.
Principles and application of various instrumental methods to the examination of physical evidence, including chromatographic and spectroscopic techniques and mass spectrometry. Laboratory fee.
FORS 6203. Examination of Questioned Documents. 3 Credits.
Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory fee.

FORS 6204. Firearms and Toolmark Identification. 3 Credits.
Methods for identifying firearms, bullet cartridge casings, toolmarks, gunshot residue, obliterated serial numbers, tire marks, and footprints. Laboratory fee.

FORS 6206. Trace Evidence Analysis. 3 Credits.
Principles that govern the analysis of trace evidence, including recovery, transference, interpretation, and comparison. Assessment of evidentiary value, reporting, and court testimony. Laboratory fee.

FORS 6207. Photography in the Forensic Sciences. 3 Credits.
Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee.

FORS 6210. Advanced Instrumental Analysis. 3 Credits.
Theory and practice of modern instrumental methods used in forensic laboratories, including mass spectrometry, optical spectroscopy, microscopy, chromatographic and electrophoretic separations. It is a required course for MFS students with concentration in Forensic Chemistry and Forensic Toxicology. Recommended background: undergraduate analytical methods.

FORS 6213. Elements of Forensic Sciences. 3 Credits.
A general overview of the history and biology of and principles underlying the science of fingerprints. Latent print development methods, recording, classification, and methodology of comparison of fingerprints and palm prints to include latent prints. Subject matter is covered at an introductory level; additional study is required to develop expertise as a latent fingerprint examiner. Restricted to None. Prerequisites: None.

FORS 6215. Science of Fingerprints. 3 Credits.
In-depth study of analysis, comparison, evaluation, and verification (ACE-V) methodology; assessing the quality and quantity of information and establishing a tolerance for comparison using the effects of distortion; uniqueness and persistence; anatomy and embryology of friction ridge skin. Laboratory fee. Prerequisites: FORS 6215.

FORS 6216. Development of Latent Prints. 3 Credits.
This Advanced Fingerprint Science Course will provide the students an increased understanding of the main principles of fingerprint identification: uniqueness and persistence. The course is broken down into three main sections, which will address the chemistry behind processing fingerprints, the anatomy and physiology of friction ridge skin and the extensive research that has been conducted in the field of fingerprint science. The students will be required to complete a skills processing exam to assess their understanding and ability to develop latent prints on items of evidence. In addition, there will be a written examination covering the topics of biology and development of friction ridge skin and a final comprehensive exam. Upon conclusion of this course, each student should have a firm grasp of why friction ridge skin can be used as a means of identification. Recommended background: FORS 6215.

FORS 6217. Fingerprint Comparisons. 3 Credits.
In-depth study of analysis, comparison, evaluation, and verification (ACE-V) methodology; assessing the quality and quantity of information and establishing a tolerance for comparison using the effects of distortion; uniqueness and persistence; anatomy and embryology of friction ridge skin. Laboratory fee. Prerequisites: FORS 6215.

FORS 6219. Digital Image Processing. 3 Credits.
Digital images of marginal value can be processed to reveal details which had been in the original, but were difficult to see. These changes must be done in ways to survive court challenges. Best practices for doing so are provided. Prerequisites: FORS 6207 or permission of the instructor. Recommended background: graduate level work in MS/CSI, MFS/FRA, MS/FRA or Grad Cert in Forensic Investigations; graduate-level work in crime scene investigation and/or friction ridge analysis, or in the graduate certificate program in forensics investigations.

FORS 6224. Criminal Law for Forensic Scientists. 3 Credits.
This course will provide an overview of criminal law offenses, criminal law procedures, issues of evidence recovery, admissibility of scientific evidence, and expert testimony, with an emphasis on the interaction between the criminal process and forensic science. A moot court experience is integral to this course. (This course combines and replaces Crim Law I and III.).

FORS 6225. Statistics for Forensic Scientists. 3 Credits.
Statistics with a focus on forensic applications. Emphasis on the Bayesian approach. Logical, probabilistic statistical reasoning skills, and R software skills. Course content is the basis for an examination question on the comprehensive examination. Students must have taken an undergraduate statistics course before registering. Restricted to None. Prerequisites: An undergraduate statistics course.

FORS 6231. Principles of Toxicology. 3 Credits.
Concepts of toxicology, including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors that influence toxicity and toxicity evaluation.
FORS 6232. Analytical Toxicology. 3 Credits.
Principles and procedures used in the isolation, identification, and quantitation of drugs of abuse from human samples. Prerequisites: FORS 6202 or permission of the instructor.

