Forensic Science at Arcadia University

Global Perspectives...Personal Attention...Real-World Integrative Learning Experiences

Faculty
Karen Scott, Ph.D., Associate Professor and Director of the Forensic Science Program
Heather Mazzanti, M.S.F.S., Assistant Professor and Assistant Director of the Forensic Science Program

Clinical Faculty
Barry Logan, Ph.D., ABFT, National Forensic Science Director of NMS Labs and Executive Director of the Fredric Rieders Family Renaissance Foundation

Adjunct Faculty
Edward Barbieri, Ph.D., Assistant Laboratory Director, Forensic, NMS Labs. Kimberlee Moran, M.Sc., R.P.A. Director of the Center for Forensic Science Research and Education
Heather Harris, M.F.S., J.D., Independent Forensic Chemistry Consultant
Richard Nilsen, M.S., J.D., Commander, Forensic Services Unit and Assistant DA, Montgomery County District Attorney’s Office
Allen Stewart, M.S., Deputy Sheriff, Montgomery County Sheriff’s Department
Christian Westring, Ph.D., DNA Technical Leader at NMS Labs
Mandi Arntson M.S.F.S., Research Scientist, Center for Forensic Science Research & Education
Jillian Fesolovich, M.S.F.S., Forensic Biologist I, NMS Labs
Rod Gullberg, M.S., Statistical Consultant, Clearview Statistical Consulting

Laboratory Instructors
Fran Diamond, Criminalistics Technical Leader at NMS Labs
Warren Korn, Laboratory Manager at The Center for Forensic Science Research and Education

About the Forensic Science Master’s Degree
- Small class sizes
- One of only a select few Master’s in Forensic Science programs accredited by the Forensic Science Education Programs Accreditation Commission (FEPAC)
- Offered on-site at The Center for Forensic Science Research & Education and NMS Labs state-of-the-art facilities
- Renowned American Board of Criminalistics (ABC) and American Board of Forensic Toxicology (ABFT) certified faculty
- Guaranteed Internship at The Center for Forensic Science Research & Education
- Preparation for careers in private, state and federal agencies as well as other associated scientific disciplines
- Provides a strong scientific foundation to pursue doctoral studies
- Arcadia University-sponsored student participation in professional meetings
- Active research programs in various forensic science disciplines
- Opportunity to attend autopsies and consult on cold case investigations
- Become recognized by the American Board of Criminalistics (ABC) by taking the Forensic Science Assessment Test (FSAT) prior to graduation

A Growing Profession: Forensic Science is broadly defined as the application of science to the purposes of law. It is highly interdisciplinary by nature and has become a vital part of the judicial and regulatory system worldwide. Professional forensic scientists, law enforcement personnel, and criminal justice employees all recognize the growing need for highly qualified specialists who can follow established protocols in the collection, preservation, analysis and presentation of forensic evidence.
National Recognition: The Arcadia University Master of Science in Forensic Science (M.S.F.S.) program is nationally accredited by the Forensic Science Education Programs Accreditation Commission (FEPAC) of the American Academy of Forensic Sciences (AAFS). Arcadia University is one of only a select few institutions in the country to hold this accreditation which recognizes the high quality graduate forensic science curriculum offered through this program.

Affiliations: The Master of Science in Forensic Science (M.S.F.S.) degree is offered by Arcadia University in partnership with the Center for Forensic Science Research & Education and in collaboration with NMS Labs, one of the nation's premier ASCLD-LAB and ISO 17025 accredited forensic science laboratories. Both facilities are located about 5 miles from Arcadia University in Willow Grove, PA. A significant portion of the coursework is conducted at the Center for Forensic Science Research & Education facilities, and forensic practitioners from NMS Labs provide a substantial part of the instruction.

Guaranteed Internship and Real-World Experience: Arcadia faculty believe that hands-on forensic science opportunities are an essential part of the educational experience. Arcadia's guaranteed internship at the Center for Forensic Science Research & Education is a unique benefit of Arcadia's program. This highly desirable, comprehensive, and intensive 12-week internal internship program gives every student valuable real-world experience and career preparation in the following areas: Forensic Biology, Forensic Toxicology, Forensic Chemistry and Trace Analysis.

