

DEPARTMENT OF CHEMISTRY AND FORENSIC SCIENCE

Programs in the Department of Chemistry and Forensic Science

- Degree information for the Associate of Science in Core Curriculum with a Chemistry Transfer Pathway (<http://catalog.asurams.edu/undergraduate/degree-programs>)
- Degree information for the Associate of Science in Core Curriculum with an Engineering Transfer Pathway (<http://catalog.asurams.edu/undergraduate/degree-programs>)

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- Chemistry Minor (<http://catalog.asurams.edu/undergraduate/arts-sciences/chemistry-forensic-science/chemistry-minor>)
- Chemistry, Bachelor of Science (<http://catalog.asurams.edu/undergraduate/arts-sciences/chemistry-forensic-science/chemistry-bs>)

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- Forensic Science Minor (<http://catalog.asurams.edu/undergraduate/arts-sciences/chemistry-forensic-science/forensic-science-minor>)

- Forensic Science, Bachelor of Science (<http://catalog.asurams.edu/undergraduate/arts-sciences/chemistry-forensic-science/forensic-science-bs>)

CHEM 1101K. Intro to Chemistry Lab. (4 Credits)

This course is designed to prepare students with little, if any, chemistry or math backgrounds for the General Chemistry I and General Chemistry II sequence (CHEM 1211/1212). Topics to be studied include matter, measurement, units and unit conversions, graphing, atomic structure, nomenclature, bonding, the periodic table, chemical equations, chemical reactions, stoichiometry. Exercises designed to improve science study skills will be included. The emphasis of the lecture will be on problem solving strategies, skill building and real life applications.

CHEM 1151K. Survey of Chemistry I. (4 Credits)

This course is the first part of a two-semester sequence covering elementary principles of general and organic chemistry and biochemistry designed for allied health profession majors. Topics to be covered include elements and compounds, chemical equations, nomenclature, and molecular geometry. Laboratory exercises will supplement the lecture material. 4 credits. Prerequisite(s): Permission of instructor. Offered: Fall.

CHEM 1152K. Survey of Chemistry II. (4 Credits)

This course is the second in a two-semester sequence covering elementary principles of general and organic chemistry and biochemistry designed for allied health profession majors. Topics to be covered include gases, solutions, acids/bases, basic functional groups and reactions of organic molecules. Additionally, carbohydrates, lipids, proteins, and enzymes are introduced. Laboratory exercises will supplement lecture material. Prerequisite(s): CHEM 1151K US.

CHEM 1211K. Principles of Chemistry I. (4 Credits)

This course is the first part of a two-semester general chemistry curriculum. It is primarily designed for students with career interests in chemistry, biology, medicine, pharmacy, and other STEM (Science, Technology, Engineering, and Mathematics) fields. This course covers basic chemistry: the fundamental concepts concerning the atomic and molecular structures and properties of matter, states of matter, stoichiometry, chemical equations and various types of equilibrium in solution including electrochemistry. Laboratory exercises supplement lectures. 4 credits. Prerequisite(s): Permission of instructor. Offered: Fall, Spring, Summer.

CHEM 1212K. Principles of Chemistry II. (4 Credits)

This course is the second part of a two-semester general chemistry sequence. It is primarily designed for students with career interests in chemistry, biology, medicine, pharmacy and other science fields. It will mainly deal with states of matter, solutions, chemical reactions, chemical kinetics, equilibrium, acids/bases and pH with corresponding laboratory activities. The laboratory activity is extremely important to enhance understanding of the materials learned from lecture. 4 credits. Prerequisite(s): CHEM 1211K. Offered: Fall, Spring, Summer.

CHEM 2250. Responsible conduct of Research. (2 Credits)

This course is designed to provide appropriate training and oversight in the responsible and ethical conduct of research to students engaging in undergraduate research. Ethical and policy issues relevant to the responsible conduct of research will be discussed. Analysis and application of topics including conflict of interest, responsible authorship, policies for handling misconduct, data management, data sharing, and policies involving use of human and animal subjects.

