

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 Interim Director of the Forensic Science Program

Sheryl Smith, Ph.D., Assistant Professor of Biology

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

John DiGregorio, Ph.D., M.D. Medical Director, NMS Labs

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

M. Fredric Rieders, '80, Ph.D., Forensic Toxicologist and CEO at NMS Labs

Allen Stewart, M.S., Deputy Sheriff, Montgomery County Sheriff's Department

Christian Westring, Ph.D., DNA Technical Leader at NMS Labs

Jill Yeakel, M.S.F.S, Program Director at The Center for Forensic Science Research and Education

Laboratory Instructors

Fran Diamond, Criminalistics Technical Leader at NMS Labs

Warren Korn, Laboratory Manager at The Center for Forensic Science Research and Education

Master's Degree

Master of Science in Forensic Science

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

FORENSIC SCIENCE at Arcadia University

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 15-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

FORENSIC SCIENCE at Arcadia University

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 in biology and chemistry taught by faculty in the Biology and Chemistry departments at Arcadia University. 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 take 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: In addition to the general admission requirements for graduate students, the following program-specific requirements must be met:

1. A Forensic Science application, including personal statements, must be completed online at 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

FORENSIC SCIENCE at Arcadia University

- 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.

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 February 1. Those received after February 1 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

FORENSIC SCIENCE at Arcadia University

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: 2012-2013 \$27,950

Fees:

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

Additional Expenses:

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

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

(70-75 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.

First-Year Coursework

Fall Semester (14-17 credits)

FS 518	Crime Scene Investigation and Reconstruction (2 credits)
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FORENSIC SCIENCE at Arcadia University

FS 519	Forensic Pattern Analysis (2 credits)
FS 570	Criminal Law and Ethics (3 credits)
FS 561a	Forensic Science Symposium (1 credit)
CH 518	Instrumental Analysis in Forensic Toxicology & Chemistry (3 credits)
3 credit Elective	BI 440 Biochemistry as needed OR CH 407 Polymers and Biopolymers OR BI 438 Bioinformatics
MA 141	Statistics (3 credits) as needed

Spring Semester (16 credits)

FS 515	Research Methods in Forensic Science (1 credit)
FS 504	General Principles of Pharmacology (3 credits)
FS 530	Forensic Serology (3 credits)
FS 535	Forensic Chemistry (3 credits)
3 credit Elective	BI 433 Molecular Biology as needed OR FS 555 Biotechnology
3 credit Elective	BI 404 Genetics as needed OR BI 421 Human Genetics OR CH 203 Equilibrium and Analysis

Summer Coursework (4 credits)

FS 596	Research Project in Forensic Science (4 credits)
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Second-Year Coursework

Fall Semester (20 credits)

FS 525	Forensic Toxicology I (3 credits)
FS 526	Forensic Toxicology II (3 credits)
FS 531	Forensic DNA Analysis (3 credits)
FS 512	Forensic Trace Analysis (3 credits)
FS 536	Advanced Forensic Chemistry (3 credits)

FS 533	Quality Management in Forensic Science (1 credit)
FS 596	Research Project in Forensic Science (4 credits)

Spring Semester (17 credits)

FS 586	Graduate Practicum in Forensic Biology (4 credits)
FS 587	Graduate Practicum in Forensic Chemistry (4 credits)
FS 588	Graduate Practicum in Forensic Toxicology (4 credits)
or FS 583	Graduate Internship in Forensic Science [external] (6 – 12 credits)
FS 596	Research Project in Forensic Science (4 credits)
FS 520	Moot Court (1 credit)

Forensic Science Courses (FS)

504

General Principles of Pharmacology

This lecture based course provides a general introduction to pharmacology as applied to forensic issues, divided into two sections: 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 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 various drug classes.

512

Forensic Trace Evidence Analysis

This lecture/laboratory based course is designed to provide the student with a foundation for the analysis of trace evidence in criminal cases. This course will include the forensic analysis of hairs, fibers, glass, paint, and soil, and the use of microscopy and other

FORENSIC SCIENCE at Arcadia University

analyses in the identification and comparison of trace evidence. Lectures will be supplemented with laboratory exercises.

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 then 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 they learned and developed in the previous weeks of the class to prepare a literature survey or design an experiment on a particular research topic.

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. Dr. Edmond Locard stated that when you enter a crime scene you bring things in with you and when you leave you take things away. This is known as the Locard exchange principle. This course will discuss how to document and collect physical evidence from various types of crime scenes without contaminating the scene. Students will be taught proper techniques for photographing the crime scene as well as for the collection of evidence, latent fingerprinting, shoe/tire impressions trace evidence and DNA collection. Students will be able to reconstruct the 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

The culmination of laboratory analysis of evidential material in criminalistics and other forensic disciplines is its presentation in court, where the analyst has the opportunity to explain the testing they performed, interpret their results and defend their validity and reliability. This course will prepare 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 I

This lecture/laboratory based course presents the major fields which comprise general toxicology: workplace drug testing; performance enhancement; performance impairment, e.g., DUI; "date rape"; and postmortem toxicology. It covers methods, procedures, education training and certification requirements, work performance and court testimony as well as the nature and content of applicable regulations and guidelines. Lectures, interactive sessions and demonstrations are used to demonstrate techniques and their application.

