

FORENSIC SCIENCE, BACHELOR OF SCIENCE (B.S.) WITH A CONCENTRATION IN FORENSIC CHEMISTRY

The forensic chemistry concentration requires an additional 26 credits in chemistry, calculus, forensic science and elective credits beyond the core requirements and is well-suited for students interested in graduate study or careers in the chemical analysis of forensic evidence, including the areas of drug analysis, toxicology and trace evidence analysis. Students also will be prepared for work in private analytical laboratories. Students completing the forensic chemistry concentration will be eligible for a minor in chemistry.

Learning outcomes

Upon completing this program, students will know and know how to do the following:

- Demonstrate a basic understanding of the laws of criminal procedure and rules of evidence
- Demonstrate proper crime scene investigation and reconstruction
- Demonstrate ethical and professional duties and responsibilities of the forensic scientist
- Be able to apply basic principles and laboratory procedures of chemistry to forensic science
- Demonstrate capabilities, use, potential and limitations of forensic laboratory theory and techniques

Special requirements

The forensic science program requires a minimum of 120 credits including completion of the College of Humanities and Sciences general education requirements, 50-52 forensic science core program credits and 26 concentration-specific credits.

For the forensic chemistry concentration, a minimum of two elective credit hours of advanced study (200- to 500-level) in an area of specialization must be taken. It is recommended that these credits be BIOL/BIOZ, CHEM/CHEZ, CRJS, FRSC/FRSZ, MATH or PHYS courses. FRSC 202 is not applicable for the major.

Degree requirements for Forensic Science, Bachelor of Science (B.S.) with a forensic chemistry concentration

General education requirements

Course	Title	Hours
University Core Education Curriculum (minimum 21 credits)		
UNIV 111 Play course video for Focused Inquiry I	Focused Inquiry I	3
UNIV 112 Play course video for Focused Inquiry II	Focused Inquiry II	3
UNIV 200	Inquiry and the Craft of Argument	3
Approved humanities/fine arts		3

Approved natural/physical sciences	3-4
Approved quantitative literacy	3-4
Approved social/behavioral sciences	3-4
Total Hours	21-24

Course	Title	Hours
Additional College of Humanities and Sciences requirements (11-23 credits)		
HUMS 202	Choices in a Consumer Society	1
Approved H&S diverse and global communities		3
Approved H&S human, social and political behavior (fulfills University Core social/behavioral sciences)		
Approved H&S literature and civilization (fulfills University Core humanities/fine arts)		
Approved H&S science and technology (fulfills University Core natural/physical sciences)		
Approved H&S general education electives		6-8
Experiential fine arts ¹		1-3
Foreign language through the 102 level (by course or placement)		0-8
Total Hours		11-23

1

Course offered by the School of the Arts

Collateral requirements

Course	Title	Hours
Required courses:		
MATH 200	Calculus with Analytic Geometry (fulfills University Core quantitative literacy)	
PHIL 201	Critical Thinking About Moral Problems (fulfills H&S literature and civilization)	
STAT 210	Basic Practice of Statistics	
Total Hours		3-10

Major requirements

Students must receive a minimum grade of C in all of the following courses. If a course is a prerequisite for another course, a minimum grade of C must be obtained in the prerequisite course before proceeding to the subsequent course.

Course	Title	Hours
BIOL 151 & BIOZ 151	Introduction to Biological Sciences I and Introduction to Biological Science Laboratory I	4
CHEM 101 & CHEZ 101	General Chemistry I and General Chemistry Laboratory I	4
CHEM 102 & CHEZ 102	General Chemistry II and General Chemistry Laboratory II	4
CHEM 301 & CHEZ 301	Organic Chemistry and Organic Chemistry Laboratory I	5
CHEM 302 & CHEZ 302	Organic Chemistry and Organic Chemistry Laboratory II	5
CHEM 303 & CHEZ 303	Physical Chemistry and Physical Chemistry Laboratory I	5