CHEM 2301K. Organic Chemistry I. (4 Credits)

This is the first course of a two-semester sequence in modern organic chemistry. In this course the student will be introduced to concepts of reactivity from structural, mechanistic, and synthetic perspectives. We will explore details of aliphatic substitution, addition, elimination, and free-radical reaction types. The systematic naming of compounds, stereochemistry, conformation, and isomerism will also be covered extensively. Laboratory exercises supplement lectures. 4 credits
Prerequisite(s): CHEM 1212K US Offered: Fall, Spring, Summer.

CHEM 2302K. Organic Chemistry II. (4 Credits)

This course is a continuation sequence of CHEM 2301K and it includes a systematic description of the chemistry of functional groups such as alkenes, alkynes, alcohols, aromatic and carbonyl compounds. Spectroscopic methods of analysis, including infrared, ultraviolet/visible, mass spectroscopy and nuclear magnetic resonance spectroscopy are also included. Laboratory exercises supplement lectures. Prerequisite(s): CHEM 2301K Offered: Fall, Spring, Summer.

CHEM 2310. Scientific Mathematics. (2 Credits)

This course is designed to acquaint students with mathematical concepts used in scientific studies including those required for the laboratory and publications. This course therefore will include mathematics review as well as applications into scientific problems.

CHEM 2320. Laboratory Research Techniques. (3 Credits)

This course provides students with hands-on training on cutting-edge techniques, technologies, and equipment that are essential for conducting general and biomedical research. It contains four modules: Basic Lab Skills, DNA, Protein Techniques and Instrumental Methods in Chemistry. Students learn experimental techniques including reagent preparation, pipetting, DNA isolation, protein purification, Agarose Gel Electrophoresis, SDS Gel Electrophoresis, conventional PCR, cell culture, Western blot, ELISA, chromatography (GC-MS) and spectroscopy (FT-IR, NMR, UV-Vis). 3 credits. Prerequisite(s): Permission of instructor. Offered: Spring, Fall .

CHEM 2351K. Quantitative Analysis I. (4 Credits)

This course involves the study of theory and practice of gravimetric and titrimetric analysis with emphasis on solution equilibria as applied to acid-base, precipitation, and complexometric methods. The laboratory work will cover basic laboratory techniques, solution preparation, titrations, equilibrium constants, statistics, gravimetric analysis, and EDTA experiments. 4 credits. Prerequisite(s): CHEM 1212K Offered: Fall.

CHEM 2352K. Quantitative Analysis II. (4 Credits)

This course is a continuation of the study of analytical methods including oxidation-reduction, titration and an introduction to instrumental methods-potentiometric, spectrophotometric, and chromatographic. The laboratory work will cover spectroscopic methods, electrochemical methods, and chromatographic methods. Modern analytical instruments such as UV-Vis and Infrared (IR) spectrophotometers, Gas Chromatograph (GC), High Performance Liquid Chromatograph (HPLC), Atomic Absorption Spectrophotometer (AAS), and electrochemical instruments will be introduced and data from each of the methods will be analyzed. Prerequisite(s): CHEM 2351K US D.

CHEM 2415. Scientific Writing. (3 Credits)

This course is designed to acquaint learners with discovery inquiry processes and to provide competencies for writing scientific papers. Prerequisite(s): Permission of instructor.

CHEM 3151K. Quantitative Analysis I. (4 Credits)

This course involves the study of theory and practice of gravimetric and titrimetric analysis with emphasis on solution equilibria as applied to acid-base, precipitation, and complexometric methods. The laboratory work will cover basic laboratory techniques, solution preparation, titrations, equilibrium constants, statistics, gravimetric analysis, and EDTA experiments. 4 credits. Prerequisite(s): CHEM 1212K Offered: Fall.

CHEM 3152K. Quantitative Analysis II. (4 Credits)

This course is a continuation of the study of analytical methods including oxidation-reduction, titration and an introduction to instrumental methods-potentiometric, spectrophotometric, and chromatographic. The laboratory work will cover spectroscopic methods, electrochemical methods, and chromatographic methods. Modern analytical instruments such as UV-Vis and Infrared (IR) spectrophotometers, Gas Chromatograph (GC), High Performance Liquid Chromatograph (HPLC), Atomic Absorption Spectrophotometer (AAS), and electrochemical instruments will be introduced and data from each of the methods will be analyzed. Prerequisite(s): CHEM 2351K US D.

