Chemistry and Environmental Science

NJIT's Department of Chemistry and Environmental Science provides a unique focus for addressing some of today's most pressing scientific and social challenges. The chemistry program's solid grounding in science, mathematics and engineering, along with lab skills, allows students to apply theory to practical solutions based on chemistry. NJIT has particular strengths in analytical, medical and environmental chemistry. Students can conduct research with faculty mentors with expertise in such areas as energy, pharmaceuticals, materials and environmental chemistry. Through the environmental science program, students acquire a well-rounded background in the field, drawing on chemistry, geology and biological sciences. Students also learn to use computer modeling, data analysis, digital mapping and more — skills that clearly afford a significant advantage in the job market.

The Department's addition of Biochemistry and Forensic Science undergraduate degree programs has further enhanced the range of experiences we offer to our students. The Bachelor of Science in Forensic Science is the first of its kind in New Jersey, and gives students the opportunity to learn from high caliber forensics experts drawn from government and law enforcement, as well as academia. The Forensic Science program leverages the strong foundation of chemistry, biochemistry, and biology courses available at NJIT to deliver a world-class education to its majors.

NJIT Faculty

B

Belfield, Kevin D., Professor

Bonchonsky, Michael P., University Lecturer

C

Casado-Zapico, Sara, Assistant Professor

Champagne, Pier Alexandre, Assistant Professor

Chen, Hao, Professor

Conley, Robert J., Emeritus

D

DeSantis, Christopher, University Lecturer

F

Farinas, Edgardo T., Associate Professor

Fisher, David R., Professor of Practice

G

Getzin, Donald, Associate Professor Emeritus

Gulotta, Miriam, University Lecturer

Gund, Tamara M., Professor

K

Kebbekus, Barbara B., Professor Emeritus

Khalizov, Alexei, Associate Professor

Kim, Yong I., Assistant Professor

L

Lambert, Donald G., Associate Professor Emeritus

Lei, George Y., Associate Professor Emeritus

Li, Mengyan, Assistant Professor

M

Mitra, Somenath, Distinguished Professor

P

Pacheco, Carlos N., Senior University Lecturer

Q

Qiu, Zeyuan, Professor

S

Sadik, Omowunmi A., Distinguished Professor

Shakib, Farnaz A., Assistant Professor

V

Venanzi, Carol A., Distinguished Professor Emeritus

W

Warner Genoa, Assistant Professor

Z

Zhang, Lijie, Assistant Professor

Zhang, Yuanwei, Assistant Professor

Programs

- BioChemistry - B.S. (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/biochemistry-bs/)
- Chemistry - B.S. (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/chemistry-bs/)
- Environmental Science - B.S. (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/environmental-science-bs/)
- Forensic Science - B.S. (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/forensic-science-bs/)

Double Majors **(**http://catalog.njit.edu/undergraduate/academic-policies-procedures/special-degree-options/**)**

- Forensic Science & Law, Technology and Culture - B.S (http://catalog.njit.edu/undergraduate/science-liberal-arts/history/frsc-ltc/)
- Chemistry & Law, Technology and Culture - B.S. (http://catalog.njit.edu/undergraduate/science-liberal-arts/history/chemistry-ltc/)

- Chemistry Minor (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/chemistry-minor/) (not for Chemical Engineering majors)
- Chemistry Minor (http://catalog.njit.edu/undergraduate/newark-college-engineering/chemical-materials-engineering/chemistry-minor-chemical-engineering-majors/) (for Chemical Engineering majors)
- Environmental Science Policy Minor (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/environmental-science-policy-minor/)
- Forensic Science Minor (http://catalog.njit.edu/undergraduate/science-liberal-arts/chemistry-environmental-science/forensic-science-minor/)

Chemistry and Environmental Science Courses

CHEM 105. Applied Chemical Principles. 4 credits, 5 contact hours (3;2;0).
Prerequisite: high school algebra or equivalent. The fundamentals and relation of chemistry to living in today's society. Suitable laboratory experiments illustrate the course material. Not open to engineering or science students, or students who have completed a college level chemistry course.

CHEM 108. College Chemistry I. 3 credits, 3 contact hours (3;0;0).
Prerequisites: a one-year college prep high school chemistry course, high school math including algebra and trigonometry. Delivered as a telecourse, the course provides the first of a two-semester sequence of college chemistry for high school students and other distance learners seeking college credit and/or preparation for the AP Examination. Matriculated undergraduates may not receive credit for this course.

