FORENSIC SCIENCE (FORS)

FORS 5114. Firearms and Toolmarks. 1 Hour.
Students are provided a broad overview of firearm and toolmark identification for forensic purposes. Terminology, function testing and ammunition are discussed, together with class and individual characteristics, identification criteria and instrumentation. Determination of caliber/gauge, trajectory and distance determination are also covered. Basic toolmark nomenclature, class and individual characteristics, fracture matching and serial number restoration are also addressed.

FORS 5116. Seminar In Forensic Science. 1 Hour.
This graduate seminar series focuses on current topics and research in forensic science.

FORS 5117. Controlled Substances. 1 Hour.
Students are introduced to the concepts, theories, and principles used in the forensic analysis of controlled substances. Methods of forensic analysis of drugs, including pill identification, microscopic examination, color tests, microcrystalline tests, thin layer chromatography (TLC), Fourier transform infrared spectroscopy (FTIR) and gas chromatography-mass spectrometry (GC-MS) will be explored. The source, origin, chemical properties and clandestine manufacture of controlled substances are also discussed. Students gain a fundamental understanding of controlled substance analysis in accordance with the standard of practice in an accredited crime laboratory.

FORS 5118. Questioned Documents. 1 Hour.
This course is designed to provide students with an understanding of techniques and procedures used for forensic document examination. Students explore handwriting comparisons, printed document alterations, and ink analysis.

FORS 5119. Fire Debris. 1 Hour.
Students address evidence collection, analytical techniques, instrumentation and data interpretation related to fire debris. Students learn to interpret analytical results within forensic contexts.

FORS 5226. Law And Forensic Sciences. 2 Hours.
Students are provided an overview of the law-forensic science interface. This includes legal concepts of admissibility of evidence and proof, rules of evidence, structure and hierarchy of criminal courts, and expert testimony. The course also includes direct and cross examination of students in a moot court setting.

FORS 5310. Forensic Molecular Biology. 3 Hours.
Students explore theories, methods, and techniques used in the study and analysis of gene structure, organization, and function in a forensic biology context.

FORS 5333. Forensic Anthropology. 3 Hours.
Students address theories, methodologies, and applications of forensic anthropology. The course covers advanced human osteology and includes hands-on training with skeletal remains. Students learn and apply the methods used to construct a human biological profile, which includes the determination of sex, age, and race based on skeletal features. The processes of human decomposition, and the identification of skeletal pathologies and trauma are also introduced. Three-hour laboratory.

FORS 5337. Fundamentals of Criminalistics. 3 Hours.
Students address the fundamentals of physical evidence concepts, pattern evidence, and forensic biology. Students acquire standards and general practices in criminalistics.

FORS 5360. Pattern and Physical Evidence Concepts. 3 Hours.
Students are introduced to the interpretation of pattern evidence and the forensic analysis of physical evidence. Scientific experiments and analysis of pattern in support of crime scene reconstruction are discussed. Pattern recognition of physical evidence, such as bloodstains, gunshot residues, tire prints, shoeprints, fire debris, explosive, glass fracture, body gesture, and wound patterns, are covered. Physical and chemical techniques for the visualization or enhancement of varies types of patterns are also introduced. Expert interpretation of observed pattern of physical evidence are discussed. Four-hour laboratory. Course Equivalents: FORS 5260 .

FORS 5362. Techniques for Crime Scene Investigations. 3 Hours.
Students are provided an advanced comprehensive review of contemporary techniques for the identification, collection, preservation, and evaluation of evidence found at the crime scene. The assistance of different items of physical evidence in the reconstruction of a crime are studied. The course includes the application of CSI theory in various applied scenarios. Concepts of physical evidence, evidence collection, quality assurance, and chain custody procedures in forensic analysis are also covered.