CHEM 3221K. Physical Chemistry I. (4 Credits)

This course is a study of the fundamental laws governing matter in the gaseous state, the laws of thermodynamics (0th-3rd laws), and chemical kinetics. It will also include the applications of principles, such as solid and liquid states, solutions, phase equilibria, and electrochemistry. In this class, students will learn what constitutes the driving force for physical and chemical changes, and how it changes with temperature and pressure. The laboratory work is designed to provide students with first-hand, practical experience in making and interpreting scientific observations. Prerequisite(s): PHYS 2222K.

CHEM 3222K. Physical Chemistry II. (4 Credits)

This course introduces the theory and application of quantum theory and bonding; magnetic and spectral properties of atoms and molecules; and statistical mechanics. Prerequisite(s): MATH 2212 US C or taken concurrently. PHYS 2222K US C and CHEM 2301K US C or CHEM 2351 US C. Offered: Fall.

CHEM 3231K. Intermediate Inorganic Chemistry I. (4 Credits)

The course will focus on acquiring different conceptual tools that are necessary to understand structure-function correlations in inorganic systems. The tools include chemical forces, symmetry and point groups, qualitative molecular orbital theory and coordination chemistry. This course will cover 12 chapters in the textbook, ranging from the first principles, transition elements to bioinorganic chemistry. The laboratory work will supplement lecture material. 4 credits. Prerequisite(s): CHEM 3222K Offered: Spring .

CHEM 3232. Intermediate Inorganic Chemistry II. (3 Credits)

This course involves the study of the transition element including bonding of coordination compounds, stereo-chemistry and reactions, and an introduction to organ metallic chemistry and catalysis.

CHEM 3250K. Biochemistry I. (4 Credits)

In this course, the student examines the structure and function and of carbohydrates, amino acids and proteins, lipids, and nucleic acids. The laboratory work is designed to supplement lectures. 4 credits. Prerequisite(s): CHEM 2302K Offered: Spring, Fall, Summer.

CHEM 3252. Biochemistry II. (3 Credits)

Designed to present details of biochemical processes normally covered in the second semester of a two semester biochemistry sequence. This includes an in-depth study of the metabolism of amino acids, lipids, carbohydrates and nucleic acids; advanced enzyme kinetics; reaction mechanisms and regulatory pathways. Recombinant DNA technology will also be addressed. Prerequisite(s): CHEM 3250K Offered: Not offered on a regular basis .

CHEM 3300. Nanoscience and Nanotechnology. (3 Credits)

This course is designed for a multidisciplinary audience with a variety of backgrounds such as chemistry, biology, physics, and forensic science. It will provide an introduction into the principles and applications of the promising field of nanotechnology and nanoscience. Furthermore, it will introduce the tools and principles relevant at the nanoscale dimension, and discuss current and future nanotechnology applications in engineering, materials, physics, chemistry, biology, electronics and energy. 3 credits. Prerequisite(s): CHEM 2302K and BIOL 2107K and (PHYS 1112K or PHYS 2222K). Offered: Fall .

CHEM 3400. Polymer Science. (3 Credits)

Polymer science has diffused into the modern world with polymers finding applications in areas such as construction materials, drug design, computing hardware and optoelectronics, healthcare as well as biomedical applications. This course provides an introduction to the fundamental physical and chemical properties of polymers such as their molecular, thermal, mechanical, and electrical properties. In addition, we explore how these materials are synthesized, evaluated, and their commercial applications. 3 credits. Prerequisite(s): CHEM 2302K Offered: Fall.

CHEM 4100K. Instrumental Analysis. (4 Credits)

In this course, the student will be introduced to study the principles and applications of modern instrumental methods of analysis with special emphasis on spectrophotometric, chromatographic, electroanalytical and radiochemical techniques. The laboratory work is designed to provide the practical experience on state-of-the-art analytical instruments such as NMR, IR spectrophotometer and Scanning Electron Microscope. Prerequisite(s): CHEM 3222K US C Offered: Spring.