Forensic Science Mission Statement: The mission of the Forensic Science program at Arcadia University is to provide high quality, competent, and professional master’s level forensic science education and training. This mission is to be accomplished through contact with internal and external professional practitioners and academicians; through research, internships, and other forensic science activities intended to increase the students’ knowledge of forensic science, and through competent and ethical professional training.

Believing that the program’s mission can be achieved through productive interactions among practitioners, academicians, and related forensic science activities, Arcadia University seeks

- To provide a comprehensive graduate program in the areas of forensic biology, chemistry, toxicology and trace evidence analysis and to serve as a model for forensic science education excellence.
- To promote scholarly inquiry into the knowledge and techniques fundamental to the practice of forensic science.
- To provide outstanding resources for students in their professional forensic science development.
- To produce competent and skilled forensic science professionals who can serve as outstanding practitioners and leaders in the forensic science field.

Forensic Science Program Structure

Our curriculum is unique in that it covers a variety of specialties, unlike other graduate programs that require a commitment to a single field of study, making for more well-rounded forensic practitioners. The curriculum involves classroom and laboratory exposure to the field of criminalistics including forensic biology, chemistry and trace analysis as well as forensic toxicology. Coursework emphasizing the development of problem-solving abilities is designed to encourage a concentration in these forensic science specialty areas and expose students to both relevant laboratory techniques and relevant medico-legal developments. An emphasis on laboratory coursework provides students with significant hands-on experiences. Students are afforded the opportunity to reinforce their laboratory skills via internship arrangements with practicing forensic laboratories, including NMS Labs in Willow Grove, PA. A comprehensive internal internship practicum at The Center for Forensic Science Research & Education is guaranteed for all students. These experiences, coupled with the completion of an independent research project, ensure that Arcadia graduates are well prepared...
for careers in forensic science and that they are well received by the forensic science community.

The M.S.F.S. program focuses primarily on the fields of forensic biology, chemistry, toxicology, and trace evidence analysis.

- **Forensic Biology** involves the analysis of biological fluids and tissues collected at crime scenes and from articles of physical evidence for the purpose of identification and individualization. A forensic biologist employs a wide range of laboratory methods and instruments for body fluid identification and forensic DNA analysis.

- **Forensic Chemistry** involves the forensic application of chemical theories, techniques, and instrumentation to the analysis of illicit drugs, arson, explosives, and other trace evidence materials.

- **Forensic Toxicology** involves the detection and characterization of chemical substances exhibiting adverse or toxic physiological effects. A forensic toxicologist uses a wide range of laboratory methods, which may include spectrophotometric and chromatographic analyses.

- **Trace Analysis** involves the proper collection, preservation identification and comparison of items such as glass, paint, hairs, fibers and soil. A forensic trace evidence examiner will use instrumental, mechanical, chemical and visual techniques to analyze these types of trace evidence.

**Program Design**

The Forensic Science program offers a variety of core and elective courses. In their first year of study, students are given the opportunity to make up any deficiencies in biology and chemistry coursework depending on their undergraduate backgrounds and have the opportunity to take advanced courses in these fields. This provides students with a strong scientific foundation which is required and essential in the field of forensic science. The remainder of the first-year courses concern both general and specific topics in forensic science. The second year of study allows for further specialization in chemical, biological, and toxicological coursework. Students also complete internship experiences and research projects in the second year.

**The First Year**

In their first year of study, students enrolled in the M.S.F.S. program take a set of core courses designed to develop a strong broad-based foundation in the forensic sciences. Courses concerning topics in forensic science are taught by full time and adjunct faculty recruited from NMS Labs as well as from local, state and federal forensic laboratories and law enforcement agencies.

**Summer Term**

After the first year, students will be required to engage in a research project mentored by a faculty member affiliated with the University or its partners. Research may be performed on campus or at an external laboratory.