CHEM 109. College Chemistry II. 3 credits, 4 contact hours (3;1;0).
Prerequisite: CHEM 108. A continuation of CHEM 108.

CHEM 121. Fundamentals of Chemical Principles I. 3 credits, 3 contact hours (3;0;0).
Introduces the basic concepts of chemistry, including chemical reactions, and bonding, electronic and molecular structure, gases and thermochemistry. Students requiring lab should also register for lab CHEM 125A.

CHEM 122. Fundamentals of Chemical Principles II. 3 credits, 3 contact hours (3;0;0).
Prerequisite: CHEM 121 with a grade C or better. Continuation of the CHEM 121 sequence. Introduces the basic concepts of chemistry, including equilibrium, chemical kinetics, thermodynamics, electrochemistry, and nuclear chemistry.

CHEM 125. General Chemistry I. 3 credits, 3 contact hours (3;0;0).
Co-requisite: MATH 110 or higher. The first semester of a two-semester sequence in chemistry. Introduces the basic concepts of chemistry, including chemical reactions and bonding, electronic and molecular structure, gases, and thermochemistry. Students requiring lab should also register for lab CHEM 125A.

CHEM 125A. General Chemistry Lab I. 1 credit, 3 contact hours (0;3;0).
Corequisites: CHEM 125 or CHEM 121. General Chemistry Lab I is a laboratory course; it is designed to be taken currently with CHEM 125 or CHEM 121. Instructions are in the lab manual and concepts are from the text and lecture of the CHEM 125/CHEM 121 courses. The experiments are designed to provide undergraduate students with practical experience and train students with laboratory techniques/equipment common to chemistry laboratories.

CHEM 126. General Chemistry II. 3 credits, 3 contact hours (3;0;0).
Prerequisites: MATH 110 or higher and CHEM 125 or CHEM 121 with a C or better. The second semester of a two-semester sequence in chemistry. Introduces the basic concepts of chemistry, including equilibrium, chemical kinetics, thermodynamics, and electrochemistry. Students requiring 2 semesters of Chemistry lab should also register for lab CHEM 126A.

CHEM 126A. Gen Chemistry Lab II. 1 credit, 3 contact hours (0;3;0).
Prerequisites: CHEM 125A with a grade of C or better. Corequisites: CHEM 126 or CHEM 122. This new course is designed to be taken concurrently with CHEM 126. Instructions are in the lab manual and concepts are from the text and lecture of the CHEM 126. The experiments are designed to provide undergraduate students with practical experience and techniques in the chemistry laboratory. Also they will help students understand the underlying concepts covered in the lecture course.

CHEM 210. Frontiers in Chemistry. 1 credit, 1 contact hour (1;0;0).
Prerequisites: CHEM 125 or CHEM 121. Restrictions: Sophomore standing. Offers CES students to come together and learn about the different subdisciplines within the department. This course will give them an opportunity to learn about the research projects of various CES faculty. The course will provide students with opportunities to enhance their understanding of classroom knowledge through research presentation from internal and external invited speakers. Through exposure to research methods, the course will also introduce them to pathways for students to engage in undergraduate research.

CHEM 221. Analytical Chemical Methods. 2 credits, 4 contact hours (0;4;0).
Corequisite: CHEM 222. Laboratory introducing quantitative chemical analyses by gravimetry, titration, spectroscopy, chromatography, and potentiometry.

CHEM 222. Analytical Chemistry. 3 credits, 3 contact hours (3;0;0).
Prerequisites: (CHEM 122 or CHEM 126), CHEM 124 or (CHEM 125A and CHEM 126A) with grade of C or better. Lecture course introducing concepts of chemical analyses by gravimetry, titration, spectroscopy, chromatography, and potentiometry.

CHEM 231. Physical Chemistry I. 3 credits, 4 contact hours (3;0;1).
Prerequisites: CHEM 122 or CHEM 126 , PHYS 111 and MATH 211 or MATH 213 or MATH 309 with a grade of C or better. The topics covered include the properties of ideal and non-ideal gases and liquids, solutions, thermochemistry, thermodynamics, the phase rule, and phase equilibria.

CHEM 235. Physical Chemistry II. 3 credits, 4 contact hours (3;0;1).
Prerequisite: CHEM 231 with a grade of C or better. A continuation of CHEM 231. The topics include homogeneous and heterogeneous chemical equilibria, ionic equilibria, electrochemistry, kinetic theory of gases, transport phenomena, kinetics, and irreversible processes.

