

# FORENSIC SCIENCE (FORS)

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**FORS 5114. Firearms and Toolmarks. 1 Hour.**

This course will provide a broad overview of firearm and toolmark identification for forensic purposes. Terminology, function testing and ammunition will be discussed, together with class and individual characteristics, identification criteria and instrumentation. Determination of caliber/gauge, trajectory and distance determination will also be covered. Basic toolmark nomenclature, class and individual characteristics, fracture matching and serial number restoration will also be addressed.

**FORS 5116. Seminar In Forensic Science. 1 Hour.**

This graduate seminar series will focus on current topics and research in forensic science.

**FORS 5117. Controlled Substance Analysis. 1 Hour.**

This course will introduce 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 will also be discussed. Students will 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. The course will explore handwriting comparisons, printed document alterations and ink analysis.

**FORS 5119. Fire Debris. 1 Hour.**

This course addresses 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.**

This course will provide 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 5231. Techniques-Crime Scene Investg. 2 Hours.**

This course will provide 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 will be 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 will also be covered. Four-hour laboratory.

**FORS 5333. Forensic Anthropology. 3 Hours.**

This course will address theories, methodologies and applications of forensic anthropology. It 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 will also be introduced. Three-hour laboratory.

**FORS 5337. Fundamentals of Criminalistics. 3 Hours.**

This course addresses 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.**

This course will introduce the interpretation of pattern evidence and the forensic analysis of physical evidence. Scientific experiments and analysis of pattern in support of crime scene reconstruction will be discussed. Pattern recognition of physical evidence, such as bloodstains, gunshot residues, tire prints, shoeprints, fire debris, explosive, glass fracture, body gesture, and wound patterns, will be covered. Physical and chemical techniques for the visualization or enhancement of various types of patterns will also be introduced. Expert interpretation of observed pattern of physical evidence will be discussed. Four-hour laboratory.

**FORS 5435. Trace/Microscopical Analysis. 4 Hours.**

This course will review the classifications and characteristics of trace evidence and provide 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, will be used in this course. The forensic examination of fiber, hair, glass, paint, gun shot residue (GSR), ink, and explosives will be covered. Four-hour laboratory.

**FORS 5440. Forensic Biology. 4 Hours.**

This course will cover the practical DNA analysis of biological evidence. Different extraction methods will be discussed as well as techniques for the quantification of DNA. Students will be 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 will be approached to generate a final DNA report. Four-hour laboratory. Credit 4 .

**FORS 5445. Forensic Instrumental Analysis. 4 Hours.**

This course will provide a comprehensive overview of the analytical methodology, approaches and instrumentation used for forensic analysis. Fundamental qualitative and quantitative chemical analysis using advanced instrumentation will be reviewed. A wide variety of techniques that are used in a number of forensic disciplines will be covered. Well established methods and novel approaches will be 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).

**FORS 6094. Special Topics in Forensic Sci. 4 Hours.**

**FORS 6111. Fundamentals of Research Methods. 1 Hour.**

This course provides 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. This course covers topics including 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.**

This course will introduce the concepts and procedures associated with quality assurance and ethical conduct in forensic science.

**FORS 6315. Statistical 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.

**Prerequisite:** FORS 5440.

**FORS 6317. Forensic Statistics. 3 Hours.**

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

**FORS 6333. Behavioral Genetics. 3 Hours.**

This course provides students with an understanding of behavior genetics and the influence of genes and the environment of emotion, personality and behavior in humans and animals. Credits 3.

**FORS 6335. Advanced Forensic Chemistry. 3 Hours.**

This course will 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 will also be explored.

**Prerequisite:** FORS 5335 and FORS 5445.

**FORS 6337. Forensic Medicine. 3 Hours.**

This course provides 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 6361. Advanced Forensic DNA. 3 Hours.**

This course will cover the practical DNA analysis of extremely degraded biological evidence including hair shafts, nails, teeth and bones. Different extraction methods will be discussed and practically applied. Techniques for quantification of minimal amounts of DNA, RNA profiling, alternative strategies for DNA analysis (low copy number, SNPs, X-STRs) and DNA sequencing (mtDNA), interpretation of results, biostatistics, and standard operation procedures will also be covered.

**Prerequisite:** FORS 5440.

**FORS 6371. Forensic Science Internship. 3 Hours.**

This is a ten week full-time internship in an approved forensic science laboratory. This opportunity allows graduate students to apply their theoretical knowledge, practical skills and abilities in a forensic science setting.

**FORS 6446. Forensic Toxicology. 4 Hours.**

This course will explore the physico-chemical characteristics of drugs and poisons of forensic interest. The course will focus on human performance and postmortem forensic toxicology applications. The course will address pharmacological and analytical challenges associated with biological evidence. It will address qualitative and quantitative analysis of compounds from biological and non-biological matrices and provide hands-on experience with chromatographic and spectroscopic techniques that are widely used in forensic laboratories. Four-hour laboratory.

**FORS 7094. Adv Topic. 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 7331. Research Methods. 3 Hours.**

This course focuses on the scientific method, research methods and design. The course provides students 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.**

This course develops 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 7346. Advanced Forensic Toxicology. 3 Hours.**

This course will focus on advanced principles and practices in forensic toxicology, in particular advanced analytical, methodological and interpretive issues. Students will 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. Credits 3.

**Prerequisite:** FORS 6446.

**FORS 7381. Explosive Analysis & Detection. 3 Hours.**

This course surveys 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. It includes military and improvised devices, post-blast evidence and constitutional aspects of interdiction.

**Prerequisite:** CHEM 4440 or FORS 5445.

**FORS 7385. Warfare Agents. 3 Hours.**

This course evaluates 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 7389. Practicum. 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 ten-week, full-time placement (400 hours) in an approved forensic science laboratory or facility.

**Prerequisite:** FORS 6371.

**FORS 7390. Forensic Laboratory Management. 3 Hours.**

This course addresses key areas of forensic laboratory management and leadership. It prepares students for administrative and leadership roles in public or private sector forensic science laboratories. It 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 8099. Dissertation. 1-3 Hours.**