

# Forensic and Investigative Science

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## Degrees Offered

- Master of Science
- Doctor of Philosophy

## M.S. FORENSIC AND INVESTIGATIVE SCIENCE

The objective of the M.S. degree is to prepare students for employment in local, state, and federal forensic science laboratories in several forensic disciplines. The M.S. degree is a rigorous, quantitative, research oriented degree accredited by the Forensic Science Education Programs Accreditation Commission (FEPAC).

Students are required to complete a minimum of 40 credit hours. The coursework is comprised of a core of advanced chemistry and biology courses and complemented with additional laboratory-based instruction in microscopy, analytical chemistry, impression evidence, and other specialty courses such as trace evidence, pattern evidence, DNA analysis, forensic chemistry, and laboratory management. Further specialization occurs through the student's research. The learning and research environments are supported by state-of-the-art instrumentation and laboratory facilities.

## PH.D. FORENSIC SCIENCE

The objective of the Ph.D. program is to prepare students to work as professionals in academia, government laboratories, and private industry as laboratory specialists. Students will learn to critically assess the current state of knowledge within the field, and to solve complex problems at the frontier of the discipline. The major component of the program is research.

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## FACULTY

### CHAIR

- Suzanne Bell - PhD (New Mexico State University)

### PROFESSOR

- Glen Jackson - PhD (West Virginia University)  
Ming Hsieh Distinguished Professor, Forensic Chemistry and Mass Spectrometry

### ASSOCIATE PROFESSOR

- Keith Morris - PhD (University of Port Elizabeth)  
Ming Hsieh Distinguished Professor, Firearms and Informatics

### ASSISTANT PROFESSORS

- Luis Arroyo - PhD (Florida International University)  
Toxicology, Environmental Forensics
- Tina Moroosse - MS (Marshall University)  
Graduate Studies Coordinator, Forensic Biology, Quality Assurance
- Robert O'Brien - MS (St. Joseph's University)  
Blood Stain Analysis, Crime Scene Analysis, Trace Evidence Analysis
- Jacqueline Speir - PhD (Rochester Institute of Technology)  
Informatics
- Tatiana Trejos - PhD (Florida International University)  
Trace Evidence, Forensic Chemistry

### CLINICAL ASSISTANT PROFESSOR

- Casper Venter - MS (Northwest University)  
Director, Forensic Facilities, Controlled Substances, Toxicology

### CLINICAL INSTRUCTOR

- Kelly Ayers - MS (West Virginia University)  
Forensic Photography, Crime Scene Analysis

## TEACHING INSTRUCTOR

- Robin Bowen - MS (West Virginia University)  
Ethics
- Rachel Mohr - PhD (Texas A&M University)  
Forensic Entomology

## Admission Requirements

The M.S. and the Ph.D. are separate degree programs and students should carefully consider which is the most appropriate for their career goals. The M.S. degree is ideal preparation for work in local, state, and federal forensic laboratory systems. The Ph.D. is geared toward preparing students for research-intensive positions, academic appointments, and laboratory management.

Students with a B.S. degree can be directly admitted to the Ph.D. program through the usual admission process. Current students in the FIS M.S. program that decide to pursue a Ph.D. must submit a completed application by the deadline to be considered for admission. Current enrollment in the FIS M.S. program **does not** guarantee acceptance into the Ph.D. program.

Placement in a specific research group or with a specific faculty member is not guaranteed. Students, particularly those applying to the Ph.D. program, are strongly encouraged to contact faculty ahead of time to discuss research interests and space availability in their research group. At least two potential research advisors must be identified as part of the admission process.

Applications are considered starting in January for admission to the following fall semester. Incomplete application packages are not considered. Priority is given to completed applications received by January 15th. Admissions for spring semester may be considered on a case-by-base basis; contact the Graduate Studies Coordinator before submitting.

Upon receipt and evaluation of the complete application package, suitable candidates will be invited for a final interview with the graduate committee.

## SPECIFIC REQUIREMENTS: MASTER OF SCIENCE PROGRAM

- A bachelor's degree in natural science, Forensic Science, or equivalent which includes at least one year of the following courses:
  1. Fundamentals of Chemistry (inclusive of laboratories),
  2. Organic Chemistry (inclusive of laboratories),
  3. Biology (inclusive of laboratories),
  4. Physics (inclusive of laboratories), and
  5. Calculus
- On-line graduate application
- Official transcripts from all institutions of higher education attended
- GRE taken within the last five years with a score of 300 or better
- GPA of 3.0 or better on a 4.0 scale
- Two letters of recommendation from persons who can address potential for success in graduate study and research
- An original writing sample by the applicant of at least 1,500 words. The writing sample may be one or more of the following: a peer-reviewed publication where the applicant was the lead author an honors thesis, research report or capstone report in which the applicant is the sole author an essay (1.5 line spacing, Times New Roman, 12 point font) discussing one of the following statements:
  - "Forensic science will survive criticism about its reliability," or
    - "DNA will eventually replace trace evidence as a technique in forensic science"