CHEM 235A. Physical Chemistry II Laboratory. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 221, CHEM 235 with a grade of C or better. Corequisite: MATH 225 (special section for chemical engineering and chemistry majors). Laboratory experiments apply and extend the basic knowledge of physical chemistry acquired in the lecture. Reports and presentations are an essential part of the course.

CHEM 236. Physical Chemistry for Chemical Engineers. 4 credits, 5 contact hours (4;0;1).
Prerequisites: (CHEM 122 or CHEM 126) and CHEM 125A and (CHE 230 or CHE 232) with a grade C or better. This course will introduce the chemical engineering students to the concepts of order, disorder, chemical equilibrium and phase equilibrium. Credit for this course will not be given if credit for CHEM 235 has been given.

CHEM 238. Analytical/Organic Chem Lab for Chemical Engineers. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 124 and CHEM 245 with a grade of C or better. This course will offer the CHE students experience in organic and analytical laboratory experiments. These experiments will reinforce concepts learned in the organic chemistry lecture classes. This laboratory course will also provide exposure to analytical and other techniques useful in the chemistry and chemical engineering laboratories.

CHEM 243. Organic Chemistry I. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 122 or CHEM 126 with a grade of C or better. Systematic study of the theories, principles and applications of Organic Chemistry. This course covers topics such as bonding theories and structure, conformations and stereochemistry, and functional groups like alkanes, alkenes, and alkynes. This course will also cover topics such as spectroscopy and mass spectrometry.

CHEM 244. Organic Chemistry II. 3 credits, 3 contact hours (3;0;0).
Prerequisite: CHEM 243 with a grade of C or better. The second semester in the two-semester Organic Chemistry sequence. Systematic study of the theories, principles, applications and techniques of Organic Chemistry. The course will cover topics such as alcohols, conjugated and aromatic compounds, carbonyl derivatives and amines.

CHEM 244A. Organic Chemistry I Laboratory. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 125A or CHEM 124 with a grade C or better. Corequisites: CHEM 245 or CHEM 243. Synthesis, purification and characterization of organic compounds are performed. Students will learn techniques such as multi-step synthesis, distillation, crystallization, separation and chromatography. Techniques such as UV, IR, NMR and mass spectrometry will be used for compound characterization.

CHEM 245. Organic Chemistry for Chemical Engineers. 4 credits, 5 contact hours (4;0;1).
Prerequisites: CHEM 126 or CHEM 122 with a grade of C or better. This course is a one-semester course(opposed to classic two-semester sequence) to provide chemical engineering students with a basic understanding of organic compounds and their reactions.

CHEM 246A. Organic Chemistry Laboratory. 4 credits, 4 contact hours (0;4;0).
Prerequisite: CHEM 244A with a grade of C or better. This course will cover some common reaction types that are not included in CHEM 244A. The experiments will be carried out in microscale. Students will learn new concepts in organic synthesis, including multi-step synthesis, organometallic reagents, and green chemistry for chemical synthesis, catalytic reactions, protecting groups, and peptide couplings. NMR and IR will be used for compound characterization.

CHEM 301. Chemical Technology. 3 credits, 4 contact hours (2;2;0).
Prerequisites: high school algebra and trigonometry or equivalent with a grade of C or better. Designed for engineering technology majors. Not open to students who have completed a college level chemistry course. Covers principles of chemistry, with a focus on chemical energetics and chemistry of materials. Suitable laboratory experiments illus-trate the course material.

CHEM 310. Co-op Work Experience I. 3 credits, 3 contact hours (0;0;3).
Restriction: completion of the sophomore year, approval of the department, and permission of the Office of Cooperative Education and Internships. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the co-op office. Mandatory participation in seminars and completion of a report. Cannot be used for degree credit.Note: Normal grading applies to this COOP Experience.

CHEM 311. Co-op Work Experience II. 3 credits, 3 contact hours (0;0;3).
Prerequisite: CHEM 310 with a grade C or better.

CHEM 336. Quantum Chemistry. 3 credits, 3 contact hours (3;0;0).
Prerequisites: MATH 222 and CHEM 126 with a grade of C or better. An introduction to quantum mechanics, statistical mechanics, spectroscopy, and solid state.