CHEM 309 & CHEZ 309	Quantitative Analysis and Quantitative Analysis Laboratory	5
CHEM 409 & CHEZ 409	Instrumental Analysis and Instrumental Analysis Laboratory	5
FRSC 300	Survey of Forensic Science	3
FRSC 309	Scientific Crime Scene Investigation	3
FRSC 365	Forensic Microscopy	4
FRSC 375	Forensic Evidence, Law and Criminal Procedure	3
FRSC 400 & FRSZ 400	Forensic Chemistry and Forensic Chemistry Laboratory	5
FRSC 490	Professional Practices in Forensic Science	3
MATH 201	Calculus with Analytic Geometry	4
PHYS 201 or PHYS 207	General Physics I University Physics I	4-5
PHYS 202 or PHYS 208	General Physics II University Physics II	4-5
STAT 314	Applications of Statistics	4
Total Hours		74-76

Concentration electives

Students must receive a minimum grade of C in all of their concentration electives. If a course is a prerequisite for another course, a minimum grade of C must be obtained in the prerequisite course before proceeding to the subsequent course.

Course	Title	Hours
Select two credits in BIOL/BIOZ, CHEM/CHEZ, CRJS, FRSC/ FRSZ, MATH or PHYS (200- to 500-level)		2
Total Hours		2

Open electives

Course	Title	Hours
Select zero to nine credits		0-9
Total Hours		0-9

Total minimum requirement 120 credits

What follows is a sample plan that meets the prescribed requirements within a four-year course of study at VCU. Please contact your adviser before beginning course work toward a degree.

Freshman year

Fall semester		Hours
BIOL 151 & BIOZ 151	Introduction to Biological Sciences I and Introduction to Biological Science Laboratory I	4
CHEM 101 & CHEZ 101	General Chemistry I and General Chemistry Laboratory I	4
UNIV 111 Play course video for Focused Inquiry I	Focused Inquiry I	3
Experiential fine arts course		1-3
Term Hours:		12-14

Spring semester

CHEM 102 & CHEZ 102	General Chemistry II and General Chemistry Laboratory II	4
HUMS 202	Choices in a Consumer Society	1
MATH 200	Calculus with Analytic Geometry	4
STAT 210	Basic Practice of Statistics	3
UNIV 112 Play course video for Focused Inquiry II	Focused Inquiry II	3
Term Hours:		15

Sophomore year

Fall semester

CHEM 301 & CHEZ 301	Organic Chemistry and Organic Chemistry Laboratory I	5
PHYS 201 or PHYS 207	General Physics I or University Physics I	4-5
STAT 314	Applications of Statistics	4
UNIV 200	Inquiry and the Craft of Argument	3
Term Hours:		16-17

Spring semester

CHEM 302 & CHEZ 302	Organic Chemistry and Organic Chemistry Laboratory II	5
CHEM 309 & CHEZ 309	Quantitative Analysis and Quantitative Analysis Laboratory	5
MATH 201	Calculus with Analytic Geometry	4
PHYS 202 or PHYS 208	General Physics II or University Physics II	4-5
Term Hours:		18-19

Junior year

Fall semester

CHEM 303 & CHEZ 303	Physical Chemistry and Physical Chemistry Laboratory I	5
FRSC 300	Survey of Forensic Science	3
PHIL 201	Critical Thinking About Moral Problems	3
Approved H&S diverse and global communities		3
Term Hours:		14

Spring semester

FRSC 309	Scientific Crime Scene Investigation	3
FRSC 365	Forensic Microscopy	4
FRSC 375	Forensic Evidence, Law and Criminal Procedure	3
BIOL/BIOZ, CHEM/CHEZ, CRJS, FRSC/FRSZ, MATH or PHYS (200- to 500-level)		2
Foreign language (101-level) or open electives		4
Term Hours:		16

Senior year

Fall semester

CHEM 409 & CHEZ 409	Instrumental Analysis and Instrumental Analysis Laboratory	5
Approved H&S General Education elective		3-4