**The Second Year**

In the second year students obtain additional depth of knowledge by taking specialized coursework in forensic biology, forensic toxicology, forensic chemistry and trace analysis. Students must also complete a laboratory practicum/internship and research project mentored by a faculty member affiliated with the University or its partners.

**Admission to the Forensic Science Master’s Program**

Program-specific admission requirements:

1. A Forensic Science application, including personal statements, must be completed online at [www.arcadia.edu/gradapp](http://www.arcadia.edu/gradapp).

2. A bachelor’s degree from an accredited institution with a GPA of 3.0 or better, with at least a 3.25 in the major. It is expected that students have an undergraduate degree in the natural or physical sciences.

3. One official transcript from each college, university or professional school attended. Transfer credits
included on a transcript must include grades earned; if not, an official transcript from the original school must be submitted. Transcripts must be sent from the issuing school in a sealed envelope and contain the appropriate signatures and seals to be considered official.

4. Completion of at least two semesters of general chemistry with laboratories, two semesters of organic chemistry with laboratories, and two semesters of general biology with laboratories.

5. Three current letters of recommendation from persons familiar with the applicant's ability to study graduate-level science.

6. Test scores for the Graduate Record Examination (GRE) or the Medical College Admission Test (MCAT), taken within the last five years.

7. International applicants should visit www.arcadia.edu/international for detailed information on admission requirements and application procedures. TOEFL/IELTS results are required for all students for whom English is a second language or who have not earned degrees or diplomas from post-secondary institutions in English-speaking countries (e.g. the United States, Canada, the United Kingdom, Republic of Ireland, Australia, and New Zealand). A course-by-course evaluation of all transcripts by an independent evaluation service based in the United States also is required.

8. It is highly recommended that prospective undergraduate students have completed coursework in genetics, molecular biology, biochemistry, statistics, and instrumental/analytical chemistry.

9. An interview with the Admissions Committee may be required.

10. Arcadia Undergraduate students desiring assured admission must submit their completed applications by November 1 of the academic year of graduation from Arcadia University.

General Admissions Procedures

Upon enrollment into their programs, all students must provide proof of medical insurance and also provide information about their health and medical history. If needed, medical insurance can be purchased through the University. Information and applications are available in the Office of Student Health Services.

Application Deadline

Completed applications will be reviewed on a rolling basis starting January 15. Those received after January 15 will be reviewed based on availability of space in the attending class.

Deferred Admission

A student admitted to the full-time program and who wants to defer his or her admission for one year must submit a request to do so in writing to the Director. Deferrals will be granted by the Department on an individual basis. Once the deferral is granted, the student must submit the required deposit to reserve his or her seat in the class. This deposit will be credited toward tuition. Students who are granted a deferral must understand that they will be subject to the prevailing tuition at the time of matriculation to the program.

Part-Time Program Admission

Students working full-time may enroll in and complete the M.S.F.S. program on a part-time basis. Although designated as a part-time program, the coursework will continue to be offered at existing times. Students will generally take 1 to 2 courses per semester and adjust their work schedule to attend and complete course requirements. Matriculated student requirements are similar to the admission requirements for the full-time program. Students will apply to the program using the same procedure as students applying to the full-time program. Admission to the part-time program may occur in either Fall or Spring semesters. Applicants to the matriculated part-time program with two or more years of relevant laboratory experience at a forensic laboratory may have the GRE requirement waived.

Personal Academic and Professional Ethics

Students interested in the program should be aware of the National Institute of Justice Report entitled “Qualifications for a Career in Forensic Science.” This document details the personal, professional and
academic criteria which will influence a prospective forensic science examiner’s suitability for employment. With regard to personal characteristics, the document states that “Because forensic science is part of the criminal justice system, personal honesty, integrity, and scientific objectivity are paramount. Those seeking careers in this field should be aware that background checks similar to those required for law enforcement officers are likely to be a condition of employment. The following may be conducted and/or reviewed before an employment offer is made and may remain as ongoing conditions of employment (this list is not all inclusive): drug tests, history of drug use, criminal history, personal associations, polygraph examination, driving record, past work performance, credit history, and medical or physical examination. Personal candor in these areas is critical.”