CHEM 339. Physical Chemistry Laboratory. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 231 or CHEM 236 with grade C or better. Corequisites: MATH 225 or MATH 279 or MATH 333 or IE 331. Pre or Corequisites: Students who have taken CHEM 231 as a prerequisite must register for CHEM 235 as a corequisite. The application of principles learned in lecture will be reinforced by the experiments done in this lab. They will also provide exposure to physical chemistry techniques used in chemistry and chemical engineering.

CHEM 340. Chemistry of Materials. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 243 with a grade of C or better. Covers chemistry of materials and introduces relevant concepts of bonding and structure. Topics covered include the crystalline solid state, bonding and thermodynamics, semiconductors/electronic materials, nanoscale materials, biomaterials, chemistry at interfaces, characterization techniques, and application of materials in devices.

CHEM 360. Environmental Chemistry of Air Pollution and Climate Change. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 126 or CHEM 122 with a grade of C or better. Chemistry of the environment with emphasis on the atmosphere. Included are an introduction to the composition and chemistry of the natural and polluted atmosphere, thermodynamics and kinetics of atmospheric reactions, indoor and outdoor air pollution, air quality and its impact on human health, air quality regulations, and climate change. Examples of specific environmental issues covered in this course are the stratospheric ozone depletion, classical and photochemical smog, acid rain, and climate change.

CHEM 361. Environmental Chemistry of Water and Soil Pollution. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 360 or one of the following courses (CHEM 222, CHEM 231, CHEM 236, CHEM 243, CHEM 245) with a grade of C or better. Chemistry of the environment, including the hydrosphere and geosphere. Principles of physical, inorganic, and organic chemistry are applied to understand the origins of environmental pollutants, their transport, distribution, and decomposition pathways in water and soil environments.

CHEM 391. Research and Independent Study. 3 credits, 3 contact hours (0;0;3).
Restriction: Junior standing in Chemistry. Provides an opportunity to work on a reserch project under the individual guidance of a member of the department.

CHEM 412. Inorganic Chemistry. 3 credits, 3 contact hours (3;0;0).
Prerequisite: CHEM 244 with a grade of C or better. The course covers structure, bonding, properties, and reactivity in inorganic chemistry. Topics covered will include inorganic structure/bonding, molecular orbitals, coordination chemistry, organometallic chemistry, catalysis, symmetry, and group theory.

CHEM 437. Applications of Computational Chemistry and Molecular Modeling. 3 credits, 3 contact hours (3;0;0).
This class introduces students to applications and fundamental aspects of computational chemistry and molecular modeling for application and understanding in organic, bio- or physical chemistry. It is an introductory course involving hands-on applications of computational chemistry and molecular modeling. The course provides training application and computer programs for students to use in determining fundamental thermochemical parameters, elementary reaction paths, and design of molecular structures to try and optimize and/or improve biochemical / pharmaceutical products or industrial chemical processes. Students will use chemical software packages to perform calculations in order to identify optimum interaction structures for pharmaceutical or industrial chemical systems. The course teaches the student to evaluate relative energy of different structures plus chemical species stability, reactivity and equilibrium rations in chemical environments. The course is relevant to organic, inorganic, physical bio- and pharmaceutical chemistry. It is also relevant to optimization of chemical engineering processes.

CHEM 473. Biochemistry. 3 credits, 3 contact hours (3;0;0).
Prerequisite: CHEM 244 or CHEM 245 with a grade of C or better. Covers the fundamentals of biochemistry including buffers, blood, proteins, enzymes, carbohydrates, fats, and nucleic acids. Emphasis on the relationship of biochemistry to biotechnology and medicine.

CHEM 474. Biochemistry II. 3 credits, 3 contact hours (3;0;0).
Prerequisite: CHEM 473 with grade of C or better. This course focuses on transducing and storing energy, synthesizing the molecules of life, and responding to environmental changes. Topics include concepts of metabolism, glycolysis, gluconeogenesis, citric acid cycle, oxidative phosphorylation, photosynthesis, fatty acid metabolism, protein turnover, amino acid catabolism, biosynthesis of amino acids, DNA replication and recombination, RNA synthesis and processing, protein synthesis, gene expression control, immune system, and drug development.

CHEM 475. Biochemistry Lab I. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 244 with a grade of C or better. Corequisites: CHEM 473. This course will offer the chemistry and related (chemical engineering, biology, bioinformatics, bioengineering) students fundamental laboratory approaches for biochemistry and biotechnology. These experiments will reinforce concepts learned in biochemistry lecture classes.