CHEM 4110. Chemical Literature I. (1 Credit)

This course is designed to acquaint the student with ethics, governmental regulations of chemicals in the work place, and primary sources of information from journals to databases that are currently available. 1 credit. Prerequisite(s): Senior Status Offered: Fall.

CHEM 4111. Junior Seminar. (1 Credit)

This course is designed to train students in using science literature and presenting scientific information. Students will review scientific writing styles and presentation formats, prepare a poster presentation, and observe and evaluate scientific presentations by invited guest, ASU faculty and senior students. Prerequisite(s): Junior Status.

CHEM 4120. Senior Research I. (1 Credit)

In this course, students will present preliminary plans/ background of their senior research proposals following a review of the current literature. 1 Credit. Prerequisite(s): CHEM 4111 Offered: Fall.

CHEM 4130K. Senior Research II. (3 Credits)

In this course, students select a research area in chemistry and the final written report is completed as a senior thesis (Off campus research experience or industrial co-op/ internships may be substituted if taken at the junior/senior level). 3 credits. Prerequisite(s): CHEM 4120 Offered: Spring, Fall.

CHEM 4140. Advanced Biochemistry. (3 Credits)

This course examines detailed biochemical pathways and elucidates the nature and mechanism of these reactions with special emphasis on the quantification of the chemical components of cells. Prerequisite(s): CHEM 3250K US C.

CHEM 4150K. Computational Chemistry. (4 Credits)

Computer application of molecular orbital calculation using semiempirical and abinitio programs incorporating molecular modeling aspects are investigated in this course. Prerequisite(s): CHEM 3222K US.

CHEM 4160. Special Topics in Chemistry. (2 Credits)

Must be enrolled in one of the following Class(s): Junior, Senior - This course is designed to allow students and faculty to explore some topics in greater detail than in a regular classroom setting, or to allow the introduction of such additional topics as specific areas of biochemistry, chemical physics, polymer chemistry, bio-analytical and environmental chemistry. Prerequisite(s): Permission of Instructor (may be repeated twice)

CHEM 4170K. Special Laboratory Problems. (2 Credits)

This course is similar to Special Topics in Chemistry (CHEM 4160) but involves laboratory experiences. Prerequisite(s): Senior status and permission of Instructor. 2 credits. Offered: Not offered on a regular basis .

CHEM 4180K. Topics in Research Techniques. (4 Credits)

This course examines relevant methods and techniques that are used in biomedical research. Prerequisite(s): Permission of instructor.

CHEM 4200K. Environmental Chemistry. (4 Credits)

This course will include an overview of the earth and its atmosphere and a study of the chemical processes that occur in this environment. The chemical structures and toxic properties of chemical pollutants and the reactions in the environment will be included, as well as a discussion of the sources for chemical contamination and methods for controlling pollution. Prerequisite(s): CHEM 2302K and MATH 1113 Offered: Not offered on a regular basis .

CHEM 4210K. Nanoscale Analytical Methods. (4 Credits)

This course provides an introduction to the novelty, the challenge and the excitement of nanoscale science and technology. This course is designed to explore the principles of nanoscale analytical methods that are essential to nanoscience and nanomaterial chemistry. This course will also provide fundamental theoretical and practical knowledge of nanomaterials. The Students will be introduced to applications and characterizations of nanomaterials. Prerequisite(s): CHEM 2352K Offered: Not offered on a regular basis .

FOSC 2100K. Intro to FOSC. (3 Credits)

This course is designed as an introductory course for those who wish to pursue a career in forensic science. Course is an overview of investigative techniques and methods used in the crime laboratory to analyze physical evidence. Course will also provide lab exercises in the metric system of measurement, general crime scene investigative techniques, and methods of scientific analysis used in crime laboratories. No Prerequisite Offered: Fall and Spring.

