FS - Forensic Sciences

Courses numbered 100 to 299 = *lower-division*; 300 to 499 = *upper-division;* 500 to 799 = *undergraduate/graduate*.

FS 298. An Introduction to Forensic Science and Crime Scene Investigation (3).
Forensic science is the study and application of science to the process of law and involves the collection, examination, evaluation and interpretation of physical evidence. Students gain a comprehensive overview of theories and practices of forensic science techniques with an understanding of the scientific and analytical approach to determining the value of evidence as it relates to the criminal justice system and in courts of law. The lecture portion of the course introduces the concepts and techniques on which the different disciplines within forensic science are used at crime scenes and within crime laboratories. The laboratory portion of the course provides for an opportunity to apply common collection and analytical techniques.

FS 381. Special Topics (1-3).
An umbrella course created to explore a variety of subtopics differentiated by letter (e.g., 381A, 381B). Not all subtopics are offered each semester – see the course schedule for availability. Students enroll in the lettered courses with specific topics in the titles rather than in this root course.

FS 381CB. Basic Bloodstain Pattern Analysis (3).
Cross-listed as CJ 581P. Designed for those interested in becoming investigators, crime scene technicians, forensic technicians and others involved in criminal and medical-legal investigations and crime scene analysis. Provides a fundamental knowledge of the discipline of bloodstain pattern analysis. Students learn the basic principles of bloodstain pattern analysis and the practical application of the discipline in criminal casework. Provides the foundation of bloodstain pattern analysis and is a prerequisite to other advanced bloodstain training taught in the criminal justice system; this course is not intended to create an "instant" expert. Prerequisite(s): CJ 191.

FS 450. Forensic Identification of Marijuana (1).
Focuses on the botanical and chemical background necessary for the identification of marijuana. Students gain practical experience in the microscopic and chemical analysis of the marijuana plant. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 451. Forensic Identification of Narcotics and Other Illicit Substances (1).
Provides a background in selected analytical chemistry procedures used in the forensic lab to ensure a specific qualitative identification of various licit and illicit controlled substances. Students gain experience in the theory and application of various colorimetric, chromatographic and spectrophotometric techniques used in the modern forensic lab. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 452. Forensic Toxicology Alcohol (1).
Provides a didactic background for understanding the pharmacology/toxicology of alcohol. Students gain an understanding of the testing of biological fluids for alcohol, the interpretation of the results, including various pharmacokinetic calculations used in forensic settings, and the application of alcohol results in a judicial arena. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 453. Forensic Serology (1).
Provides a background in the detection, characterization and identification of biological fluids. Students gain a fundamental background in the characteristics of blood, saliva and semen, and practical hands-on experience in the forensic analytical techniques used in their detection and identification. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 454. Fingerprint Development and Analysis (1).
Provides an understanding of the development of fingerprint classification systems, and the detection, collection and preservation of latent fingerprints. Students gain practical hands-on experience using various powders and chemicals for development and recovery of latent fingerprints. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 455. Forensic Arson Analysis (1).
Provides exposure to the detection and classification of various flammable chemicals used in arson fires. Students gain exposure to the analytical techniques used in the laboratory investigation of suspicious fires. Prerequisite(s): BIOL 210, 211, CHEM 211, 212.

FS 498. Seminar in Forensic Sciences Techniques I (3).
Part one of the comprehensive academic-year-long overview of how forensic science techniques influence the criminal investigation process. Students receive instruction from faculty in the chemistry, biological sciences, anthropology and criminal justice departments. Prerequisite(s): FS 450, 451, 452, 453, 454, 455, CJ 420.

FS 499. Seminar in Forensic Sciences Techniques II (3).
Part two of the comprehensive overview of how forensic science techniques influence the criminal investigation process. Students receive instruction from faculty in the chemistry, biological sciences, anthropology and criminal justice departments. Prerequisite(s): FS 450, 451, 452, 453, 454, 455, 498, CJ 420.

FS 581. Advanced Special Topics in Forensic Science (1-4).
An umbrella course created to explore a variety of subtopics differentiated by letter (e.g., 581A, 581B). Not all subtopics are offered each semester – see the course schedule for availability. Students enroll in the lettered courses with specific topics in the titles rather than in this root course. Prerequisite(s): CJ 191 or FS 298; junior, senior or graduate standing.