Approved H&S science and technology	3-4
Foreign language (102-level) or open elective	4
Term Hours:	15-17
Spring semester	
FRSC 400 Forensic Chemistry & FRSZ 400 and Forensic Chemistry Laboratory	5
FRSC 490 Professional Practices in Forensic Science	3
Approved H&S General Education elective	3-4
Approved H&S human, social and political behavior course	3-4
Term Hours:	14-16
Total Hours:	120-128

FRSC 202. Crime and Science. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Introduces the scientific theory, concepts and practices used in any physical science by relating them to the analysis of physical evidence performed in forensic laboratories and the fundamentals of crime scene investigation, and their relationship to the criminal justice system and criminal investigations. Not applicable for credit toward B.S. in Forensic Science.

FRSC 300. Survey of Forensic Science. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: BIOL 151 and BIOZ 151, each with a minimum grade of C. Pre- or corequisites: CHEM 301 and CHEZ 301, and UNIV 200 or HONR 200. Enrollment restricted to forensic science majors or by permission of instructor. Introduces the theory, concepts and practices used in the analysis of physical evidence performed in crime laboratories, and the fundamentals of crime scene investigation. Also introduces ethical and quality assurance issues of crucial importance in modern crime laboratories.

FRSC 309. Scientific Crime Scene Investigation. 3 Hours.

Semester course; 3 lecture/laboratory hours. 3 credits. Prerequisites: CHEM 301 and either FRSC 300 or FRSC 350, each with a minimum grade of C. Enrollment restricted to forensic science majors or by permission of instructor. Provides scientific theory of crime scene investigation and crime scene reconstruction and basic knowledge of proper crime scene protocol and evidence processing techniques. Includes the processes for documentation, collecting and preserving physical evidence.

FRSC 310. Forensic Anthropology. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisite: ANTH 210 or FRSC 300 with a minimum grade of C. A comprehensive overview of forensic anthropology including its development and the theory and methodology on which it is based. Crosslisted as: ANTH 310.

FRSC 325. Forensic Medicine. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: FRSC 300, CHEM 301 and CHEZ 301, each with a minimum grade of C. Enrollment restricted to forensic science majors or by permission of instructor. An investigation of topics in death scene investigations as well as autopsy findings associated with natural and unnatural deaths.

FRSC 351. Forensic Science Service-learning. 2 Hours.

Semester course; 2 lecture hours. 2 credits. May be repeated for a maximum of 4 credits. Prerequisites: FRSC 300 and at least one additional FRSC/Z course, each with a minimum grade of C. Enrollment restricted to forensic science majors or by permission of instructor. Provides an opportunity to learn about the community's schools and how to teach forensic science concepts to school-aged students. Each week, VCU students will provide hands-on lab activities in community-based programs to reinforce lessons learned through their school curricula. Reflective writing, partner assignments and a final presentation are required, in addition to 20 community partner hours. VCU students will improve their ability to explain forensic concepts to those with differing scientific backgrounds, have increased confidence when addressing audiences and deepen their understanding of civic responsibility.

FRSC 365. Forensic Microscopy. 4 Hours.

Semester course; 4 lecture/laboratory hours. 4 credits. Prerequisites: CHEM 301 and either FRSC 300 or FRSC 350, each with a minimum grade of C. An in-depth course in the theory and practical application of microscopy to the examination, identification and individualization of physical evidence submitted to forensic laboratories.

FRSC 375. Forensic Evidence, Law and Criminal Procedure. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Pre- or co-requisites: FRSC 300 or FRSC 350. Open only to forensic science majors or by permission of instructor. The law of criminal procedure and rules of evidence as applied to forensic science. Topics will include scientific versus legal burdens of proof, legal terminology and trial procedure.

FRSC 385. Forensic Serology. 3 Hours.

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisites: CHEM 301 and either FRSC 300 or FRSC 350, each with a minimum grade of C. Examines the application of basic chemical, biological, immunological and microscopic laboratory techniques to the examination and identification of body-fluid stains, including both presumptive and/or confirmatory identification of blood, semen, saliva, urine and feces. Applies methods that are used in forensic laboratories to identify the species of origin and includes a review of advanced methods for automated serological analysis. Laboratory exercises will supplement lectures to give students practical knowledge of the laboratory procedures.