## SPECIFIC REQUIREMENTS: DOCTOR OF PHILOSOPHY PROGRAM

- B.S. or M.S. degree from accredited college or university (research-based)
- On-line graduate application
- GPA of 3.0 or better on a 4.0 scale
- Eight M.S. Program courses or equivalent with a grade of C or better
- Research writing example: (1) peer-reviewed publication where the student is the lead author, (2) thesis research converted to a publication-ready document - note that this document must conform to a preprint to be submitted to a peer reviewed journal (such as JFS or FSI), including appropriate subsections and reasonable length, or (3) thesis research proposal converted to a white paper (maximum length of 6 pages, single-spaced)
- Three letters of recommendation (all three references must be able to comment on the applicant's academic and/or research skills)

## Master of Science

### MAJOR REQUIREMENTS

Minimum GPA of 3.0 is required.

Minimum grade of C is required for all courses applied toward degree.

FIS 501	Foundations of Criminalistics	3
FIS 502	Forensic Laboratory Management	3
FIS 602	Forensic Informatics	3
FIS 614	Trace Evidence Examination	3
FIS 620	Forensic Casework Practicum	3
FIS 632	Advanced Forensic Biology	3
FIS 660	Advanced Forensic Chemistry	3
FIS 696	Graduate Seminar	1
FIS 696	Graduate Seminar	1
FIS 696	Graduate Seminar	1
FIS 696	Graduate Seminar	1
FIS 697	Research	6
STAT 516	Forensic Statistics	3
Approved Elective Courses *		6
Thesis Proposal		
Thesis Defense		
Total Hours		40

\* Approved Electives can include any 400 level Biology, Chemistry, or Forensic and Investigative Science course as well as FIS 604, FIS 610, FIS 615 or any 700 level Pharmacy course.

## Doctor of Philosophy

### MAJOR REQUIREMENTS

Minimum grade of B- in all courses

#### Required Core Courses

FIS 701	Advanced Criminalistics	4
FIS 702	Advanced Forensic Science	3
FIS 703	Research Design in Forensic Science	3
<b>Forensic Seminar</b>		6
FIS 796	Graduate Seminar	
<b>Colloquium *</b>		6
FIS 799	Graduate Colloquium	
<b>Research</b>		15
FIS 797	Research	
Comprehensive Oral Examination		
Dissertation Proposal		
Dissertation		
Dissertation Defense		
Total Hours		37

\* Note: Each student must take at least two colloquium courses, one of which must be outside his/her research area. These colloquium courses are modeled after the tutorials offered at Oxford College, where the student works directly with the faculty member exploring a certain topic in greater depth. Each student will take a tutorial colloquium under the direction of his/her advisor and one from another faculty member who is a member of the dissertation committee.

The PhD program requires the completion of the courses listed above, including at least 15 hours of PhD level research. Each student must earn a cumulative GPA of 3.0 or better with no grade less than a C- in any course.

## Major Learning Outcomes

### FORENSIC AND INVESTIGATIVE SCIENCE

1. Develop an understanding of the areas of knowledge that are essential to forensic science.
2. Acquire skills and expertise in the application of basic forensic science concepts and of specialty knowledge to problem solving.
3. Ensure the student is oriented in professional values, concepts, and ethics.
4. Demonstrate integration of knowledge and skills through independent research.
5. Educate and prepare fundamentally sound forensic scientists.

## Academic Standards

Detailed academic standards, expectations, and timelines are provided in the Department's Graduate Student Handbook. A minimum grade point average of 3.0 must be maintained in all required courses. Students must earn a C or better in all required courses and a student can attempt (enroll) in an FIS graduate course a maximum of two times.

## Advisory Committees and Research

All students should identify a faculty mentor and research topic as soon as possible. The faculty mentor will work with the student to develop a Plan of Study, constitute an advisory committee, and formulate research plans. Details on the composition and establishment of an advisory committee, timelines, and expectations are provided in the Department's Graduate Student Handbook.

## COURSES

### **FIS 501. Foundations of Criminalistics. 3 Hours.**

This course reviews the core theories and fundamental principles of criminalistics. Particular attention will be dedicated to problems of interpreting physical evidence. Aspects on research, scientific method, and ethics will also be addressed.

### **FIS 502. Forensic Laboratory Management. 3 Hours.**

This course provides an overview of management issues in forensic science laboratories, including personnel and human resources, project management, leadership, organization, communication, strategy and budgeting.