FORS 5435. Trace/Microscopical Analysis. 4 Hours.
Student engage in the review of the classifications and characteristics of trace evidence and are provided hands-on experience in microscopic examination of physical evidence. A wide variety of chromatographic, spectroscopic, and microscopic techniques, such as stereo microscope, polarized light microscope, digital microscope, comparison microscope, scanning electron microscopy-energy dispersive spectroscopy, micro Fourier transform infrared spectrometer, pyrolysis-gas chromatography-mass spectrometry, are used in this course. The forensic examination of fiber, hair, glass, paint, gun shot residue (GSR), ink, and explosives are covered. Four-hour laboratory. Course Equivalents: FORS 5335 .

FORS 5440. Forensic Biology. 4 Hours.
Students cover the practical DNA analysis of biological evidence. Different extraction methods are discussed as well as techniques for the quantification of DNA. Students are introduced to emerging forensic DNA methods, such as identifying the tissue of origin and assessing the level of DNA degradation and PCR inhibitors in a biological sample. Strategies for the analysis of PCR products (autosomal and Y chromosome STRs), interpretation of results, biostatistics, and quality assurance procedures will be covered. Basic statistical genetics theory are approached to generate a final DNA report.

FORS 5445. Forensic Instrumental Analysis. 4 Hours.
Students are provided a comprehensive overview of the analytical methodology, approaches, and instrumentation used for forensic analysis. Fundamental qualitative and quantitative chemical analysis using advanced instrumentation are reviewed. A wide variety of techniques that are used in a number of forensic disciplines are covered. Well established methods and novel approaches are discussed. Four-hour laboratory.

FORS 6014. Forensic Science Research. 1-3 Hours.
This capstone experience allows students to formally apply their acquired knowledge and skills in forensic science. This course consists of an independent research project which culminates in a formal written report or manuscript. Additionally, students are required to present and defend their scientific research orally in a public forum. Variable Credit (1-3). Course Equivalents: FORS 6114 .

FORS 6094. Special Topics in Forensic Science. 1-4 Hours.
Course Equivalents: FORS 6394 .

FORS 6111. Fundamentals of Research Methods. 1 Hour.
Students are provided a broad overview of theoretical and practical concepts necessary for scientific research. These include an overview of the scientific method, the importance of logical research design, and basic scientific writing skills. Topics covered may include: qualitative and quantitative research approaches, developing and refining research questions and project outlines to adequately test hypotheses, reviewing scientific literature, developing technical writing strategies, and understanding relevant ethical issues.

FORS 6224. Quality Assurance and Ethical Conduct in Forensic Science. 2 Hours.
Students are introduced to the concepts and procedures associated with quality assurance and ethical conduct in forensic science.

FORS 6315. Forensic Population Genetics. 3 Hours.
This course will focus on the application of statistical methods and theory to forensic genetics. Students must have an introductory knowledge of probability theory and statistics. Fundamental topics like ideal populations, random mating, Hardy-Weinberg equilibrium, linkage disequilibrium, disturbing forces, inbreeding, four-allele descent measurements, product rule, independence testing and genetic distance will also be covered. Students will analyze and interpret the results from microsatellite population databases using population genetics software. Course Equivalents: FORS 5115, FORS 5215, FORS 6215
Prerequisite: FORS 5440.

FORS 6317. Forensic Statistics. 3 Hours.
Students address the application of statistical methods to forensic science problems and evidence interpretation. During this course, differences between the frequentist and Bayesian approaches are emphasized. The merits of each approach are explored for a variety of forensic problems, particularly the interpretation of forensic evidence in the courts. Students are exposed to examples pertaining to trace evidence, impression evidence, toxicology, controlled substances, and DNA evidence. Students learn how to construct simple Bayesian networks and utilize statistical software to compute results.

FORS 6319. Controlled Substance Analysis. 3 Hours.
Students will explore controlled substance analysis using instrumental techniques that are commonly encountered in accredited forensic laboratories. Aspects covered in this course include sample processing, presumptive vs. confirmatory testing, analytical instrumentation, drug class-specific analytical schemes, acceptable methodologies, and clandestine laboratories investigation.
Prerequisite: FORS 5117 and FORS 5445.