FOSC 2110. Survey Of Forensic Science. (3 Credits)

This course will enlighten students with the basic principles and uses of forensic science in the criminal justice system. This course will review the basic applications of forensic science fields in crime reconstruction. The outcome of the course will include students gaining basic understanding of the importance and limitations of the forensic sciences in solving crime. Offered: Spring.

FOSC 2120K. Forensic Photography. (3 Credits)

Designed as an introductory course in forensic photography, the history of photography will be presented. Technical aspects of exposure, images characteristics, and crime scene and evidence documentation will be introduced and projects will be used to apply these techniques. A final crime scene project with a presentation using photographs generated in the project will be used to show how photographic documentation can be used as an investigative and analysis technique in the reconstruction of a crime scene. Pre requisite FOSC 2100K Offered: Fall .

FOSC 2130K. Crime Scene Invst & Recon. (3 Credits)

This course is intended to familiarize students with the basic principles of Crime Scene investigations and reconstruction through Crime Scene Unit, Crime Scene Protocol, Crime Scene Evidence Collection and Crime scene interpretations. Prerequisite FOSC 2100K Offered: Spring .

FOSC 2140K. Crime Scene Invest & Recon II. (3 Credits)

This course will present opportunities to learn more principles in crime scene investigation including crime scene processing, crime scene Evidence Classification collection methods and crime scene reports. The course will go in depth and much more beyond what is presented in Crime Scene Investigation and Reconstruction I. Prerequisite FOSC 2130 Offered: Fall .

FOSC 3020K. Forensic Microscopy of Trace. (4 Credits)

Light microscopy of trace evidence including, contrast, resolving power and illumination; interference, phase and fluorescence microscopy; microscopy with polarized light, birefringence and crystal structure; dispersion staining; photomicrography; fibers, minerals, and residues. Prerequisite: PHYS 2221K and PHYS 2222K Or PHYS 1111K and PHYS 1112K Offered: Fall .

FOSC 3030. Criminal Evidence and Court Procedure. (3 Credits)

Consideration of laws of criminal evidence, rules of search and seizures, chain-of-custody, admissibility, opinion and hearsay, etc., and the mechanics of trials. Prerequisite: CRJU 1100 and FOSC 2100K. Offered: Fall.

FOSC 3100K. Intern Forensic Sci DNA Typi. (3 Credits)

This course consists of lectures that review in some detail the history, scientific principles, forensic applications and practice of DNA typing and databases in different countries. This course will teach students about different DNA typing technologies and databases and their international usage and variations. DNA typing provides information on genetic variations in all forms of life and molecular level which can be used in forensics, clinical diagnostics and evolutionary biology among many fields. This course will also examine the roles and activities of international, regional and national organizations in the promotion and exchange of DNA database technologies and information. Prerequisite FOSC 2100, and BIOL 2111K Offered: Fall .

FOSC 3200K. Bio Terrorism & Biotechnology. (3 Credits)

This course was designed to help internalize the ASU Forensic Science program curriculum. The course is concerned with the scientific issues and nature of current and future threats posed by Bioterrorism and the connection between Biotechnology and bio-defense. The scientific theme and scope are international and involve showing how different countries, multinational companies and transnational organizations are active in the fields of Biotechnology and impacted by issues relating to Biotechnology and Bioterrorism. Prerequisite: FOSC 2100, BIOL 2111K Offered: Spring.

FOSC 4040K. Forensic Serology/DNA Tech I. (3 Credits)

Practices of search, collection, preservation, and identification of blood and body fluids as wet or dry stains; immunologic typing of blood; DA-typing and electrophoresis, and laboratory report. Distribution: Forensic Technology/Technician. Prerequisite: BIOL 2111K, CHEM 1212K, and CHEM 3250 K Offered: Fall.

FOSC 4050K. Forensic Chemistry. (4 Credits)

Theory and practice of quantitative chemical analysis, chemical spectroscopy and instrumental methods of analysis: U.V., visible and infrared (IR) spectrophotometry, Fourier transform IR, fluorescence and fluorometry, atomic absorption and emission, Raman NMR, mass- spec., for structures and molecular stereochemistry; chromatographic methods of separation- TLC, HPLC, and GC. Laboratory report. Prerequisite: CHEM 2302K or CHEM 2302 and CHEM 2351K or CHEM 2351. Offered: Fall .

