

# Forensic Chemistry, P.S.M.

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COLLEGE OF SCIENCE AND TECHNOLOGY (<http://cst.temple.edu>)

## 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.

**Time Limit for Degree Completion:** 5 years

**Campus Location:** Main, Ft. Washington, and the Center for Forensic Science Education, Willow Grove, PA

**Full-Time/Part-Time Status:** The degree program can be completed on a full- or part-time basis. Most of the classes are offered in the evenings or on weekends to enable full-time working professionals to be enrolled in the program. International students are required to register as full-time students.

**Interdisciplinary Study:** The two-year program consists of courses in forensic and analytical chemistry as well as data analysis, law, and ethics. Student research projects are developed with the cooperation of Temple faculty and members of our External Advisory Board under the guidance of the P.S.M. in Forensic Chemistry Steering Committee.

**Accreditation:** Temple University is fully accredited by the Middle States Commission on Higher Education.

**Job Prospects:** 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.

**Non-Matriculated Student Policy:** Non-matriculated students may enroll in a total of three courses (9 credits) with permission of the instructor and the Chemistry Department.

**Financing Opportunities:** Financial assistance in the form of Research or Teaching Assistantships is not offered at this time.

## Admission Requirements and Deadlines

### Application Deadline:

*Fall:* June 15; February 15 international

*Spring:* September 15

Applications are processed on a continual basis. Ordinarily, the applicant is informed of an admissions decision within three weeks of receipt of all supporting application documents. Late applications may be considered for admission.

*APPLY ONLINE to this graduate program.*

### Letters of Reference:

*Number Required:* 3

*From Whom:* Letters should be obtained from college/university faculty or faculty who are familiar with the applicant's competency. If the applicant has an established career in a related field, the applicant's immediate supervisor should provide one of the letters.

**Coursework Required for Admission Consideration:** An undergraduate degree in Chemistry or a closely related field is required. Candidates not holding a degree in Chemistry should contact the Program Director for guidance.

**Bachelor's Degree in Discipline/Related Discipline:** A baccalaureate degree in Chemistry or a closely related field is required.

**Statement of Goals:** Approximately 500 to 1,000 words specify your interest in the Forensic Chemistry P.S.M. program, your career goals, and your academic and professional achievements.

**Standardized Test Scores:**

GRE: Required. A combined minimum percentile of 100% on the quantitative and verbal reasoning sections is expected. A GRE waiver will be considered for those applicants with an exceptional undergraduate GPA.

TOEFL: 85 iBT or 575 PBT minimum

**Transfer Credit:** Graduate credits from an accredited institution may be transferred into the Forensic Chemistry P.S.M. program. The credits must be equivalent to coursework offered by the Chemistry Department at Temple University. A grade of "B" or better must have been earned for the credits to transfer. The P.S.M. in Forensic Chemistry Steering Committee makes recommendations to the Department Chair for transferring credit on an individual basis. The maximum number of credits a student may transfer is 6.

## Program Requirements

**General Program Requirements:**

*Number of Credits Required Beyond the Baccalaureate:* 32

*Required Courses:*

CHEM 5102	Data Analysis and Evidence	2
CHEM 5108	Investigative Chemistry	4
CHEM 8001	Leadership, Law and Ethics in Forensic Science	3
CHEM 8107	Advanced Forensic Chemistry	3
CHEM 8310	Special Topics in Analytical Chemistry (two terms/two topics)	6
CHEM 8601	Analytical Separations	3
CHEM 9800	Seminar in Forensic Chemistry (two terms)	2
CHEM 9991	Master's Research Projects	3
PS 8007	Applied Biopharmaceutics	3
PS 8111	Introduction to Toxicology	3
Total Credit Hours		32

**Additional Requirements:**

All graduate-level courses must be passed with a "B-" or better.

Attendance at scheduled departmental colloquia is required.

**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).

## Contacts

**Program Web Address:**

<http://cst.temple.edu/forensicchemistry>

**Department Information:**

Dept. of Chemistry  
130 Beury Hall  
1901 N. 13th Street  
Philadelphia, PA 19122-6078  
garry.cole@temple.edu  
215-204-2552

**Mailing Address for Application Materials:**

CST Graduate Services  
340 Carnell Hall (041-03)

1803 N. Broad Street  
Philadelphia, PA 19122-6104  
GRADCST@temple.edu

## Department Contacts:

*Program Director:*

Susan Jansen-Varnum, Ph.D.  
susan.varnum@temple.edu

## Courses

### **CHEM 5001. Advanced Inorganic Chemistry I. 3 Credit Hours.**

Group theory and its applications to chemical systems. Molecular orbital theory and spectroscopy. Descriptive chemistry of transition metal and organometallic compounds.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5102. Data Analysis and Evidence. 2 Credit Hours.**

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.