FRSC 391. Topics in Forensic Science. 1-3 Hours.

Semester course; 1-3 lecture hours. 1-3 credits. Maximum total of 6 credits for all forensic science topics courses may be applied to the major. Prerequisites: CHEM 301 and either FRSC 300 or FRSC 350, each with a minimum grade of C. 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 400. Forensic Chemistry. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: CHEM 409 and CHEZ 409; and either FRSC 300 or FRSC 350, each with a minimum grade of C. Provides an understanding of presumptive and confirmatory chemical analyses used in a forensic laboratory for the characterization and identification of physical evidence, such as accelerants and explosives, paints and polymers, suspected drug substances, and toxicology. Chemical analyses as pertaining to firearms, toolmarks and glass will also be explored.

FRSC 410. Forensic Pattern Evidence. 3 Hours.

Semester course; 3 lecture/laboratory hours. 3 credits. Prerequisite: FRSC 309 with a minimum grade of C. Enrollment restricted to forensic science majors or by permission of instructor. Covers topics in pattern evidence analysis including analysis of latent prints and impression evidence of footwear and tire treadmarks as applied to forensic casework. Covers both the theoretical and practical aspects using lectures and laboratory exercises focusing on the visualization, examination and interpretation of pattern evidence.

FRSC 412. Forensic Analysis of Firearms and Toolmarks. 3 Hours.

Semester course; 3 lecture/laboratory hours. 3 credits. Prerequisite: FRSC 365 with a minimum grade of C. Enrollment restricted to forensic science majors or by permission of instructor. An investigation of topics in firearms and toolmark examination for forensic applications. Covers both theoretical and practical aspects using lectures and laboratory exercises.

FRSC 438. Forensic Molecular Biology. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: CHEM 302, CHEZ 302, and BIOL 310 or equivalent, each with a minimum grade of C. Provides an understanding of molecular biology testing methodologies as applied to analysis of forensic samples. Current topics in forensic DNA analysis will include quality assurance, DNA databanking, contemporary research and population genetics. Crosslisted as: BIOL 438.

FRSC 445. Forensic Toxicology. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: CHEM 301, CHEM 302 and CHEZ 301, each with a minimum grade of C. Provides a comprehensive overview of the basic principles of toxicology and the practical aspects of forensic toxicology. Students will learn to define the toxic agents most commonly resulting in legal problems in U.S. society and also the process by which the U.S. judicial system is aided by scientific investigation. Crosslisted as: PATH 445.

FRSC 490. Professional Practices in Forensic Science. 3 Hours.

Semester course; 3 lecture hours. 3 credits. Prerequisites: CHEM 301; FRSC 300 or FRSC 350; and one additional forensic science course, each with a minimum grade of C. Enrollment restricted to seniors in forensic science with at least 85 credit hours toward the degree. An examination and evaluation of historical and current issues in the scientific analysis of physical evidence in criminal investigations. Individual and group activities relating to professional practices (ethics, quality control and testimony) of forensic scientists.

FRSC 492. Forensic Science Independent Study. 1-3 Hours.

Semester course; 1-3 independent study hours. 1-3 credits. May be repeated for a maximum of 6 credits. Prerequisites: CHEM 301; and FRSC 300 or FRSC 350, each with a minimum grade of C. Enrollment restricted to forensic science majors with at least sophomore standing and a minimum GPA of 2.5. A determination of the amount of credit and the written permission of both the instructor and the program director must be procured prior to registration for the course.

FRSC 493. Forensic Science Internship. 3 Hours.

Semester course; 3 research hours. 3 credits. Prerequisite: FRSC 300 or FRSC 350 with a minimum grade of C. Enrollment restricted to forensic science majors with a minimum GPA of 2.75. An application is required in advance of admission with permission of the internship coordinator. Through placement in an approved organization, the student will obtain a broader, more practical knowledge of forensic science and its applications. Written progress and final reports are required. Graded as pass/fail.