CHEM 480. Instrumental Analysis. 2 credits, 4 contact hours (0;4;0).
Prerequisites: CHEM 221, CHEM 222 or equivalent with a grade of C or better. Laboratory exploring the principles of operation of modern instruments for chemical analysis. Ultra-violet and infrared spectroscopy, mass spectrometry, gas chromatography, high performance liquid chromatography, voltametry, and potentiometry are among the instruments utilized. Apply calibration methods, statistical data treatment, and sample preparation techniques are applied.

CHEM 490. Special Topics in Chemistry. 3 credits, 3 contact hours (3;0;0).
Prerequisite: depends upon the nature of the course given. Course is offered in specific areas as interest develops.

CHEM 491. Research and Independent Study I. 3 credits, 3 contact hours (0;0;3).
Prerequisite: senior standing in chemistry or chemical engineering. Provides an opportunity to work on a research project under the individual guidance of a member of the department.

CHEM 492. Research and Independent Study II. 3 credits, 3 contact hours (0;0;3).
Prerequisite: CHEM 491 with a grade of C or better. A continuation of CHEM 491.

EPS 202. Society, Technology, and the Environment. 3 credits, 3 contact hours (3;0;0).
Prerequisite: ENGL 101. Uses case studies to examine the relationships between the creation and use of technologies, the human and natural environment, and the development of social and cultural institutions. Its central theme is the manner in which human society structures the environment in which it lives: nature and culture, city and country, civilization and development. This course satisfies 3 credits of the Basic Social Sciences GER.

EPS 312. Technology and Policy in Contemporary America. 3 credits, 3 contact hours (3;0;0).
Prerequisites: HUM 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HIST 213 or their equivalents. A study of technology and politics in recent America. Focuses on the role of the federal government in shaping technology, especially through funding technological innovations and applications. Topics will include the origins of technology policy in World War II, the influence of the Cold War, the science and technology policy advisory system, and political and cultural influences on technology policy. Honors Note: See HSS 101.

EPS 313. Environmental History and Policy. 3 credits, 3 contact hours (3;0;0).
Prerequisites: HUM 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HIST 213 or their equivalents. Covers the rise of the modern environmental debate, and examines its current priorities and values, politics and economics, and impacts on industry and society. Students review the role of regulatory agencies, private industry, public interest groups, and the media. Current major issues in New Jersey are considered, as well as environmental debate on a national and global level. Honors Note: See HSS 101.

EPS 362. Environmental Economics. 3 credits, 3 contact hours (3;0;0).
Prerequisites: HUM 101, HSS 202, SS 201 or their equivalents. Presents a detailed overview of the relationship between political economy and the environment. Draws on diverse case studies including global warming, harvesting of minerals on the ocean's floor, destruction of old growth forests, and contamination of the -nation's water, air, and soils. Explores the economic remedies to the fast-changing relationship between society and nature. Honors Note: See HSS 101.

EPS 380. Policy Issues in the Coastal Environment. 3 credits, 3 contact hours (3;0;0).
Prerequisites: HUM 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, HIST 213 or their equivalents. An examination of coastal environments from the standpoint of the scientist, the engineer, and the resource manager. Topics include beach and shoreline characteristics, technological innovations to address coastal erosion problems, and current debates in coastal policy and resource management. Case studies are used to illustrate coastal management practices and the scientific, technical, and social constraint to policy formulation.

EPS 381. Field Techniques and Research. 3 credits, 3 contact hours (3;0;0).
Prerequisites: HUM 101, HSS 202 or their equivalents; two from HSS 211, HSS 212, Hist 213 or their equivalents.; STS 307. An introduction to research methods. The objectives of the course are to provide opportunity to pursue specialized, in-depth research in a subfield of science, technology and society of the student's choice; to develop skills in problem identification, research design and problem solving; to increase familiarity with methods of data analysis; to strengthen library research skills; to provide an opportunity to gather original field data in a team-oriented environment; and to improve oral and written communication skills.

EVSC 125. Fundamentals of Environmental Sciences. 3 credits, 3 contact hours (3;0;0).
An introductory course that will present freshman EVSC students with general concepts and topics on Environment, including chemistry, ecosystems, geological and soil resources, water quality, agricultural and Environment, atmosphere, noise and ionizing radiation.