Support Services
Professional counseling services are available through the Arcadia University Counseling Center.

Expenses

Tuition: 2014-2015 $30,000

Fees:
- Parking, registration, student liability insurance (per year) $130

Additional Expenses (estimated):
- Books and supplies (estimated):
  - Year one $500; Year two $500
- Room and Board: Off Campus
- Travel: Varies

Included in tuition cost:
- Registration, travel and hotel accommodations for 1 national and 1 regional forensic science meeting.
- Registration fee for sitting the FSAT once per year.
- Personalized lab coat.

Financial Aid

Scholarships
Several partial-tuition scholarships are available for students in the Forensic Science program. Upon acceptance into the program, students will be reviewed automatically for these scholarships, which are based upon academic achievement and are renewable for two years.

Assistantships
Graduate assistantships are available on a semester-to-semester basis. Select students are automatically awarded graduate assistantships upon acceptance, but any graduate student may apply for a campus-wide graduate assistantship. Questions regarding graduate assistantships should be directed to the College of Graduate Studies at 215-572-2925.

Federal Loans
Graduate students are eligible to borrow through the federal Stafford Loan and federal PLUS Loan programs. Arcadia University, in partnership with AES/PHEAA, offers the no-fee Arcadia University Preferred Stafford Loan Program, which provides students with benefits that include:
- Origination and guarantee fee waivers
- Interest rate reduction during repayment
- Superior administration and servicing

All financial aid paperwork not submitted online should be sent to the Office of Enrollment Management/Financial Aid. Please e-mail finaid@arcadia.edu or call 1-877-ARCADIA (1-877-272-2342) if you have additional questions about financial aid.

Requirements for the M.S. in Forensic Science

(72 credits)

The program includes at least 38 credits of required graduate coursework, in addition to 6 to 12 semester hours of research, 6 to 12 semester hours of practicum/internship, plus mandatory participation in a symposium/seminar series. Students working full-time with two or more years of relevant laboratory experience at a forensic laboratory who are completing the program on a part-time basis may have the practicum/internship requirement waived with approval of the Program Director.
# Forensic Science at Arcadia University

## First-Year Coursework

### Fall Semester (14 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 518</td>
<td>Crime Scene Investigation and Reconstruction (2 credits)</td>
</tr>
<tr>
<td>FS 519</td>
<td>Forensic Pattern Analysis (2 credits)</td>
</tr>
<tr>
<td>FS 570</td>
<td>Criminal Law and Ethics (3 credits)</td>
</tr>
<tr>
<td>FS 561a</td>
<td>Forensic Science Symposium (1 credit)</td>
</tr>
<tr>
<td>CH 518</td>
<td>Instrumental Analysis in Forensic Toxicology &amp; Chemistry (3 credits)</td>
</tr>
<tr>
<td>FS 540</td>
<td>Statistical Analysis and Biostatistics (3 credits)</td>
</tr>
<tr>
<td>BI 440</td>
<td>Biochemistry (0 graduate credits, as needed)</td>
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### Spring Semester (16 credits)

