

DEPARTMENT OF FORENSIC SCIENCE

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forensicscience.vcu.edu (<http://forensicscience.vcu.edu/>)

The Department of Forensic Science offers programs leading to bachelor's and master's degrees.

The Bachelor of Science is for students who plan a career or graduate study in the forensic sciences. The forensic science program provides students with fundamental learning in forensic laboratory analyses and crime scene investigation, with academic emphasis in biology, chemistry and criminal justice. The program offers three concentrations: forensic biology, forensic chemistry and physical evidence. Students will select one of the three concentrations prior to the second semester of their sophomore year. The B.S. in Forensic Science supplies students with the necessary skills for professional careers in forensic laboratories, public and private, basic research laboratories, clinical laboratories, and/or to pursue graduate studies. Students also will be prepared to pursue advanced degrees in the physical sciences, biological sciences, forensic science, law, allied health and medicine, to name a few.

The Master of Science in Forensic Science prepares students for careers as forensic scientists in government and private laboratories. Students receive in-depth exposure to specializations within the field, including drug analysis, DNA analysis, trace evidence, criminalistics and legal issues.

For more information visit the departmental website (<http://forensicscience.vcu.edu/>).

- Forensic Science, Master of Science (M.S.) with a concentration in forensic biology (<http://bulletin.vcu.edu/graduate/college-humanities-sciences/forensic-science/forensic-science-ms-concentration-forensic-biology/>)
- Forensic Science, Master of Science (M.S.) with a concentration in forensic chemistry/drugs and toxicology (<http://bulletin.vcu.edu/graduate/college-humanities-sciences/forensic-science/forensic-science-ms-concentration-forensic-chemistry-drugs-toxicology/>)
- Forensic Science, Master of Science (M.S.) with a concentration in forensic chemistry/trace (<http://bulletin.vcu.edu/graduate/college-humanities-sciences/forensic-science/forensic-science-ms-concentration-forensic-chemistry-trace/>)
- Forensic Science, Master of Science (M.S.) with a concentration in forensic physical analysis (<http://bulletin.vcu.edu/graduate/college-humanities-sciences/forensic-science/forensic-science-ms-concentration-forensic-physical-analysis/>)

- Forensic scienc (FRSC) (p. 1)
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Forensic science

FRSC 505. Forensic Entomology. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Course focuses on proper collection, preservation and identification of entomological evidence. Students collect entomological evidence from a mock crime scene and utilize these specimens for estimation of minimum postmortem interval. There is a significant laboratory component.

FRSC 510. Developmental Osteology. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: FRSC 300; ANTH 307 and ANTZ 307; ANTH 310; graduate standing in forensic science; or permission of instructor. Examines the human musculoskeletal system and its development from an embryonic state to the adult form. Students learn the developmental course of each bone in the human skeleton and those of the associated soft tissue structures. Students are provided with training in the recognition of skeletal elements and bony landmarks, siding skeletal elements (and fragments thereof), knowledge of muscle structure and function and knowledge of nervous and venous structures associated with bony landmarks. Developmental defects and trauma associated with birth and child abuse are discussed. Juvenile age estimation from bones and radiographic images are emphasized.

FRSC 515. Forensic Anthropology Applications. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Focuses on estimation of the biological profile in human identification, the analysis of perimortem trauma and writing of case reports. The laboratory component will cover all aspects of the course including providing practice for age and race estimation.

FRSC 520. Forensic Fire Investigation. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisite: FRSC 375 with a minimum grade of C (for undergraduate students), FRSC 670 or equivalent. Examines the specialized field of forensic fire investigation including on-scene investigation, fire theory, accelerant-assisted burn patterns and expert-witness testimony.

FRSC 565. Scientific Crime Scene Investigation. 3 Hours.

Semester course; 3 lecture and/or laboratory hours. 3 credits. Presents the theory and techniques of scientific crime scene investigation including: recognition, documentation, collection and enhancement of physical evidence. A comprehensive introduction to the use of physical evidence for crime scene reconstruction is presented.