EVSC 325. Energy and Environment. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 125 with a grade C or better and PHYS 111 with grade C or better. An advanced course to instruct EVSC students, topics on energy and environmental issues such as introduction to energy, natural energy conservation, environmental issues of energy production and consumption, regulation and legislation related to energy, public policy development in energy and environment.

EVSC 335. Environmental Law. 3 credits, 3 contact hours (3;0;0).
Prerequisite: ENGL 102 with a grade of C or better. The prerequisite is a college ability to communicate competently in the English language including the ability to research and prepare essay compositions and to articulate the major points in a presentation format. The introduction to Environmental Law will cover the regulatory system developed over time that has forged a complex system of environmental rules influencing industrial and other private and public actions that impact the environment. The course will review these rules from the vantage point of the practicing technical environmental engineer and scientist. Students will become familiar with the background and derivation of these laws as well as the major operational features such as environmental permits and enforcement. Several major environmental cases will be analyzed that give definition to the key features of these laws. Each class module will direct itself to the practical application of these laws.

EVSC 340. Environmental Health and Safety. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 126. This course includes an interdisciplinary review of fundamental scientific principles necessary to understand basic environmental health science. Basic science and engineering knowledge is applied to the recognition, evaluation and control of physical, chemical and biological processes that influence human health and welfare. The impact of contaminants ranging from industrial pollutants to biological agents and environmental disease vectors will be analyzed. This course is based on the premise that exposures to the environmental stressors that cause harm can be recognized through the observation of environmental quality parameters and mitigated by source controls and pollution prevention.

EVSC 375. Environmental Biology. 3 credits, 3 contact hours (3;0;0).
An introductory ecological approach to understanding man's impact and dependence on the natural environment. Broad topics include ecosystems, nutrient cycles, pollution, pest management, conservation of natural resources, energy, and human population.

EVSC 381. Geomorphology. 3 credits, 3 contact hours (3;0;0).
This is a course in geomorphology, the study of landforms and the contemporary processes that create and modify them. The course will emphasize earth surface processes and quantitative analysis of landform change. Lectures will stress geomorphic principles and two field-based problems will enable students to apply these principles to contemporary geomorphic problems in engineering and management with a focus on the natural environment.

EVSC 385. Environmental Microbiology. 3 credits, 3 contact hours (3;0;0).
Prerequisites: R120 101 and R120 102, or BIOL 205 and BIOL 206, with grade of C or better. The main goals of this course are to present an overview of the important microbes involved in environmental microbiology, to discuss the environments where they are found, to learn how they are detected and monitored, and to describe their effects on humans. Lectures and exams will be supplemented with discussions of experimental design and data interpretation by reading current research articles.

EVSC 391. Research and Independent Study. 3 credits, 3 contact hours (0;0;3).
Provides an opportunity to work on a research project under the individual guidance of a member of the department.

EVSC 416. Principles of Toxicology. 3 credits, 3 contact hours (3;0;0).
Prerequisites: CHEM 122 or CHEM 126 with a C or higher. The course is intended to explore the general principles of toxicology and apply them to the assessment of acute, subacute and chronic effects of hazardous and toxic chemicals. Qualitative and quantitative measures of toxicity and testing protocols are addressed. The role of toxicology in risk assessment and risk management is discussed.

EVSC 484. Environmental Analysis. 3 credits, 4 contact hours (2;2;0).
The analysis of environmental samples is studied from the acquisition of representative samples, through sample handling, chain of custody, sample storage, analytical method selection, analysis, and data treatment.

EVSC 490. Special Topics in Environmental Science. 3 credits, 3 contact hours (3;0;0).
Prerequisites: This will depend upon the course given. The course will be offered in specific areas as interest develops.

FRSC 201. Intro to Forensic Science. 3 credits, 3 contact hours (3;0;0).
This course explores the scientific and legal praxis of forensic science. Forensic science is an integral and important part of the legal system by providing investigators credible science to corroborate or refute statements, and offering factual reports of scientific-based findings to a trial judge and jury. Students will be introduced to the science behind examination techniques used in forensic science labs. Guest lecturers and practitioners will offer insights into their day-to-day investigative and technological challenges and success.