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 515</td>
<td>Research Methods in Forensic Science (1 credit)</td>
</tr>
<tr>
<td>FS 504</td>
<td>General Principles of Pharmacology (3 credits)</td>
</tr>
<tr>
<td>FS 530</td>
<td>Forensic Serology (3 credits)</td>
</tr>
<tr>
<td>FS 535</td>
<td>Forensic Chemistry (3 credits)</td>
</tr>
<tr>
<td>FS 535L</td>
<td>Forensic Chemistry Lab (1 credits)</td>
</tr>
<tr>
<td>FS 532</td>
<td>Forensic Microscopy (3 credits)</td>
</tr>
<tr>
<td>FS 532L</td>
<td>Forensic Microscopy Lab (1 credits)</td>
</tr>
<tr>
<td>FS 561b</td>
<td>Forensic Science Symposium (1 credit)</td>
</tr>
<tr>
<td>BI 204</td>
<td>Genetics (0 graduate credits, as needed) OR</td>
</tr>
<tr>
<td>CH 203</td>
<td>Equilibrium and Analysis (0 graduate credits, as needed)</td>
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### Summer Coursework (4 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 596</td>
<td>Research Project in Forensic Science (4 credits) OR</td>
</tr>
<tr>
<td>FS 597</td>
<td>Research Project in Forensic Chemistry (4 credits) OR</td>
</tr>
<tr>
<td>FS 598</td>
<td>Research Project in Forensic Biology (4 credits)</td>
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</tbody>
</table>

## Second-Year Coursework

### Fall Semester (20 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 525</td>
<td>Forensic Toxicology I (3 credits)</td>
</tr>
<tr>
<td>FS 525L</td>
<td>Forensic Toxicology Lab (1 credit)</td>
</tr>
<tr>
<td>FS 531</td>
<td>Human Molecular biology (3 credits)</td>
</tr>
<tr>
<td>FS 531L</td>
<td>Human Molecular Biology Lab (1 credit)</td>
</tr>
<tr>
<td>FS 512</td>
<td>Forensic Trace Analysis (3 credits)</td>
</tr>
<tr>
<td>FS 536</td>
<td>Advanced Forensic Chemistry (3 credits)</td>
</tr>
<tr>
<td>FS 533</td>
<td>Quality Management in Forensic Science (1 credit)</td>
</tr>
<tr>
<td>FS 562A</td>
<td>Forensic Science Communications I (1 credit)</td>
</tr>
<tr>
<td>FS 596</td>
<td>Research Project in Forensic Science (4 credits) OR</td>
</tr>
<tr>
<td>FS 597</td>
<td>Research Project in Forensic Chemistry (4 credits) OR</td>
</tr>
<tr>
<td>FS 598</td>
<td>Research Project in Forensic Biology (4 credits)</td>
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### Spring Semester (18 credits)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 520</td>
<td>Moot Court (1 credit)</td>
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<tr>
<td>FS 562B</td>
<td>Forensic Science Communications II (1 credit)</td>
</tr>
</tbody>
</table>

### One of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>FS 586</td>
<td>Graduate Practicum in Forensic Biology (12 credits) OR</td>
</tr>
<tr>
<td>FS 587</td>
<td>Graduate Practicum in Forensic Chemistry (12 credits) OR</td>
</tr>
<tr>
<td>FS 588</td>
<td>Graduate Practicum in Forensic Toxicology (12 credits) OR</td>
</tr>
<tr>
<td>FS 583</td>
<td>Graduate Internship in Forensic Science [external] (6 – 12 credits)</td>
</tr>
</tbody>
</table>
One of the following:

FS 596 Research Project in Forensic Science (4 credits) OR
FS 597 Research Project in Forensic Chemistry (4 credits) OR
FS 598 Research Project in Forensic Biology (4 credits)

Forensic Science Courses (FS)

504 General Principles of Pharmacology
This lecture based course provides a general overview of pharmacology as applied to forensic issues. The course covers both Pharmacokinetics and Pharmacodynamics. In Pharmacokinetics, there is a detailed discussion of absorption, distribution, metabolism and excretion of drugs with an emphasis on drug transport, active metabolites and drug interactions. In Pharmacodynamics, there is a discussion of receptor—drug binding characteristics and efficacy. Various pharmacological effects will also be discussed, such as, therapeutic, toxic, idiosyncratic, hypersensitive and lethal effects, with clinical examples to illustrate the differences. There is a detailed pharmacological discussion of the various drug classes.

512 Forensic Trace Evidence Analysis
This lecture/laboratory based course details the types of trace evidence found in criminal cases including the forensic analysis of hairs, fibers, glass, paint, and soil. The use of microscopy will be complemented with other analytical methodologies for the identification and comparison of a variety of trace evidence types.