FORS 6234. Medicinal Chemistry I. 3 Credits.
Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

FORS 6235. Medicinal Chemistry II. 3 Credits.
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens.

FORS 6236. Forensic Toxicology I. 3 Credits.
Biological, chemical, and pharmacological principles that underlie forensic toxicology. Prerequisites: FORS 6235 or permission of the instructor.

FORS 6237. Forensic Toxicology II. 3 Credits.
Lectures, student seminars, and projects dealing with topics of current interest in forensic toxicology. Prerequisites: FORS 6236 or permission of the instructor.

FORS 6238. Forensic Chemistry I. 3 Credits.
Examination of glass and soils. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: FORS 6202 or permission of instructor. Laboratory fee.

FORS 6239. Forensic Chemistry II. 3 Credits.
Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrometry and pyrolysis-gas-liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: FORS 6202 or permission of instructor. Laboratory fee.

FORS 6240. Forensic Drug Analysis. 3 Credits.
Examination of dosage forms of drugs. Laboratory exercises include color spot tests, crystal tests, infrared spectrometry and gas chromatography-mass spectrometry. Laboratory fee.

FORS 6241. Forensic Molecular Biology I. 3 Credits.
Techniques of molecular biology applied to the collection, examination, analysis, and interpretation of biological evidence.

FORS 6242. Forensic Molecular Biology II. 3 Credits.
Advanced methods of forensic molecular biology. Laboratory examinations and classifications of dried blood and other biological materials through a variety of nuclear and mitochondrial markers. Laboratory fee. Prerequisite: FORS 6241 and permission of instructor.

FORS 6243. Forensic Molecular Biology III. 3 Credits.

FORS 6244. Population Genetics. 3 Credits.
The genetic variation in human populations as a framework for measurement and analysis of genetic diversity and evolutionary process. Consideration of the possible roles of cultural change leading to adaptive/selective events. Same as ANTH 6406.

FORS 6247. Population Genetics. 3 Credits.
Origin, maintenance, and possible significance of genetic variation in populations. Selection, genetic drift, and population structure are emphasized. Both theoretical and applied aspects of population genetics are discussed. Same as BISC 6228.

FORS 6250. Crime Scene Investigation for Lab Personnel. 3 Credits.
A condensed offering of the subject matter of FORS 6251–FORS 6252. FORS 6250 cannot be taken for credit toward the crime scene investigation concentration. Laboratory fee.

FORS 6251. Crime Scene Investigation I. 3 Credits.
Examination, analysis, and reconstruction of crime scenes. Principles from biology, chemistry, and physics applied to identification, documentation, preservation, and collection of physical evidence. Laboratory fee.

FORS 6252. Crime Scene Investigation II. 3 Credits.
Continuation of FORS 6251. Examination, analysis, and reconstruction of crime scenes. Principles from biology, chemistry, and physics applied to identification, documentation, preservation, and collection of physical evidence. Laboratory fee.

FORS 6254. Forensic Psychiatry. 3 Credits.
Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

FORS 6255. Investigation of Child Abuse. 3 Credits.
This course integrates medical, scientific, psychological, sociological and legal information for investigators and professionals involved in the field of child abuse. Special emphasis will be placed on the application of research-supported data to situations involving the murder, abuse and exploitation of children.

FORS 6256. Forensic Pathology. 3 Credits.
Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

FORS 6257. Medicolegal Death Investigation. 3 Credits.
Medical, scientific, sociological, and legal methodologies applied to forensic investigations. Aspects of death scene analysis by a medical examiner, including autopsy procedures, unidentified remains, child death investigations, and mass disaster investigations. Prerequisite: FORS 6256 and permission of instructor. Laboratory fee.
FORS 6258. The Investigation of Sexual Assault and Other Sex Crimes. 3 Credits.
This course integrates medical, psychological, sociological and legal information for investigators and professionals involved in the field of sex crime investigation. Special emphasis will be placed on the application of research-supported data to situations involving the sexual exploitation and victimization of adults.

FORS 6259. Computer Related Law. 3 Credits.
A problem-oriented course that focuses on applying the holdings of cases and analysis of statutes to different criminal fact patterns. The course is designed to examine criminal law, criminal procedures, and evidence as it relates to computer crime and the collection/analysis of digital evidence. Open only to students enrolled in off-campus forensic sciences programs.

FORS 6260. Security Case Law. 3 Credits.
Negligence and liability, international torts, compensatory and punitive damages, and contract law. The exercise of security functions by private individuals and organizations.