### **FIS 505. Biological and Chemical Evidence. 3 Hours.**

PR: Acceptance to the Forensic Justice LL.M. The course will enable legal professionals to have a basic understanding of Chemical and Biological evidence in legal proceedings. It is a cross link between science and law and will close the existing gap between the two disciplines. The course will enable legal professionals to prepare for examination or cross examination of expert witnesses in legal proceedings.

### **FIS 514. Forensic Impression & Trace Evidence. 3 Hours.**

PR: Admission to the Master of Laws (LLM) in Forensic Justice and FIS 480 with a minimum grade of C-. Introduction to the analysis and interpretation of forensic impression and trace evidence. Critical analysis skills for data collection methods, data interpretation, reporting structures, current challenges, and anticipated advances. Topics include: fingerprints, firearms, footwear, microscopy, hair, glass, and bloodstain pattern analysis.

### **FIS 593A. Special Topics. 1-6 Hours.**

PR: Consent. Investigation of topics not covered in regularly scheduled courses.

### **FIS 602. Forensic Informatics. 3 Hours.**

This course will cover data management in forensic laboratories (procedural and scientific). Topics such as quality, legal environment, laboratory information systems, and forensic intelligence will be developed. This course includes a laboratory component.

### **FIS 604. Forensic Fingerprint Examination. 3 Hours.**

This course presents the fundamental and advanced aspects of fingerprint comparisons using ACE-V methodology. Specific topics such as Daubert requirements, friction ridge identification; poroscopy, palm prints will be covered. This course includes a laboratory component.

### **FIS 610. Firearms Examination. 3 Hours.**

This course presents the fundamentals and advanced aspects of firearms related to evidence. Topics include the design, mechanism, and manufacture of firearms as well as interior, exterior and terminal ballistics. This course includes laboratory component.

### **FIS 614. Trace Evidence Examination. 3 Hours.**

PR: CHEM 314 or FIS 314. This course will develop the theories of transfer (such as hairs, fibers, paints, gunshot residues and glass). Topics such as microscopy, spectroscopy, and chromatography will be applied. This course includes a laboratory component.

### **FIS 615. Questioned Document Examination. 3 Hours.**

This course will focus on handwriting comparisons, signatures, typewriting, and typescripts. Topics include erasures, additions and alterations, printed and photocopied documents and ink analysis. This course includes a laboratory component.

### **FIS 620. Forensic Casework Practicum. 3 Hours.**

Students will manage mock cases involving multiple types of evidence. They will collect, analyze and interpret the evidence. Written reports on the case will be submitted to evaluation during a mock trial.

**FIS 632. Advanced Forensic Biology. 3 Hours.**

This course will provide students with the knowledge and skills to perform forensic DNA analyses. Topics include analytical methods and procedures, result interpretation and evidence assessment. This course includes a laboratory component.

**FIS 660. Advanced Forensic Chemistry. 3 Hours.**

This course covers the chemical analysis of a wide variety of forensic evidence types. Topics include statistics, sampling, data quality, calibration, sample preparation, instrumentation; drug analysis, toxicology and explosives. This course includes a laboratory component.

**FIS 693A. Special Topics. 1-6 Hours.**

PR: Consent. Investigation of topics not covered in regularly scheduled courses.

**FIS 695. Independent Study. 1-6 Hours.**

Faculty Supervised study of topics not available through regular class offerings.

**FIS 696. Graduate Seminar. 1 Hour.**

PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

**FIS 697. Research. 1-15 Hours.**

PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

**FIS 702. Advanced Forensic Science. 3 Hours.**

This course develops competency in two main areas: 1) the ability to evaluate the admissibility of forensic science techniques in legal casework, and 2) the ability to identify gaps in present-day scientific principles, policies and technologies within the core sub-disciplines of forensic science, including, but not limited to, forensic chemistry, biology, trace evidence and pattern sciences.

**FIS 703. Research Design in Forensic Science. 3 Hours.**

PR: Admission to the FIS Doctor of Philosophy program. Research Design in Forensic Science is an applied research and statistics based course established specifically for students in the FIS Doctor of Philosophy program. The course will prepare students for data analysis related to sampling, regression, outlier detection, univariate significance testing, propagation of uncertainty, multivariate classification, classifier evaluation, Bayesian reasoning, data standardization and significance reporting.

**FIS 792A-B. Directed Study. 1-6 Hours.**

Directed study, reading, and/or research.

**FIS 796. Graduate Seminar. 1 Hour.**

PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

**FIS 797. Research. 1-15 Hours.**

PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation.

**FIS 799. Graduate Colloquium. 1-6 Hours.**

PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use of the University's facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department's 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.