515 Research Methods in Forensic Science
This lecture based course is designed to familiarize the student with the basic methods and techniques of research and the preparation of research papers. It is designed to instill proper practices for creating an experiment and reporting those results and ideas in an appropriate manner.

In this course, students will learn how to research a topic and design an experiment. The students will be asked to dissect and critique relevant scientific journal articles to understand the intent and content of each section. Finally, the students will utilize the skills learned and developed throughout class to prepare a proposal for a literature or laboratory based project.

518 Crime Scene Investigation and Reconstruction
This lecture/hands-on based course will provide students with an in-depth review of crime scene processing and evaluation. Following an overview of documentation and collection of physical evidence from various types of crime scenes without contaminating the scene, students will be taught effective techniques for photographing the crime scene and for the collection of evidence such as latent fingerprints, shoe/tire impressions, trace evidence and biological materials. Students will be given the opportunity to reconstruct an entire crime scene for court presentation.

519 Forensic Pattern Analysis
This lecture/laboratory based course will provide students with an overview of the principles and concepts on which pattern evidence analysis is based. Methods of analysis for various types of forensic pattern evidence including fingerprints, footwear impressions, tire marks, tool marks, blood spatter analysis and fired bullets and cartridges will be discussed. Students will use mechanical, chemical and visual techniques to develop and analyze these types of pattern evidence.

520 Moot Court
This interactive lecture based course covers strategies for the presentation of evidence in court. The culmination of laboratory analysis of evidential material and review of the resulting data is its presentation in court, where the scientist has the opportunity to explain the testing carried out, interpret their results and defend their validity and reliability. This course will educate the forensic science student in the preparation and presentation
of scientific information to lay audiences, and will help students understand the dynamics of the court room. This is achieved through lectures and moot court format. Instructors may utilize reports and projects prepared in other courses to provide the subject matter for the students’ testimony. Students will be videotaped for self-critique.

525  
**Forensic Toxicology**

This lecture based course deals with the detection, identification and quantitation of foreign chemicals (toxins) in the body. In order to accurately interpret toxicological findings it is essential that the toxicologist has an understanding of the pharmacology of that substance and the pathological effects it has on the body. In this context Forensic Toxicology can be divided into two categories, post-mortem toxicology and human performance toxicology. This course will provide the student with the skills for development of a detailed knowledge of the types of toxic substances and matrices encountered in Forensic Toxicology and the procedures by which these are tested in the laboratory. Students will also utilize their theoretical knowledge of pharmacology in the application to Forensic Toxicology casework.

525L  
**Forensic Toxicology Lab**

Laboratory practicum emphasizing current methodologies and instrumentation employed by modern forensic laboratories for the determination of drugs and toxins in biological matrices. Techniques employed will include screening, extraction and quantitative confirmation procedures.

530  
**Forensic Serology**

This lecture/laboratory based course covers the biochemical basis of biological fluid testing procedures and includes classical serological and electrophoretic techniques. Court testimony in the area of forensic biology is also addressed. Practical and laboratory exercises demonstrate the techniques and their applications.

531  
**Human Molecular Biology**

This lecture/laboratory based course covers the basic principles of DNA functions and chemistry, capillary electrophoresis, polymerase chain reaction, and STR multiplexing of nuclear DNA. It examines the history of forensic DNA techniques as well as surveying current trends including mitochondrial and single nucleotide DNA polymorphism techniques. Statistical analyses of data will also be covered.

531L  
**Human Molecular Biology Lab**

Laboratory practicum emphasizing techniques and methods utilized in modern forensic laboratories for case investigation requiring DNA analysis including DNA extraction, quantification, amplification and detection techniques as well as data analysis and statistical interpretation.

532  
**Forensic Microscopy**

This lecture based course will provide students with detailed knowledge of optical microscopes (ex. Compound and stereo microscopes) and electron microscopes (ex. SEM and TEM) as well as methods that can be interfaced with microscopes (ex. micro-FTIR, X-ray diffraction and micro spectrophotometry) and their use in forensic science.

