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

The forensic biology concentration requires an additional 26 credits in biology, forensic science and elective credits beyond the core requirements and is well-suited for students interested in graduate study or careers in the forensic biology section of forensic laboratories. Students also will be prepared for work in molecular biology laboratories in both the public and private sectors. Students completing the forensic biology concentration will be eligible for a minor in chemistry. Additionally, students who complete BIOL 317 or BIOL 318 will be eligible for a minor in biology.

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 biology to forensic science
- Demonstrate capabilities, use and limitations of forensic laboratory techniques

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

General education requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIV 111</td>
<td>Focused Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>UNIV 112</td>
<td>Focused Inquiry II</td>
<td>3</td>
</tr>
<tr>
<td>UNIV 200</td>
<td>Inquiry and the Craft of Argument</td>
<td>3</td>
</tr>
<tr>
<td>Approved humanities/fine arts</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Approved natural/physical sciences</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Approved quantitative literacy</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Approved social/behavioral sciences</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>21-24</td>
</tr>
</tbody>
</table>

Required courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 200</td>
<td>Calculus with Analytic Geometry I (fulfills University Core quantitative literacy)</td>
<td>3-10</td>
</tr>
<tr>
<td>PHIL 201</td>
<td>Critical Thinking About Moral Problems (fulfills H&amp;S literature and civilization)</td>
<td></td>
</tr>
<tr>
<td>STAT 210</td>
<td>Basic Practice of Statistics</td>
<td>3-10</td>
</tr>
</tbody>
</table>

Total Hours 3-10

Collateral requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 151 &amp; BIOZ 151</td>
<td>Introduction to Biological Sciences I and Introduction to Biological Science Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 152 &amp; BIOZ 152</td>
<td>Introduction to Biological Sciences II and Introduction to Biological Science Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 300</td>
<td>Cellular and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 310</td>
<td>Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOZ 476</td>
<td>Molecular Capstone Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 101 &amp; CHEZ 101</td>
<td>General Chemistry I and General Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 102 &amp; CHEZ 102</td>
<td>General Chemistry II and General Chemistry Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 301 &amp; CHEZ 301</td>
<td>Organic Chemistry and Organic Chemistry Laboratory I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 302 &amp; CHEZ 302</td>
<td>Organic Chemistry and Organic Chemistry Laboratory II</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 403</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>FRSC 300</td>
<td>Survey of Forensic Science</td>
<td>3</td>
</tr>
<tr>
<td>FRSC 309</td>
<td>Scientific Crime Scene Investigation</td>
<td>3</td>
</tr>
<tr>
<td>FRSC 365</td>
<td>Forensic Microscopy</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 375</td>
<td>Forensic Evidence, Law and Criminal Procedure</td>
<td>3</td>
</tr>
</tbody>
</table>

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.

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<tr>
<th>Course</th>
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<tr>
<td>UNIV 111 Play course video for Focused Inquiry I</td>
<td></td>
<td>3</td>
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<td>Approved humanities/fine arts</td>
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<td>Total Hours</td>
<td></td>
<td>21-24</td>
</tr>
</tbody>
</table>

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
Forensic Science, Bachelor of Science (B.S.) with a concentration in forensic biology

FRSC 385 Forensic Serology 3
FRSC/BIOL 438 Forensic Molecular Biology 3
FRSZ/BIOZ 438 Forensic Molecular Biology Laboratory 2
FRSC 490 Professional Practices in Forensic Science 3
PHYS 201 General Physics I 4-5
or PHYS 207 University Physics I
PHYS 202 General Physics II 4-5
or PHYS 208 University Physics II
STAT 314 Applications of Statistics 4
Total Hours 73-75

Concentration electives
Students must receive a minimum grade of C in all 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 three credits in BIOL/BIOZ, CHEM/CHEZ, CRJS, FRSC/FRSZ, MATH or PHYS (200- to 500-level) 3
Total Hours 3

Open electives

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

The minimum total of credit hours required for this degree is 120.

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.

Note: This plan of study assumes that the student scored well enough on the VCU Mathematics Placement Test to place into MATH 200 or that the student has completed MATH 151 with a minimum grade of C (a pre- or corequisite for BIOL 151, BIOZ 151 and CHEM 101, a prerequisite for CHEM 102).

Freshman year

Fall semester
Course Title Hours
BIO 151 Introduction to Biological Sciences I 4
& BIOZ 151 and Introduction to Biological Science Laboratory I
CHEM 101 General Chemistry I 4
& CHEZ 101 and General Chemistry Laboratory I
UNIV 111 Focused Inquiry I 3
Play course video for Focused Inquiry I
Approved H&S science and technology 3-4
Experiential fine arts 1-3
Term Hours: 15-18

Spring semester
Course Title Hours
BIO 152 Introduction to Biological Sciences II 4
& BIOZ 152 and Introduction to Biological Science Laboratory II
CHEM 102 General Chemistry II 4
& CHEZ 102 and General Chemistry Laboratory II
HUMS 202 Choices in a Consumer Society 1
MATH 200 Calculus with Analytic Geometry I 4
UNIV 112 Focused Inquiry II 3
Term Hours: 16

Sophomore year

Fall semester
Course Title Hours
BIO 300 Cellular and Molecular Biology 3
CHEM 301 Organic Chemistry I 5
& CHEZ 301 and Organic Chemistry Laboratory I
STAT 210 Basic Practice of Statistics 3
UNIV 200 Inquiry and the Craft of Argument 3
Term Hours: 14

Spring semester
Course Title Hours
CHEM 302 Organic Chemistry I 5
& CHEZ 302 and Organic Chemistry Laboratory II
FRSC 300 Survey of Forensic Science 3
PHIL 201 Critical Thinking About Moral Problems (fulfills H&S literature and civilization course) 3
STAT 314 Applications of Statistics 4
Term Hours: 15

Junior year

Fall semester
Course Title Hours
FRSC 309 Scientific Crime Scene Investigation 3
FRSC 375 Forensic Evidence, Law and Criminal Procedure 3
PHYS 201 or PHYS 207 General Physics I or University Physics I 4-5
BIOL/BIOZ, CHEM/CHEZ, CRJS, FRSC/FRSZ, MATH or PHYS (200- to 500-level) 3
Approved H&S diverse and global communities 3
Term Hours: 16-17

Spring semester
Course Title Hours
BIOL 310 Genetics 3
FRSC 365 Forensic Microscopy 4
PHYS 202 or PHYS 208 General Physics II or University Physics II 4-5
Foreign language (101-level) or open electives 4
Term Hours: 15-16

Senior year

Fall semester
Course Title Hours
BIOZ 476 Molecular Capstone Laboratory 2
CHEM 403 Biochemistry I 3
FRSC 385 Forensic Serology 3
Term Hours: 0-9

Approved H&S science and technology 3-4
Experiential fine arts 1-3
Term Hours: 15-18
There is little, if any, flexibility regarding when to take these courses in order to enroll in FRSC 300 during spring semester of sophomore year.

The minimum total of credit hours required for this degree is 120.

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, BIOL 151, CHEM 102, CHEZ 102 and UNIV 112, each with a minimum grade of C. Pre- or corequisites: CHEM 301 and CHEZ 301, and UNIV 200 or HONR 200. Enrollment is 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 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. 1-3 Hours.
Semester course; 1-3 field experience hours. 1-3 credits. Prerequisite: FRSC 300 with a minimum grade of C. Enrollment is 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.