**Department Restrictions:** Must be enrolled in one of the following Departments: CST:Chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5103. Advanced Instrumental Methods. 3 Credit Hours.**

Recent developments in electrochemical and electroanalytical techniques, including voltammetric and potentiostatic procedures and the basics of instrumental design. Applications to organic chemistry, trace analysis, chromatographic detectors, and electrokinetics discussed.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5107. Drug Analysis. 4 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5108. Investigative Chemistry. 4 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5201. Physical Methods in Organic Chemistry. 3 Credit Hours.**

Principles and applications of important physical and spectroscopic methods; IR, UV, NMR, MS, ESR, ORD, and CD in structure determination.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

### **CHEM 5202. Organic Reaction Mechanisms. 3 Credit Hours.**

This course is an introductory overview of organic structure and most common organic reaction mechanisms.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5205. Organic Syntheses. 3 Credit Hours.**

Scope and limitations of modern synthetic methods, including silicon reagents, organometallic and radical chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5301. Quantum Chemistry. 3 Credit Hours.**

Introduction to quantum mechanics and its application to chemical systems.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5302. Statistical Thermodynamics. 3 Credit Hours.**

The basic concept of statistical mechanical ensembles and their application.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5304. Nanomaterials Chemistry and Physics. 3 Credit Hours.**

This course will cover the key chemical/physical properties of nanomaterials as well as nanomaterials characterization and synthesis for graduate students. The goal of this class is to help students get familiar to the important concepts associated with the confined dimensionality in nanomaterials and apply these concepts to understand unique electronic/optical properties of nanomaterials and the thermodynamics/kinetics of forming nanomaterials. The course is organized with four modules: 1) Introduction to Nanoscience - Physical and Chemical Concepts, 2) Characterization of Materials at Nanoscale, 3) Fabrication of Nanostructures and Nanomaterials, and 4) Case Study of Specific Nanomaterials.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5305. Chemical Kinetics. 3 Credit Hours.**

A study of the dynamics of chemical reactions.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5358. Cellular/Molecular Neuroscience. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5401. Biochemistry I. 3 Credit Hours.**

A survey of the biological macromolecules (proteins, nucleic acids, carbohydrates, and lipids) correlating their structures with their chemical properties and biological functions.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5412. Structural Bioinformatics II. 3 Credit Hours.**

This course provides an introduction to structural bioinformatics, with focus on understanding three dimensional structures of biological macromolecules. Topics covered include: an overview of macromolecular structure determination, introduction to molecular modeling theory and the application of computational modelling in structure based drug design. The course also offers practical training on the application of molecular modelling methods for understanding structural biology and in rational drug discovery.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

BIOL 5411|Minimum Grade of B-|May not be taken concurrently.

**CHEM 5505. Advanced Polymer Structure and Properties. 3 Credit Hours.**

Polymers are ubiquitous in many new (scaffolds for tissue engineering, hip replacements) and old (textiles, engineering resins, flocculants) applications, and are often used in composites with inorganic materials. In order to better understand the use and novel developments of polymers, this course will provide the fundamentals of synthesis, polymer structure/property relationships, and characterization methods.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 5701. Teaching of Chemistry. 0 to 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8000. Special Topics in Inorganic Chemistry. 3 Credit Hours.**

A survey of a topic chosen by the instructor. Topics could include bioinorganic chemistry, organometallic chemistry, solid state and materials chemistry, and catalysis.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8001. Leadership, Law and Ethics in Forensic Science. 3 Credit Hours.**

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.

**Department Restrictions:** Must be enrolled in one of the following Departments: CST:Chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8107. Advanced Forensic Chemistry. 3 Credit Hours.**

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.

**Department Restrictions:** Must be enrolled in one of the following Departments: CST:Chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

CHEM 5102|Minimum Grade of B+|May not be taken concurrently.