532L  
**Forensic Microscopy Lab**

Laboratory practicum emphasizing current methodologies and instrumentation employed by modern forensic laboratories for the microscopic analysis of trace evidence.

533  
**Quality Management in Forensic Science**

This lecture based course will evaluate theoretical and practical applications of forensic science laboratory management. Expectations for the professional practice of forensic science are changing, driven by developing technology, legal precedent and government regulation. Professional organizations also play a role in governing the qualifications of people practicing in the field, and setting standards for ensuring that valid science is practiced and admitted to court. This course will emphasize various quality measures, including quality control and quality assurance, proficiency testing, professional certification and
laboratory accreditation standards. Issues related to bias, error and uncertainty will also be explored. The class will review critiques of the forensic sciences that are the basis for development of scientific working groups (SWG's) in various disciplines, proposed areas for improvement in forensic science including research, education, validation, and management of laboratories.

535
**Forensic Chemistry**
This lecture/laboratory based course is designed to provide the student with an in-depth knowledge of the theories, techniques and vocabulary of the unique field of forensic chemistry. This course covers forensic chemistry techniques and principles relating to controlled substances, ignitable liquids/fire debris and explosives. A review of organic and analytical chemistry as they relate to forensic chemistry will be discussed.

535L
**Forensic Chemistry Lab**
Laboratory practicum emphasizing current methodologies and instrumentation employed by modern forensic laboratories for the detection and identification of chemicals of forensic interest including controlled substances, accelerants and explosives.

536
**Advanced Forensic Chemistry**
This lecture/laboratory based course is designed to build on those topics covered in Forensic Chemistry. This course covers forensic chemistry analytical techniques and principles relating to controlled substances, fire debris, and ignitable liquids.

540
**Statistical Analysis and Biostatistics**
Advanced study of the theory and application of statistical analysis techniques on data sets from a variety of biological and physical sciences. Emphasis placed on the collection and presentation of data, probability, hypothesis testing, descriptive and inferential statistics. Students learn to apply common computer statistical modules. Three class hours. Prerequisites: Equivalent of statistics; or permission of instructor.

561A/B
**Forensic Science Symposium**
Wide-ranging introduction to key areas and "hot topics" in forensic science, as presented by a series of guest lectures by leading practitioners in the field.

562A
**Forensic Science Communications I**
Discussion based course covering all major areas of emphasis in the MSFS program designed to enhance oral communication skills and prepare students for oral exams and job interviews. This course culminates in the oral board portion of the capstone experience.

562B
**Forensic Science Communications II**
Discussion based course designed to enhance oral communication skills through a lecture series as presented by students on their master’s forensic research.

570
**Criminal Law and Ethics**
This lecture based course will provide the student with an introduction to the American criminal justice system. Through discussion and analysis of the U.S. Constitution, the Pennsylvania Constitution, Federal (and State) Rules of Criminal Procedure, and Federal (and State) Rules of Evidence with particular emphasis on case law, students will develop a practical understanding of modern criminal jurisprudence. Special emphasis and consideration will be given to the ethical obligations of criminal justice practitioners, including judges, prosecutors, defense attorneys, law enforcement officers and expert witnesses.

583
**Graduate Internship in Forensic Science**
A supervised external full-time internship at a pre-approved facility. Students are exposed to forensic analysis in an operational forensic laboratory and are evaluated by the forensic science program external internship committee and the sponsoring forensic laboratory. Credit will depend on number of hours in the internship, with a minimum of 300 hours (6
FORENSIC SCIENCE at Arcadia University

credits) required to a maximum of 600 hours (12 credits). Other numbers of hours will be prorated accordingly.