FOSC 4060K. SEM-EDAX of Trace Evidence. (3 Credits)

Practice of scanning electronic microscopy with energy-dispersive X-rays for physical and elemental characterization of trace evidence, including gunshot residue particles, image processing and automation. Laboratory report. Prerequisite: FOSC 3020K. PHYS 1111K and PHYS 1112K Offered: Spring.

FOSC 4080K. Forensic Serology/DNA Tech II. (3 Credits)

Laboratory practice of confirmatory tests for traces of bloodstains and semen stains; electrophoresis of blood enzymes and blood grouping, advanced DNA-typing, etc., and Lab report. Prerequisite: BIOL 2111K, and CHEM 1212K Offered Spring .

FOSC 4090K. Controlled Substance/Toxicolog. (3 Credits)

Theory and practice of controlled substance identification GC-MS, HPLC, TLC, and infrared spectroscopy (IR/ FTIR), and detection of alcohol toxication by breath testing. Laboratory report. Prerequisite: CHEM 2302K, and CHEM 3250K or CHEM 2351K Offered: Spring .

FOSC 4120K. Electron Optics, EM/Quant Anal. (3 Credits)

An introduction to electron microscopy, optical designs of SEM, TEM, HVEM and STEM, and to microanalysis with wave length dispersive, energy-dispersive, and X-ray fluorescence spectrometers. SEM-EDX practice and laboratory report. Prerequisite: 0-3 credits. Prerequisite: FOSC 4060. Offered: Spring .

FOSC 4130. Expert Witness at Mock Trial. (2 Credits)

Consideration of place of expert's in dispute resolution, cases that require expert testimony, pre-trial preparations, rules of evidence, articles and exhibits, courtroom demeanor, participation at criminal mock trials and offer expert testimony.

FOSC 4140K. Fingerprint Technology. (2 Credits)

Practice of fingerprinting: identification and development of latent fingerprints, enhancements by laser, automated identification system, image processing and the expert fingerprint witness. Prerequisite: FOSC 2100 and FOSC 2000 or FOSC 2100. Offered: Fall .

FOSC 4150K. Evident Proc/Med Tech/Nur/Para. (2 Credits)

Practice in evidence protection and collection: biological and medical evidence and controls to be collected, injuries to be photographed, legal and scientific requirements of packaging and storage, writing medical report and assisting, the coroner, rules of evidence and expert witness. Laboratory report. Prerequisite: FOSC 3020 and FOSC 2130. Offered: Spring.

FOSC 4160K. Evidence Collection in Scientific Crime Investigation (w/ lab). (2 Credits)

A course for the first officer at the crime scene, investigators and specialized personnel in processing the crime scene and collection of evidence for a systematic investigation consistent with standards for law enforcement agencies and rules of evidence. Laboratory practice and report.

FOSC 4170K. Ballistics of Firearms/Tool Mk. (3 Credits)

Theory and practice of the physics of interior, exterior, and terminal ballistics as applied to identification of fire arms, bullets, and casing, primer and powder, gunshot residue formation and deposition, pellet distribution, muzzle-to-target distance and bullet wounds. Lab report. Prerequisite: FOSC 2100K, FOSC 3020K Offered: Spring.

FOSC 4201K. Evidence Analysis/Research. (3 Credits)

On-campus research and evidence examination or Internship I to generate crime laboratory proficiency and competence in defending to witness in the presence of judges in a moot court. Prerequisite: Graduating Seniors only Offered: Fall & Spring.

FOSC 4999. Senior Capstone Seminar. (3 Credits)

This course involves establishing students' understanding of ethics, quality control and assurance and their being able to explain, analyze and apply their knowledge of these topics. The course also reviews laboratory techniques and field practice in the forensic science field as well as certain of the forensic science professional literature. Preparation of application materials for Forensic careers and the review and exercise of their forensic knowledge gained during the program may also be done based on time and inclination of students. Prerequisite: Graduating seniors only. Offered: Fall & Spring.