FRSC 566. Advanced Crime Scene Investigation. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: FRSC 309 with a minimum grade of C (for undergraduate students), FRSC 565 or equivalent. An advanced study of the methods and techniques of crime scene investigation with an emphasis on crime scene reconstruction by the use of physical evidence. Course will include extensive practical applications with mock crime scenes.

FRSC 570. Forensic Science Seminar. 1 Hour.

Semester course; 1 lecture hour. 1 credit. May be repeated for a maximum of 3 credits. A seminar course featuring presentations by faculty, crime laboratory staff, students and visiting lecturers. Instruction includes discussions of research and developments and current topics in various forensic science disciplines and related fields. Graded as S/U.

FRSC 580. Applied Statistics for Forensic Science. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisite: STAT 210, STAT 212 or equivalent statistics knowledge; or graduate standing in forensic science. The course will focus on the forensic applications of data visualization methods, hypothesis testing, analysis of variance, correlation measures, regression, multivariate analyses and concepts in database "matching" procedures. Techniques discussed will include ANOVA, MANOVA, principal component analysis, non-metric multidimensional scaling, discriminant function analysis and machine learning/neural network analysis.

FRSC 581. Forensic Analysis of Fire Debris and Explosive Evidence. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: CHEM 409, CHEZ 409 and FRSC 365; or FRSC 671, FRSZ 671, FRSC 673 and FRSZ 673. Presents the collection, analysis and interpretation of ignitable liquids and explosives as they are applied in forensic casework. Covers the theoretical and practical aspects. Laboratory exercises include hands-on instruction with appropriate instrumentation and techniques, including stereomicroscopy, gas and ion chromatography, GC-MS, thin layer chromatography, HPLC and FT-IR.

FRSC 582. Forensic Analysis of Paint and Fiber Evidence. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: CHEM 409, CHEZ 409 and FRSC 365; or FRSC 671, FRSZ 671, FRSC 673 and FRSZ 673. Covers topics in polymer analysis including collection, classification and analysis of paint and fiber evidence as applied to forensic casework. The course covers the theoretical and practical aspects, using lectures and laboratory exercises. Laboratory exercises include hands-on instruction with appropriate instrumentation and techniques, including stereomicroscopy, microchemical testing, microspectrophotometry, fluorescence microscopy, FT-IR and polarizing light microscopy.

FRSC 591. Topics in Forensic Science. 1-3 Hours.

Semester course; variable lecture hours. 1-3 credits; maximum of 6 credits for all forensic science topic courses may be applied to major. Prerequisite: graduate standing in the forensic science program or permission of instructor required for enrollment. A study in selected topics in forensic science. See the Schedule of Classes for specific topics to be offered each semester and additional prerequisites.

FRSC 607. Forensic Taphonomy. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Focuses on the process and sequence of human decomposition, as well as the burial, water disposal and surface dispersal of human remains. The course covers current issues in taphonomic research and practical application, including both domestic and international examples of mass disasters and mass graves. An understanding of the principles of archaeological stratigraphy is an integral part of the course. There is a significant field work and laboratory component.

FRSC 644. Analytical Considerations in Forensic Toxicology. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Lecture and laboratory will focus on the development and validation of advanced analytical methods in forensic toxicology. Data analysis and interpretation and the application of statistical tools will be discussed. Lectures will also provide the fundamentals of pharmacokinetics and toxicokinetics and dynamics as they pertain to forensically relevant chemicals and psychoactive substances.

FRSC 645. Applications in Forensic Toxicology. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisite: FRSC 644. Lecture and laboratory focused on the toxicokinetics and toxicodynamics of categories and specific chemicals and psychoactive substances. Sample preparation, instrumental analysis and professional practices relevant to post-mortem toxicology, surveillance drug testing and drug-facilitated crimes will be discussed.

FRSC 660. Toolmark Examinations. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 673 and FRSZ 673 or permission of instructor. Covers topics in toolmark examination and identification as applied to forensic casework. The course covers both the theoretical and practical aspects, using lectures and laboratory exercises.