526

Forensic Toxicology II

This lecture/laboratory based course is built on hands-on, systematic methods and procedures for detection/exclusion of case-pertinent foreign chemicals in autopsy specimens at concentrations that are relevant to general and specific case issues. Lectures and reports by students will parallel, challenge and amplify the progress of the systematic laboratory work. Instruction will cover: the effects of pre-analytical factors on choices of analytical methods and procedures: principles, applicability and limitations of methods and factors in arriving (or not) at "reasonable forensic toxicological certainty," opinions regarding identities, quantities and case-issue questions in general (hypothetical) and specific (actual) cases.

FORENSIC SCIENCE at Arcadia University

530

Forensic Serology

This lecture/laboratory based course covers the biochemical basis of forensic testing procedures and includes classical serological and electrophoretic techniques. It examines fundamental genetic and statistical principles and their application to forensic biology. Court testimony in the area of forensic biology also is addressed. Practical and laboratory exercises demonstrate the techniques and their applications.

531

Forensic DNA Analysis

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. Testimony in admissibility and Daubert hearings are addressed. Practical demonstrations illustrate the techniques and their applications.

533

Quality Management in Forensic Science

This lecture based course will discuss 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 a foundation in 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.

Prerequisites: Students should have completed General Chemistry, Organic Chemistry and Instrumental Analysis courses.

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.

Prerequisites: FS 535

555

Biotechnology

This course includes lectures and limited laboratory demonstrations in DNA technology. The topic areas include: classical examples of biotechnology, automated DNA quantitation, PCR and RT PCR analysis, slab-gel and capillary electrophoresis, detection methods (fluorescent dyes), genetic analyzers, STR, Y-STR, SNP (nuclear DNA) genotyping, mtDNA sequencing, DNA database analysis, and applications of biotechnology to various fields with an emphasis on their use in the forensic sciences.

561a

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.

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, Federal (and state) Rules of Evidence and case law, students will develop a practical understanding of modern criminal jurisprudence. Special emphasis and

FORENSIC SCIENCE at Arcadia University

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 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) are used to process casework samples, perform 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 drugs including the weighing and sampling of drug evidence as well as presumptive and confirmatory drug identification are used to process casework samples, perform 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, perform 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 at Arcadia University

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.

598

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.

433

Molecular Biology

Study of the molecular structure and functioning of the gene. Includes in-depth investigation of current areas of molecular research in biological fields such as medicine, development, population biology and evolution. Laboratory involves techniques of molecular biology including DNA purification and analysis, cloning and the polymerase chain reaction. Three class hours and three laboratory hours weekly.

Prerequisites: BI101, 102, 204, CH101, 102; or permission of the instructor.

438

Bioinformatics

This is an interdisciplinary course in Bioinformatics offered by the Departments of Computer Science/Math and Biology. The focus of this course is on genomics including concepts in gene structure and function. Students will gain knowledge in the utilization

of genome databases/browsers and bioinformatic tools employed for gene model prediction (annotation), and use those tools to annotate sequences from various eukaryotic genomes. Students will be given instruction on algorithm design based on pattern-matching and will gain hands-on experience in the use of algorithms to help predict gene models and to test those models for accuracy within the context of the programming language Perl. Collaboration between students trained in different disciplines (math, computer science, biology) will be encouraged in order to address issues in genomics and to reflect the interdisciplinary nature of the field.

Prerequisites: BI101/BI102; CS101/CS102.

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.

404

Instrumental Methods of Analysis I

Study of the theory and practice of instrumental analysis. Includes electrochemical, spectrophotometric, chromatographic, mass spectral and nuclear magnetic resonance methods of analysis as background for the separation, identification and analysis of chemical substances. Three class hours and four laboratory hours weekly.

Prerequisites: CH 203, CH 301, CH 302 highly recommended.

407

Polymers and Biopolymers

A coherent introduction to modern polymer chemistry designed for students interested in

FORENSIC SCIENCE at Arcadia University

chemistry, physics, engineering and biochemistry. Specifically, this course aims to broaden the perspective of students in the different technical areas to the point where they can appreciate the scope and importance of polymers, biopolymers and contemporary polymer technology. Emphasis is placed on the nature and synthesis of polymers; biological polymers and their reactions; thermodynamics and kinetics of polymerization; and physical characterization, fabrication, testing and uses of both natural and synthetic polymeric materials. Four class hours weekly.

Prerequisites: CH 201, CH 202.

Math Courses (MA)

141

Elementary Statistics

Introduction to basic statistical techniques and their applications to the sciences, social sciences and business administration.

Includes the collection and presentation of data, measures of central tendency and variability, probability, sampling distributions, confidence intervals, hypothesis testing, correlation and regression, and introduction to analysis of variance. Students learn to use common computer packages in statistics.

Prerequisite: MA 100 or placement exam.