FORS 6333. Behavioral Genetics. 3 Hours.
Students are provided with an understanding of behavior genetics and the influence of genes and the environment of emotion, personality and behavior in humans and animals.

FORS 6335. Advanced Forensic Chemistry. 3 Hours.
Students address novel scientific techniques in crime scene chemistry and crime lab chemistry. Non-destructive optical methods developed for sensing or identifying physical evidence are particularly emphasized in this course. New developments in chromatographic, spectroscopic, and microscopic techniques for the analysis of fibers, hair, gunshot residue, ink, paints, glass, explosives and narcotics are also explored.
Prerequisite: FORS 5335 and FORS 5445.

FORS 6337. Forensic Medicine. 3 Hours.
Students are provided an overview of forensic medicine and forensic pathology pertaining to medicolegal death investigation. Students analyze legal issues associated with the practice of forensic medicine.

FORS 6345. Advanced Instrumental Analysis. 3 Hours.
Students explore advanced instrumental methods and gain both theoretical knowledge and practical skills. Detailed attention is given to analytical method development and method validation. Students will further develop their analytical and technical skills and integrate instrumental theory into practical applications.
Prerequisite: FORS 5445 and FORS 6446.

FORS 6360. Advanced Forensic Spectroscopy and Spectral Interpretation. 3 Hours.
In this course, students will engage with Infrared and Raman spectroscopy instruments and apply them in forensic science contexts. They will learn and implement strategies for interpreting real-world sample data. A key component will be mastering spectral searches using libraries/databases. Through demonstrations, students will have hands-on opportunities to analyze their own data. They will also explore and apply spectroscopy techniques in seized drug analysis and trace evidence analysis disciplines.
Prerequisite: FORS 5445.

FORS 6361. Advanced Forensic DNA. 3 Hours.
Students learn practical DNA analysis techniques for extremely degraded biological evidence, including hair shafts, nails, teeth, and bones. Topics may include different extraction methods, RNA profiling, alternative DNA analysis strategies (e.g., low copy number, SNPs, X-STRs, mtDNA), next-generation sequencing (NGS), result interpretation, biostatistics, and standard operating procedures. Course Equivalents: FORS 5261. FORS 5361
Prerequisite: FORS 5440.

FORS 6371. Forensic Science Internship. 3 Hours.
This is a six - to ten - week, full-time internship in an approved forensic science laboratory. It allows graduate students to apply their theoretical knowledge, practical skills, and abilities in a forensic science setting.

FORS 6446. Forensic Toxicology. 4 Hours.
Students explore the physico-chemical characteristics of drugs and poisons of forensic interest with a focus on human performance and postmortem forensic toxicology applications. Students address pharmacological and analytical challenges associated with biological evidence as well as qualitative and quantitative analysis of compounds from biological and non-biological matrices and are provided with hands-on experience with chromatographic and spectroscopic techniques that are widely used in forensic laboratories. Four-hour laboratory. Course Equivalents: FORS 5346, FORS 5446 .

FORS 7089. Practicum. 1-3 Hours.
The practicum affords the doctoral student the opportunity to apply research in a practical setting, adapt technologies for maximal use, appreciate the steps necessary for the implementation of new technology within an accredited environment, and observe the technical and non-technical processes involved. During the practicum students must complete the equivalent of a six- to ten-week, full-time placement in an approved forensic science laboratory or facility. Variable credit (1-3) Course Equivalents: FORS 7389
Prerequisite: FORS 6371.

FORS 7094. Advanced Topics in Forensic Science. 1-3 Hours.
This special topic course is adaptable to the needs and interests of the individual doctoral students majoring in Forensic Science. Variable credit (1-3).
Prerequisite: Departmental Approval.