FRSC 661. Analysis of Pattern Evidence. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 673 and FRSZ 673 or equivalents. Covers topics in pattern evidence analysis including analysis of latent prints and other patterned evidence as applied to forensic casework. The course covers both the theoretical and practical aspects, using lectures and laboratory exercises focusing on the collection, analysis and interpretation of pattern evidence.

FRSC 662. Firearm Identification. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Prerequisites: FRSC 673 and FRSZ 673 or equivalents. Covers topics in firearm identification as applied to forensic casework. The course covers both the theoretical and practical aspects, using lectures and laboratory exercises.

FRSC 663. Forensic Medicine. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Covers the fundamentals of forensic medicine including topics such as forensic death investigations, postmortem changes, time-of-death determinations, identification of unknown human remains and the forensic pathology of natural and traumatic deaths in adults and children. The characteristics and diagnosis of various types of trauma as well as the characteristics of common natural diseases that cause sudden death will be presented.

FRSC 670. Forensic Evidence and Criminal Procedure. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Presents the law of criminal procedure and rules of evidence as applied to forensic science. Explores issues of scientific versus legal burdens of proof, legal terminology and trial procedure.

FRSC 671. Instrumentation in Forensic Chemistry. 2 Hours.

Semester course; 2 lecture hours. 2 credits. Corequisite: FRSZ 671. Enrollment is restricted to students in the forensic science program. Theory and applications of chromatography, mass spectrometry and spectroscopy as used in modern crime laboratories. Instruction will focus on instrumental analysis as applied to drug analysis, toxicology, fire debris identification and general trace evidence examination.

FRSC 672. Advanced Drug Analysis. 3 Hours.

Semester course; 3 lecture and/or laboratory hours. 3 credits. Isolation and identification of abused drugs emphasizing the analysis of unknowns, problems encountered in analysis and chain of custody issues.

FRSC 673. Forensic Microscopy. 2 Hours.

Semester course; 2 lecture hours. 2 credits. Establishes the foundation for the theory of microscopy. The knowledge acquired in this course can be applied to forensic disciplines such as firearms examinations, forensic biology, controlled substances, questioned documents and trace evidence.

FRSC 675. Forensic Serology and DNA Analysis. 2 Hours.

Semester course; 2 lecture hours. 2 credits. Presents the theory and methodology used for the examination and identification of body fluid stains and determination of species. Provides students an introduction to the theory and methodology of forensic DNA analysis as well as forensic DNA quality control issues. Instruction will focus on molecular biology techniques as they are applied in a forensic DNA crime laboratory setting.

FRSC 676. Advanced Forensic DNA Analysis. 3 Hours.

Semester course; 2 lecture and 3 laboratory hours. 3 credits. Focuses on the specific principles and modern procedures used for analysis of forensic nuclear and mitochondrial DNA evidence. Other topics include current research and development for forensic DNA instrumentation and applications, statistical interpretation of results and case report writing. Students gain individualized, hands-on experience with DNA procedures and instrumentation in the laboratory exercises. Students will process mock forensic casework.

FRSC 677. Professional Practices and Expert Testimony. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisite: must have successfully completed a minimum of 18 credit hours in the forensic science master's degree program. Topics related to professional practices in the forensic science field will be covered, including ethics, bias, quality assurance, laboratory management and professional development. Individual and group activities relating to these topics will be completed. Additionally, this course will examine forensic expert testimony in the courtroom, communication of scientific findings to a general audience, trial preparation and cross-examination in moot court format.

FRSC 680. Forensic Psychology. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Guilty mind requirements in criminal law. Competency to stand trial, insanity defense, mental disorder and crime. Behavioral profiling of serial murders and sex offenders. Issues in the use of clinical and statistical prediction methods in criminal justice. Crosslisted as: CRJS 680.

FRSC 686. Emerging Molecular Applications for Forensic Biology. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisite: FRSC 676. Emerging forensic molecular technologies as well as molecular applications for nontraditional forensic needs will be covered. Emphasis will be given to current research and to technologies most likely to be implemented in forensic laboratories. Molecular applications may include those that involve analysis of DNA, RNA, protein, or other cell macromolecules and/or those that use advanced molecular tools for separation, detection, manipulation, identification, imaging and analysis. Students gain individualized experience in literature research, in summarization/simplification of technical information and in oral presentation.