586 Graduate Practicum in Forensic Biology
A supervised internal full-time practicum at the Fredric Rieders Family Renaissance Foundation (FRFRF). Principles of the forensic analysis of blood and other biological materials as well as the procedures involved in DNA profiling of evidence (including DNA extraction, quantitation, amplification and detection) will be used to process casework samples, conduct analyses, interpret results, write reports, and participate in moot court experiences. Students have multiple hands-on casework samples, laboratory experiences, and the assistance of forensic practitioners in the preparation and execution of appropriate reports, analyses, and court testimonies.

587 Graduate Practicum in Forensic Chemistry
A supervised internal full-time practicum at the Fredric Rieders Family Renaissance Foundation (FRFRF). Principles and techniques of the forensic identification of chemicals including the weighing/sampling of evidence as well as presumptive and confirmatory identification will be used to process casework samples, conduct analyses, interpret results, write reports, and participate in moot court experiences. Students have multiple hands-on casework samples, laboratory experiences, and the assistance of forensic practitioners in the preparation and execution of appropriate reports, analyses, and court testimonies. Students also learn those analytical techniques used for the forensic analysis of trace evidence.

588 Graduate Practicum in Forensic Toxicology
A supervised internal full-time practicum at the Fredric Rieders Family Renaissance Foundation (FRFRF). Principles and procedures used in the forensic analysis of drugs and toxins, including their detection, extraction and purification from biological matrices, and quantitation will be used to process casework samples, conduct analyses, interpret results, write reports, and participate in moot court experiences. Students have multiple hands-on casework samples, experiences with screening procedures and analytical methodologies and the assistance of forensic practitioners in the preparation and execution of appropriate reports and court testimonies.

589 Independent Research
This course is designed for the student to independently integrate their graduate coursework studies and to incorporate their learning, research and/or internship experiences into a formal presentation. Their presentations should demonstrate a comprehensive and detailed understanding of their area of specialization.

596 Research Project in Forensic Science
This course consists of original laboratory-based research in some aspect of forensic chemistry, biology or toxicology, comparing existing testing modalities or experimenting with novel techniques. Projects involve all stages of a research task—proposal, experimental design, data collection, analysis—and will be supervised by a member of the regular Arcadia University teaching faculty, another member of the Forensic Science teaching faculty, and a forensic practitioner or someone with specialized knowledge. The culmination of this research should result in students meeting together to compare projects and prepare their capstone presentations.

597 Research Project in Forensic Chemistry
This course consists of original laboratory-based research in some aspect of forensic chemistry that can be taken repeatedly for credit with approval of the sponsoring professor and program director. Projects involve all stages of a research task—proposal, experimental design, data collection, analysis—and will be supervised by a member of the regular Arcadia University teaching faculty, another member of the Forensic Science teaching faculty, and a forensic practitioner or someone with specialized knowledge. The culmination of this research should result in students meeting together to compare projects and prepare their capstone presentations.
Research Project in Forensic Biology

This course consists of original laboratory-based research in some aspect of forensic biology that can be taken repeatedly for credit with approval of the sponsoring professor and program director. Projects involve all stages of a research task—proposal, experimental design, data collection, analysis—and will be supervised by a member of the regular Arcadia University teaching faculty, another member of the Forensic Science teaching faculty, and a forensic practitioner or someone with specialized knowledge. The culmination of this research should result in students meeting together to compare projects and prepare their capstone presentations.

Biology Courses (BI)

404 Genetics

Study of the classical and modern views of the nature of the gene, its transmission and its function. Includes microbial and population genetics. Three class hours and three laboratory hours weekly.

Prerequisites: BI 101 and 102; or permission of the instructor.

440 Biochemistry

This course introduces students to the basic concepts in biochemistry through lecture and problem sets. A biomedical perspective is used throughout. Students learn the basic principles governing the structure and function of biochemical systems.

Prerequisite: Permission of the instructor.

Chemistry Courses (CH)

203 Equilibrium and Analysis

Examination of the principles and theory of chemical equilibrium in the context of quantitative chemical analysis. Includes selected traditional analytical laboratory techniques frequently applied to analyses of systems of biological and environmental interest. Also introduces instrumental techniques of analysis.

Prerequisite: CH102; or permission of the chairperson.