FORS 6261. Security Management. 3 Credits.
An overview of the factors that shape modern security management: technology, law, ethics and societal changes. The course focuses on risk assessment and the necessity to identify, analyze, and counter threat.

FORS 6264. Computer Network Defense. 3 Credits.
Identification of common threats to enterprise information systems and the tools, techniques, and strategies for mitigating those threats. Access control concepts, methodologies, and implementation within centralized and decentralized environments across an enterprise's computer systems; common methods of cyber-attacks; principles, means, and methods for ensuring system integrity, confidentiality, and availability; auditing and monitoring technologies for preventative, detective, and corrective measures.

FORS 6270. Digital Artifacts: Points of Evidence. 3 Credits.
The inner workings of common activity on a computer system, the digital trail these activities leave, and how to recover, interpret, and present such artifacts forensically.

FORS 6271. Cyberpsychology. 3 Credits.
How cyberpsychology can be used in the conduct of digital forensic investigations; the role of the psychologist in and methods used for investigating cybercrime cases.

FORS 6273. RschMethods for SecurityProfs. 3 Credits.
FORS 6277. Computer Forensics I: File System Analysis. 3 Credits.
An introduction to the tools and procedures used for digital investigations. Analysis of the FAT, NTFS, EXT, and HFS file systems. How data is stored at the file system level. Laboratory fee. Restricted to students enrolled in the department or with approval of the program director.

FORS 6278. Computer Forensics II: Applied Computer Forensics. 3 Credits.
Application of the tools and techniques learned in FORS 6277. Digital forensics as it relates to both civil and criminal investigations; best practices in securing, processing, acquiring, examining, and reporting on digital evidence. Prerequisite: FORS 6277.

FORS 6279. Incidence Response: Understanding and Identifying Network-Based Attacks. 3 Credits.
Computer network operations and network-based computer crime. Fraud schemes related to electronic commerce, theft of sensitive computer information, compromise of computer networks, and identity theft. Elements of proof of network-based crime are discussed. Prerequisite: FORS 6277 or approval of program director. Laboratory fee.

FORS 6280. Advanced Incidence Response: Investigating Network-Based Attacks. 3 Credits.
Detecting and responding to network- and host-based intruders, integrating intrusion detection systems into network topologies, identifying methods hackers use to break into network systems, analyzing network traffic and detecting attacks, and creating an effective response strategy. Prerequisite: FORS 6279. Laboratory fee.

FORS 6283. Steganography and Electronic Watermarking. 3 Credits.
Digital data hiding techniques. Investigation of data hiding and labeling techniques, attacks against steganography and watermarked information; countermeasures to such attacks. Open only to students enrolled in the department or by approval of the program director. Laboratory fee. Prerequisite: FORS 6277, FORS 6278.

FORS 6284. Security Mgt Capstone Course. 3 Credits.
FORS 6285. Digital Forensics Capstone. 3 Credits.
The culminating experience in the digital forensics program allows students to integrate the knowledge and skills they have acquired in the program and demonstrate their command, analysis, and synthesis of the material. Restricted to students in the MS in digital forensics program.

FORS 6287. Project Management for Security Professionals. 3 Credits.
FORS 6288. The Investigative Process for Computer Forensics. 3 Credits.
In-depth examination of the investigative process for computer-related crime in both criminal and civil sectors. Topics include identification and validation of information sources, development and handling of informants, interview and interrogation techniques, and managing the investigative process.

FORS 6290. Selected Topics. 3 Credits.
Current issues in research, investigation, and law.
FORS 6291. Computer Forensics III: Advanced Techniques. 3 Credits.
Further examination of methods and techniques used to conduct and report high-technology crime investigations. Open only to students enrolled in the department or by approval of the program director. Laboratory fee. Prerequisite: FORS 6278.

FORS 6292. Graduate Seminar. 1 Credit.
Students in designated forensic sciences degree programs must register for this course in their first semester and again after completion of the required independent research project.

FORS 6295. Research. 1-12 Credits.
Research on problems approved by the department, under the supervision of an appropriate member of the program faculty. Admission by permission only.

FORS 6298. Forensic Sciences Practicum. 1-3 Credits.
Internship experience in a forensic science laboratory or criminal justice agency, under the supervision of an appropriate member of the program faculty. Students must preregister for this course. Admission by permission only.

FORS 6998. Thesis Research. 3 Credits.
FORS 6999. Thesis Research. 3 Credits.