**CHEM 8200. Special Topics in Organic Chemistry. 3 Credit Hours.**

Advanced lecture course; subject matter varies from semester to semester.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8201. The Chemistry of Natural Products. 3 Credit Hours.**

Biogenetic classification, classical and modern synthetic approaches to polyketides, steroids, terpenes, and alkaloids.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8202. Organometallic Chemistry. 3 Credit Hours.**

A survey of the chemistry of organic compounds of the main and transition elements, with emphasis on their reactions and applications.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8205. Heterocyclic Chemistry. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8210. Special Topics in Organic Chemistry. 3 Credit Hours.**

Advanced lecture course; subject matter varies from semester to semester.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8300. Special Topics in Physical Chemistry. 3 Credit Hours.**

Advanced lecture course, subject matter varies from semester to semester.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8301. Molecular Spectroscopy. 3 Credit Hours.**

Absorption, emission and scattering of light by molecular system. Discussion of basic principles and experimental techniques.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8302. Computational Chemistry. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8303. Modern Meth in Exp Chem. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8310. Special Topics in Analytical Chemistry. 3 Credit Hours.**

Advanced lecture course, subject matter varies from semester to semester.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8400. Special Topics in Biochemistry. 3 Credit Hours.**

Advanced lecture course; subject matter varies from semester to semester.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 8401. Bioinorganic Chemistry. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8501. High Polymer Chemistry. 3 Credit Hours.**

Introduction to the important theoretical and practical aspects of high polymer chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8601. Analytical Separations. 3 Credit Hours.**

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

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**CHEM 8985. Teaching in Higher Ed:Phys Sci. 1 to 3 Credit Hour.**

Teaching in Higher Education: Physical Sciences. This course focuses on learning theory and the best teaching practices, with the aim of preparing students for effective higher education teaching.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9300. Seminar in Physical Chemistry. 1 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9800. Seminar in Forensic Chemistry. 1 Credit Hour.**

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.

**Department Restrictions:** Must be enrolled in one of the following Departments: CST:Chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9900. Seminar. 2 Credit Hours.**

Formal presentation of research topics by graduate students. Regular attendance required of all graduate students.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9991. Master's Research Projects. 1 to 6 Credit Hour.**

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.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9994. Preliminary Examination Preparation. 1 to 6 Credit Hour.**

This course is required for students who are preparing for the preliminary or candidacy examination. Students should enroll after coursework is completed or when preparing for the candidacy exam until the time that the preliminary or candidacy examination is completed. This course will confer full-time status at the minimum credit hour registration limit of one credit. All students must complete a minimum of one credit of this course. Students must complete a total of 6 credit hours of 9994, 9998 and 9999.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9995. Capstone Project. 1 to 6 Credit Hour.**

Capstone project for master's students including students in PSM, MA or MS. This class will provide full-time status. Students in PSM programs need to register for at least one credit of this course to fulfill program requirements. Additional credits may be required for specific programs. This course will confer full-time status at the minimum credit hour registration limit of one credit.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Degree Restrictions:** Must be enrolled in one of the following Degrees: Master of Arts, Master of Science, Prof Science Masters.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9996. Master's Thesis Research. 1 to 6 Credit Hour.**

Course for master's thesis research. Only intended for students in thesis bearing master's programs. A minimum of one credit is required. This course will confer full-time status at the minimum credit hour registration limit of one credit.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9998. Pre-Dissertation Research / Elevation to Candidacy. 1 to 6 Credit Hour.**

This course is intended for students who are performing research prior to candidacy. Students can register for this course after required courses are completed. This course will confer full-time status at the minimum credit hour registration limit of one credit. Students must be registered for this course during the semester that they are to be elevated to candidacy examination. Students must complete a total of 6 credit hours of 9994, 9998 and 9999.

**Department Restrictions:** Must be enrolled in one of the following Departments: CST:Chemistry.

**Field of Study Restrictions:** Must be enrolled in one of the following Fields of study: Chemistry.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Science & Technology.

**Repeatability:** This course may be repeated for additional credit.

**CHEM 9999. Dissertation Research. 1 to 6 Credit Hour.**

The course is for Ph.D. students who have been elevated to candidacy. During the course of their candidacy students must complete a minimum of two credits of dissertation research. This course will confer full-time status at the minimum credit hour registration limit of one credit. Students must complete a total of 6 credit hours of 9994, 9998 and 9999.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Student Attribute Restrictions:** Must be enrolled in one of the following Student Attributes: Dissertation Writing Student.

**Repeatability:** This course may be repeated for additional credit.