FS 581J. Forensic Photography (3).
Cross-listed as CJ 581I. Photographic documentation plays a major role in recording crime scenes and physical evidence upon its discovery. Course provides photography theory and hands-on application as applied to criminal investigations and criminalistics. Provides an understanding of theory, methods and skills needed for proper exposure, lighting techniques and composition to produce sharp, well defined, properly exposed digital images used as part of the criminal investigative and judicial process. Students become familiar with the use of digital single-lens reflex and/or mirrorless camera equipment and develop photographic methods to recognize, take and prepare images for investigative and/or courtroom use. Students are given the opportunity to apply learned skills while processing mock crime scenes and other photographic assignments. Prerequisite(s): CJ 191.

FS 701. Forensic Science Overview I Seminar (1).
Designed to introduce students to various forensic science disciplines, including forensic biology, crime scene investigation, latent prints, firearms and toolmarks, and questioned document examinations. The course provides students demonstrations of foundational lab tests and their application. Students have hands-on opportunities to conduct some of the foundational lab tests.

FS 702. Forensic Science Overview Seminar II (2).
Designed to introduce students to additional forensic science disciplines. Focuses on analytical chemistry (e.g., explosives analysis, fire debris analysis, drug chemistry and toxicology) and microscopy and materials analysis (e.g., trace examinations for hair, fibers, paint, etc.). The course exposes students to relevant instrumental methods and software and includes a discussion of the role of AI in forensic science.

FS 703. Professional Responsibility and Quality Assurance in Forensic Science (3).
Covers ethical considerations in forensic science work. Topics include professional conduct subject to ethics, the importance of using valid scientific work, bias, and the efforts to maintain high standards of quality assurance through laboratory accreditation. Emphasis is placed on the professional demands of handling evidence, as well as the history of various domestic and international forensic DNA testing standards.

FS 704. Applied Forensic Science Research Methods (3).
Designed to use applications of basic laboratory methods for the research of forensic science topics, with an emphasis on scientific writing, experimental design, data collection, review of examples of evaluation and analysis, communication skills, and critical thinking and publication review. The course also incorporates teachings relating to forensic validation and statistical applications in biology.

FS 706. Criminal Law for Forensic Scientists (3).
Discusses aspects of criminal law relevant for forensic scientists. Reviews major U.S. Supreme Court rulings related to forensic science, including Brady, Daubert and Fry. The course also includes a discussion of when and how lab tests can be used in a case, courtroom demeanor, and testimony techniques and pitfalls. Special emphasis is given to the laws affecting evidence, courtroom procedure, ethics and professional responsibilities of the forensic expert. Students receive an applied learning opportunity through a moot court exercise.

FS 710. Forensic Biology I (4).
Provides students with a foundational understanding of Deoxyribonucleic Acid (DNA), forensic biology and DNA analysis techniques. It introduces students to historical forensic biological analyses including Restriction Fragment Length Polymorphisms (RFLP) and ABO blood typing, and current testing technologies like multiplexing and Short Tandem Repeats (STR) analysis made possible through the discovery of the Polymerase Chain Reaction (PCR). The course further introduces students to techniques used in the collection of DNA from crime scene evidence, as well as DNA extraction. The lab portion of this course affords an opportunity for students to perform several lab tests associated with forensic biology. This course has a lab component.

FS 711. Forensic Biology II (3).
Educates students in modern techniques used in forensic DNA analysis and reviews emerging forensic biological laboratory techniques most likely to be implemented in forensic laboratories. Modern techniques include theory and history of quantification, PCR and genetic analysis. Other topics include current research in molecular applications that involve analysis of DNA, RNA, protein or other cell macromolecules and use of advanced molecular tools for analysis.

FS 712. Forensic Biology III (3).
Focuses on modern advanced DNA analysis and interpretation topics, including complex mixtures, inhibition and degradation. It also includes a discussion of molecular genetics with a focus on probabilistic genotyping, and an overview of statistical theory and approaches relating to forensic biology (e.g., CPI/CPR, RMP, LR). Students are required to present a class seminar based on technical literature on a topic chosen in consultation with the instructor. The emphasis is on applications in forensics.

FS 713. Forensic Biology Seminar (1).
Students review the major forensic biology lab tests and demonstrate competency by conducting at least three such tests. Guest lecturers present on topics related to DNA analysis (e.g., fringe and future DNA methods) and potential legal challenges associated with forensic biology.