FRSC 307. Crime Scene Investigation &Lab. 4 credits, 5 contact hours (3;2;0).
Prerequisite: FRSC 201. Overview and analysis of the cardinal principles and techniques of crime scene investigation, with an emphasis on a rigorous scientific approach. Students will be introduced to: documentation with notes, sketches, and photography; specialized techniques for the recognition and enhancement of physical evidence; preparation and maintenance of case folders; communication of results and preparation of formal reports; management of resources, including equipment and personnel; and ethics and bias in criminalistics.

FRSC 350. Mobile Device Forensics. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Computing Literacy GER. Mobile Device Forensics is a branch of digital forensics relating to recovery of digital evidence or data from a mobile device under forensically sound conditions. Duties in this area include the forensic seizure and preservation of mobile devices, extraction of data, analysis of data, and the creation of reports for use in legal proceedings. This course will introduce students to the acquisition and analysis of data that can be retrieved from mobile devices, focusing on applying industry best practices to evidence collection and analysis with hands-on exercises using current techniques.

FRSC 359. Physical Methods of Forensic Analysis & Lab. 4 credits, 6 contact hours (2;4;0).
Prerequisites: FRSC 201; FRSC 307 (FRSC 307 may be taken as a co-requisite). This course is designed to prepare undergraduate students in the forensic science program for impression, pattern, and trace evidence analysis. Students will learn the principles of criminalistics, proper evaluation and comparison of impression evidence, and the theory and practical application of forensic microscopy to the analysis of unknown materials. There will be an emphasis on the necessity of an objective and rigorous scientific approach to forensic investigations.

FRSC 365. Mobile Device Forensics. 3 credits, 3 contact hours (3;0;0).
Prerequisites: FRSC 201. Mobile Device Forensics is a branch of digital forensics relating to recovery of digital evidence or data from a mobile device under forensically sound conditions. Duties in this area include the forensic seizure and preservation of mobile devices, extraction of data, analysis of data, and the creation of reports for use in legal proceedings. This course will introduce students to the acquisition and analysis of data that can be retrieved from mobile devices, focusing on applying industry best practices to evidence collection and analysis with hands-on exercises using current tools.

FRSC 475. Forensic Chemistry & Lab. 4 credits, 6 contact hours (2;4;0).
Prerequisite: CHEM 221. Forensic Chemistry is the application of modern analytical chemistry to matters of law. This course will describe methods of analysis commonly performed in forensic laboratories for the analysis of controlled substances, forensic toxicology, fire debris analysis, trace evidence, and other types of evidence. The laboratory component of the course will prepare students for forensic science careers with practical examples of commonly performed tests and examinations.

FRSC 479. Forensic Biology & Lab. 4 credits, 6 contact hours (2;4;0).
Prerequisite: BIOL 352. Forensic Biology will expose students to Forensic Serology and Forensic DNA. It covers the different types of analyses that are performed in forensic biology sections of crime laboratories. The course will introduce students to human identity testing, focusing on the theory, methods, procedures and statistics associated with this forensic science. The course also contains a weekly laboratory component.

FRSC 480. Forensic Microscopy & Lab. 4 credits, 6 contact hours (2;4;0).
Prerequisite: CHEM 221. This course provides students with the basic knowledge and skills necessary to explore the application of microscopy to the forensic sciences. This course incorporates lectures and laboratory exercises organized in a format to engage each registrant in the analytical and investigative roles of the light microscope in the forensic professions. The general topics and techniques covered in this course include microscope nomenclature, alignment and focus, microscopic sample handling, and photographic documentation of samples.

FRSC 490. Co-op Work Experience. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Senior standing and departmental approval. Students gain major-related work experience and reinforcement of their academic program. Work assignments are facilitated and approved by the co-op office. Requires mandatory participation in seminars and completion of a report. Note: Normal grading applies to this co-op experience.

FRSC 491. Research & Indep Study I. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Senior standing and departmental approval. Research in forensic science. Each student works under the supervision of a forensic science or associated faculty member. A research paper or poster are required.

FRSC 495. Senior Seminar. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Senior standing and departmental approval. Offers forensic science students the opportunity to enhance their understanding of professional practice through their integration of skills and knowledge gained in prior courses. The resultant research paper and presentation represents the culmination of the undergraduate disciplinary experience. Guest speakers will be invited to present on topics relevant to their area of expertise within the field of forensic science.

FRSC 498. Special Topics in Forensic Science. 3 credits, 3 contact hours (3;0;0).
Prerequisites: Permission of instructor. Special topics course in the field of forensic science.