FRSC 690. Scientific Writing. 1 Hour.

Semester course; 1 lecture hour. 1 credit. Enrollment restricted to students in the M.S. in Forensic Science program. Focuses on scientific writing techniques, including abstracts, posters, review articles and research proposals. Emphasis will be placed on writing for scientific journals in forensic science and other peer-reviewed journals.

FRSC 692. Forensic Science Independent Study. 1-3 Hours.

Semester course; variable hours. 1-3 credits. Maximum credit for all independent study applicable to degree is 6 credits. The amount of credit must be determined, and written permission of instructor and program director must be obtained prior to registration. This course is designed to provide an opportunity for independent laboratory research in an area of forensic science or related scientific discipline. The end products of this experience will include an oral presentation at a campus seminar and a written report.

FRSC 693. Current Topics in Forensic Science. 1 Hour.

Semester course; 1 lecture hour. 1 credit. May be repeated for credit. A course designed to develop skills in reading journal manuscripts and delivering oral presentations in conjunction with an in-depth study of a current topic in forensic science. Student will conduct library research, present talks and lead discussions on the selected topic. See the Schedule of Classes for specific current topics course to be offered each semester and prerequisites.

FRSC 792. Research Techniques. 1 Hour.

Semester course; 3 laboratory hours. 1 credit. Enrollment restricted to students with graduate standing in forensic sciences and with permission of faculty mentor. Application of basic laboratory methods used in forensic science to the investigation of topics of interest. Emphasis on experimental design, data collection and analysis, communication skills, and critical thinking. Graded as Satisfactory/Unsatisfactory.

FRSC 793. Directed Research in Forensic Science. 1-3 Hours.

Semester course; 1-3 practicum hours. 1-3 credits. May be repeated for credit with up to 6 credits counted toward the degree requirements. Enrollment restricted to students in the forensic science master's degree program with permission of the instructor. A capstone course in which students will conduct independent, original laboratory research in a forensic specialization area of interest, while also gaining practical experience in crime laboratory practices and methods. A minimum of 300 hours of laboratory research and a minimum of three credits are required for graduation.

Forensic science laboratory

FRSZ 671. Instrumentation in Forensic Chemistry Laboratory. 1 Hour.

Semester course; 3 laboratory hours. 1 credit. Corequisite: FRSC 671. Enrollment is restricted to students in the forensic science program. Applications of chromatography, mass spectrometry and spectroscopy as used in modern crime laboratories. Instruction will focus on instrumental analysis as applied to drug analysis, toxicology, fire debris identification and general trace evidence examination. Laboratory exercises will focus on core instruments used across multiple subdisciplines in forensic chemistry.

FRSZ 673. Forensic Microscopy Laboratory. 1 Hour.

Semester course; 3 laboratory hours. 1 credit. Establishes the foundation for the application and methodology of microscopy. The knowledge acquired in this course can be applied to forensic disciplines such as firearms examinations, forensic biology, controlled substances, questioned documents and trace evidence. The course consists of laboratory exercises and demonstrations.

FRSZ 675. Forensic Serology and DNA Analysis Laboratory. 1 Hour.

Semester course; 3 laboratory hours. 1 credit. Presents the chemical, immunological and microscopic laboratory techniques commonly used for the examination and identification of body fluid stains and determination of species. Provides working knowledge and hands-on practice with basic forensic DNA procedures, including DNA extractions, quantitation, PCR amplification analysis/genotyping. Instruction focuses on molecular biology techniques as applied in a forensic DNA laboratory.

FRSZ 792. Research Techniques. 1 Hour.

Semester course; 3 laboratory hours. 1 credit. Enrollment restricted to students with graduate standing in forensic science and permission of faculty mentor. Application of basic laboratory methods used in forensic science to the investigation of topics of interest. Emphasis on experimental design, data collection and analysis, communication skills, and critical thinking. Graded as Pass/Fail.