FORS 7315. Advanced DNA Mixture Interpretation. 3 Hours.
Students interpret DNA mixtures and will compare them with known reference profiles, determine contributor status and explore both manual binary and probabilistic deconvolution techniques followed by the estimation of genotype probabilities. Students improve critical thinking skills to properly communicate analytic expertise.
Prerequisite: FORS 6315.

FORS 7331. Research Methods. 3 Hours.
Students focus on the scientific method, research methods, and design. Students are provided the opportunity to discover, structure, and formulate research questions. Through this process, students come to understand the many ways in which researchers can acquire knowledge and insights using a wide variety of research methods applicable to forensic science.
Prerequisite: Three credits of statistics.

FORS 7332. Scientific Communications. 3 Hours.
Students develop the oral and written communication skills necessary for forensic science researchers and practitioners. Students must develop mastery of the following: technical report writing with regard to standard operating procedures, scientific publications and grant proposals; oral presentations, depositions and courtroom testimony of scientific evidence.
Prerequisite: FORS 5226.

FORS 7334. Social Science of Forensics. 3 Hours.
This course addresses the nexus between social and behavioral principles and the conduct of forensic science. Topics addressed include the organization of the forensic enterprise including the structure and functioning of forensic crime labs; performance assessment of forensic systems, organizations and practitioners; sociological, social-psychological, and psychological factors affecting the performance of forensic practitioners; and management theory of forensic workplaces and workers.

FORS 7345. Advanced Mass Spectrometry and Spectral Interpretation. 3 Hours.
Students explore ionization, dissociation, mass analysis, and detection techniques in mass spectrometry instrumentation. Students gain experience with mass spectral interpretation of both odd-electron and even-electron mass spectra. Students are also exposed to mass spectrometry-based applications from the seized drug analysis, toxicology, and trace evidence disciplines.
Prerequisite: FORS 5445.

FORS 7346. Advanced Forensic Toxicology. 3 Hours.
Students focus on advanced principles and practices in forensic toxicology, in particular, advanced analytical, methodological, and interpretive issues. Students apply their knowledge of basic forensic toxicology principles to a variety of analytical and interpretive topics relevant to behavioral and postmortem toxicology, including but not limited to, impaired driving, sexual assault, and death investigation. Course Equivalents: FORS 6346
Prerequisite: FORS 6446.

FORS 7381. Explosive Analysis & Detection. 3 Hours.
Students survey the broad field of explosive engineering and detection to include the safety and transportation classifications. Chemical and physical properties, explosive reagents and byproducts, and detection techniques are addressed, including military and improvised devices, post-blast evidence and constitutional aspects of interdiction.
Prerequisite: CHEM 4440 or FORS 5445.

FORS 7385. Warfare Agents. 3 Hours.
Students evaluate chemical, biological, and radiological warfare agents. These agents are discussed from a chemical and biochemical standpoint including structure, function, mechanism of action, injury, clinical therapy, and recovery. Three credit hours of biochemistry or toxicology at the undergraduate or graduate level are recommended for students taking this course.

FORS 7390. Forensic Laboratory Management. 3 Hours.
Students address key areas of forensic laboratory management and leadership. Students are prepared for administrative and leadership roles in public or private sector forensic science laboratories. The course focuses on the integration of technical and discipline specific policies and procedures into the administrative framework of the crime laboratory. Issues include the quality management system, organizational efficiency, fiscal, personnel and resource management, regulation, certification and accreditation.

FORS 7394. Doctoral Seminar in Forensic Science. 3 Hours.
Students broaden their awareness of forensic science practice and critically evaluate forensic research while contributing to their professional development. The seminar focuses on professional practice issues, theoretical and interpretive topics, and current standards within forensic science. Students critically evaluate proposed and existing standards, analyze the process of standard development, discuss and present on topics related to emerging issues, trends, technologies, and foundational science.

FORS 8099. Dissertation. 1-6 Hours.