FS 720. Population Genetics (3).
Covers the theories and models of population genetics and how they are directly applied in forensic DNA typing and the interpretation of results. Students learn about the origin, maintenance and possible significance of genetic variation in populations. Emphasis is placed on how mutation, selection, drift and migration shape genetic variation, as well as population structure.

FS 721. Forensic Biology Serology and DNA Testing (3).
Presents the theory and methodology of modern and emerging techniques used for the examination and identification of body fluid stains, tissue types and species determinations. The course includes lecture and lab components, and instruction focuses on molecular biology techniques applied to a forensic DNA crime laboratory setting.

FS 730. Forensic Biology Capstone Research I (2).
Designed to provide a seminar associated with the formation of the capstone research project. The course assists in developing a proposal and making a presentation of that proposal. Emphasis is on experimental design, data collection and analysis. The student is expected to offer a proposal for a forensic research topic or validation study that will serve as their capstone. The proposal must contribute to the knowledge base of forensic science and be focused on a forensically relevant topic with real-world impact on operational forensic laboratories.

FS 731. Forensic Biology Capstone Research II (3).
Supports the students in the execution of their research or validation study. Students have an approved proposal for a forensic science lab research study or test validation from their enrollment in FS 730, and this course supports the execution of the study, including a presentation of the results to qualified forensic scientists.

FS 740. Introduction to Firearms and Toolmark Examinations (3).
Provides an in-depth introduction to forensic firearms and toolmark examination. Students explore the scope of work performed by examiners in firearms and toolmark identification, to acquire a comprehensive understanding of the characteristics detected in fired ammunition components, to include the scope of work, characteristics analysis, microscopic comparison, terminology, examination protocols and restoration techniques.

FS 742. History of Firearm Examination (3).
Provides a comprehensive examination of the history and evolution of firearms identification. Students cover the development of muzzle-loading firearms and the history of black powder, highlighting their significance in the advancement of firearms technology, and delve into the historical background of firearms identification, focusing on key figures who have guided its evolutionary phases. Additionally, students explore the evolution of firearms identification and examination equipment, and learn the correct terminology used within the firearm and toolmarks forensic discipline. Pre- or corequisite(s): FS 740.

FS 744. Modern Firearms: Manufacture and Operating Systems (3).
Provides an in-depth exploration of the manufacture, mechanisms, assembly and operation of modern firearms. Students gain comprehensive knowledge of various firearm types, components, mechanisms and the principles behind their operation. The course is designed to equip students with the technical expertise necessary for forensic analysis and firearms examination. Pre- or corequisite(s): FS 742.

FS 746. Advanced Analysis of Firearms and Toolmark Examination I (3).
Delves into the forensic analysis of firearms and toolmarks, providing students with the skills and knowledge necessary to perform

detailed examinations and comparisons. The course covers the examination of fired bullets, microscopic comparisons, fired shotshell projectiles, general rifling characteristics, toolmark examinations, and distinguishing between class and subclass. Pre- or corequisite(s): FS 744.

FS 747. Advanced Analysis of Firearms and Toolmarks Examination II (3).
Delves into the forensic analysis of firearms and toolmarks, providing students with the skills and knowledge necessary to perform detailed examinations and comparisons. The course covers the examination of fired bullets, microscopic comparisons to include 3D topography and virtual comparison microscopy (VCM), individual marks, and best known non-match (KNM) concepts, and common range of conclusions. Prerequisite(s): FS 746.

FS 748. Court Testimony for Firearms and Toolmark Examiners and Research Project (3).
Provides an in-depth examination of the role of forensic experts in the courtroom, specifically focusing on firearm and toolmark examination. Students explore the legal and scientific principles underpinning the admissibility of forensic evidence, with a particular emphasis on the Daubert decision and other relevant legal precedents. The course also covers strategies used by opposing counsel to challenge the credibility and reliability of expert testimony. Additionally, students research and produce a technical research paper or project. Capstone course. Pre- or corequisite(s): FS 742.

FS 749. Forensic Validation and Laboratory Techniques (3).
Provides an in-depth exploration of laboratory skills and the validations used within the forensic science laboratory, emphasizing the critical skills and standards necessary for professional practice. Aligned with the Organization of Scientific Area Committees (OSAC) for Forensic Science standards and guidelines, this course covers essential topics such as documentation, laboratory skills, communication skills, examiner proficiency testing, validation processes, quality assurance, analytical procedures, reporting, peer reviews and analytical standards. Pre- or corequisite(s): FS 704.