

Forensic Chemistry (P.S.M.)

About The Program:

The primary objective of the Forensic Chemistry P.S.M. is for students to develop a portfolio of knowledge and experiences through a strong background in analytical methodologies that will enable them to tackle problems in forensic chemistry, environmental chemistry, and other areas of chemistry. Other objectives include providing:

- a theoretical understanding of major concepts in Forensic Chemistry,
- a range of practical skills in Forensic Chemistry, and
- knowledge and skills applicable to academia, industry, and government.

The goal of the program is the successful placement of graduates into relevant jobs and to enable career advancement for chemists already employed.

The program includes core requirements in current topics in forensic chemistry; applied biopharmaceutics; data analysis; law, ethics, and policy; and toxicology. Attendance is required at annual symposia where leaders in the field of forensic science present on current topics and developments in the field of forensics and forensic chemistry. Many courses in the program are conducted as hands-on training in a modular, forensic chemistry laboratory. An independent project is assigned that will generate knowledge with the goal of developing advanced forensic skills, enabling program graduates to effectively work in and be leaders of the discipline of forensic chemistry. All students are required to complete a forensic chemistry internship.

Career Options: Official job placement is not offered, but prospects are good. The program is designed to help recent graduates obtain relevant employment as well as accelerate career advancement and/or allow career shift of currently employed professionals. Graduates of P.S.M. programs are in high demand, which underscores the P.S.M. as an attractive career path for those who do not wish to become academic researchers or pursue a doctorate degree.

Prerequisites for Admission: Background in Chemistry, Biochemistry, or a related field.

Requirements of Programs:

- **Total Credit Hours:** 32
- **Culminating Events:**

Capstone Project:

The internship involves a significant project completed in an approved forensic laboratory. As part of the culminating event of the Forensic Chemistry P.S.M., students will present project results at the final Seminar in Forensic Chemistry ([CHEM 9800](#)).

Core Courses

Data Analysis and Evidence – Forensic chemistry involves the forensic application of analytical chemistry theories, techniques and instrumentation to the analysis of controlled substances, fire debris evidence, explosives, and other trace evidence/chemical unknown materials. This course will cover those concepts relevant to the field of forensic chemistry including chain of custody, the theory and practical applications of the uncertainty of measurement and propagation of error. Students will also learn the classifications and unique physical and chemical characteristics of forensic chemistry evidence and investigate the physical and chemical characteristics of this evidence through the use of chemical, microscopic and instrumental techniques. The chemical characteristics of explosive materials as well as the analytical techniques used to analyze these samples will also be covered.

Investigative Chemistry

Leadership, Law and Ethics in Forensic Science – This course will provide the students with an introduction to the American criminal justice system, explain the role of the forensic scientist in the criminal justice system, and discuss theoretical and practical applications of forensic science laboratory management. Students will learn successful leadership styles and discuss topics relating to ethical behavior, quality measures including quality control and quality assurance, communication and privacy issues relating to forensic science as well as resource management. 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.

Advanced Forensic Chemistry – Forensic chemistry involves the forensic application of analytical chemistry theories, techniques and instrumentation to the analysis of controlled substances, fire debris evidence, explosives, and other trace evidence/chemical unknown materials. This course will cover those concepts relevant to the field of forensic chemistry including chain of custody, the theory and practical applications of the uncertainty of measurement and propagation of error. Students will also learn the classifications and unique physical and chemical characteristics of forensic chemistry evidence and investigate the physical and chemical characteristics of this evidence through the use of chemical, microscopic and instrumental techniques. The chemical characteristics of explosive materials as well as the analytical techniques used to analyze these samples will also be covered.

Special Topics in Analytical Chemistry (two terms/two topics) – Advanced lecture course, subject matter varies from semester to semester.

Analytical Separations – Theory and practice of modern separation methods with emphasis on chromatographic and electrophoretic techniques.

Seminar in Forensic Chemistry (two terms) – 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.

Master's Research Projects – Short-term, limited research project or laboratory project in the field. This course is not the capstone project course, nor can it be used for thesis based research. The course is

for master's students only, including PSM, MA or MS. This class will not confer full-time program status unless nine credits are taken.

Applied Biopharmaceutics – Presents the interrelationships of the physicochemical properties of the drug and the dosage form, to the route of administration and to the rate and extent of systemic absorption. Drug absorption mechanisms, physiological and GIT constraints on dosage form transit and bioavailability, effect of formulation parameters, dissolution methodologies, in-vitro/in-vivo correlation of drug product performance as well as SUPAC, ICH and FDA guidelines on development and approval process will be covered. Formulation strategies for optimum therapeutic outcome via application of pharmaceutical sciences to the design of drug delivery systems is provided.

Introduction to Toxicology – Toxicology is a multi-disciplinary science focused on the adverse effects of chemicals, drugs and environmental agents. In the first part of this course the basic principles of toxicology will be covered, including dose response relationships, mechanisms of toxicity and exposure. In the second part, target organs of toxicity will be presented with an overview of anatomy and physiology of different target organs (e.g. liver, kidney), as well as organ-specific response to toxic insult. In the final segment of the course, students will be exposed to a variety of areas of applied toxicology, including risk assessment, clinical & forensic toxicology, chemical carcinogenesis, reproductive toxicology and the role of toxicology in drug development.

Courses:

Click [HERE](#) for more information on the courses below.

- Advanced Inorganic Chemistry I
- Organometallic Chemistry
- Data Analysis and Evidence
- Advanced Instrumental Methods
- Drug Analysis
- Investigative Chemistry
- Physical Methods in Organic Chemistry
- Organic Reaction Mechanisms
- Organic Syntheses
- Quantum Chemistry
- Statistical Thermodynamics
- Nanomaterials Chemistry and Physics
- Chemical Kinetics
- Cellular/Molecular Neuroscience
- Biochemistry I
- Chemical Biology
- Structural Bioinformatics II
- Advanced Polymer Structure and Properties
- Teaching of Chemistry
- Responsibility and Ethics in Chemical Research
- Special Topics in Inorganic Chemistry
- Leadership, Law and Ethics in Forensic Science
- Advanced Forensic Chemistry
- Special Topics in Organic Chemistry
- The Chemistry of Natural Products
- Heterocyclic Chemistry
- Special Topics in Organic Chemistry
- Special Topics in Physical Chemistry
- Molecular Spectroscopy
- Computational Chemistry
- Modern Meth in Exp Chem
- Special Topics in Analytical Chemistry

- Special Topics in Biochemistry
 - Bioinorganic Chemistry
 - High Polymer Chemistry
 - Analytical Separations
 - Teaching in Higher Ed: Phys Sci
 - Seminar in Physical Chemistry
- Seminar in Forensic Chemistry
 - Seminar
 - Master's Research Projects
 - Preliminary Examination Preparation
 - Capstone Project
 - Master's Thesis Research