

School of Arts and Sciences

CHEMISTRY

www.chem.pitt.edu

Chemistry is a science, the workings of which are central to all of our lives. Those who study chemistry investigate and strive to understand, replicate, and affect natural processes that occur in living things, the earth, the oceans, and the atmosphere. Industrial applications of chemical processes provide materials to feed, clothe, and house people; drugs and equipment to detect and combat disease; and processes that provide energy to run our world. As we enter the 21st century, the influence and application of high technologies such as molecular biology, drug design, ceramics, and microelectronics in our everyday lives increase daily.

The University of Pittsburgh's undergraduate chemistry program provides a rigorous, comprehensive background in the four primary areas of chemistry—analytical, physical, organic, and inorganic. It offers students solid preparation for graduate study as well as a variety of careers in industry, education, and research. Chemistry graduates have found career opportunities in areas such as agricultural chemistry, food chemistry, environmental science, petrochemicals, pharmaceuticals, semiconductors and electronics, sales, and basic research. Alternately, you can combine your study in chemistry with educational certification for a career in secondary science education.

Suggested Course Sequence for Chemistry Majors

The required courses in chemistry and physics are offered during the fall and spring terms, and many are offered during the summer sessions. Alternative course sequences are acceptable if you meet all of the prerequisites.

Freshman Year**Fall Term**

CHEM 0110 General Chemistry 1
MATH 0220 Analytical Geometry and Calculus 1
ENGCMP English Composition course
Required general education course(s)

Spring Term

CHEM 0120 General Chemistry 2
MATH 0230 Analytical Geometry and Calculus 2
Required general education course(s)

Sophomore Year**Fall Term**

CHEM 0310 Organic Chemistry 1
CHEM 0330 Organic Chemistry Laboratory 1
MATH 0240 Analytical Geometry and Calculus 3
PHYS 0174 Physics for Science and Engineering 1*
Required general education course(s)

Spring Term

CHEM 0320 Organic Chemistry 2
CHEM 0340 Organic Chemistry Laboratory 2
PHYS 0175 Physics for Science and Engineering 2*
PHYS 0219 Introduction to Experimental Physics
Required general education course(s)

Junior Year**Fall Term**

CHEM 1410 Physical Chemistry 1
CHEM 0250 Introduction to Analytical Chemistry
CHEM 0260 Introduction to Analytical Chemistry Laboratory
Required general education course
Language course (if not satisfied by advanced standing)

Spring Term

CHEM 1250 Instrumental Analysis
CHEM 1255 Instrumental Analysis Laboratory
CHEM 1420 Physical Chemistry 2
CHEM 1430 Physical Chemistry Laboratory 1
CHEM 1700 Introduction to Undergraduate Research
Required general education course
Language course (if not satisfied by advanced standing)



Senior Year

Fall Term

CHEM 1130 Inorganic Chemistry
CHEM 1440 Physical Chemistry Laboratory 2
Required general education course
Required general education course

Spring Term

Science elective course
General elective course
General elective course
General elective course
Required general education course
CHEM 1140 Preparative Inorganic Chemistry

*These courses are calculus-based physics courses. Students pursuing the bioscience or education option may instead take the algebra-based physics sequence of PHYS 0110 Introduction to Physics 1, PHYS 0111 Introduction to Physics 2, and PHYS 0212 Introduction to Laboratory Physics.

Science Elective

These are some of the courses that satisfy the requirement for at least two credits in science electives. Lab courses are indicated with a #. For students pursuing American Chemical Society (ACS) certification, the elective course must be BIOSC 1000 Introduction to Biochemistry.

Biological Sciences

BIOSC 0350 Genetics
BIOSC 0370 Ecology
BIOSC 1000 Introduction to Biochemistry
BIOSC 1030 Commercial Microbiology
BIOSC 1500 Cell Biology
BIOSC 1810 Macromolecular Structure and Function
BIOSC 1820 Metabolic Pathways
BIOSC 1850 Microbiology
BIOSC 1940 Molecular Biology

Computer Science

CS 0441 Discrete Structures for Computer Science
CS 0445 Introduction to Information Structure

Geology and Planetary Science

GEOL 1001 Mineralogy#
GEOL 1500 Introduction to Geochemistry

Chemistry

CHEM 1210 Digital Electronics#
CHEM 1260 Intermediate Analytical Chemistry
CHEM 1310 Synthetic Organic Chemistry
CHEM 1380 Techniques of Organic Research
CHEM 1450 Molecular Modeling and Graphics
CHEM 1460 Introduction to Modern Computational Science
CHEM 1480 Intermediate Physical Chemistry
CHEM 1600 Synthesis and Characterization of Polymers
CHEM 1605 Synthesis and Characterization of Polymers Lab
CHEM 1700 Undergraduate Research Seminar
CHEM 1710 Undergraduate Research#
CHEM 1720 Undergraduate Teaching Experience

Mathematics

MATH 0250 Matrix Theory and Differential Equations
MATH 1180 Linear Algebra 1

Statistics

STAT 1000 Applied Statistics Methods

Chemistry Options

Pitt's undergraduate chemistry program allows students to pursue special options that combine chemistry and another area of study that suits their interests and is relevant to their career goals. Options are available in bioscience, business, communications, computer science, education, and polymer science. In each option, you take courses in the chosen second discipline in place of selected science courses required for the standard chemistry major, so you are not required to earn additional credits to graduate.

Bioscience Option 14 total credits

The bioscience option includes the core bioscience courses and an introduction to molecular biology, environmental biology, and biochemistry. A chemistry degree supplemented with bioscience courses is a successful combination for students interested in the graduate health professions, including medical and dental school; graduate study in biochemistry; or a career in the nutrition, pharmaceutical, genetic engineering, environmental science, or fine chemicals industries. The requirements for the bioscience option are as follows:

BIOSC 0050 Foundations of Biology 1/BIOSC 0150 Foundations of Biology Laboratory 1
BIOSC 0060 Foundations of Biology 2/BIOSC 0160 Foundations of Biology Laboratory 2

Choice of two courses:

BIOSC 0350 Genetics
BIOSC 0370 Ecology
BIOSC 1000 Biochemical Concepts
BIOSC 1030 Commercial Microbiology
BIOSC 1500 Cell Biology
BIOSC 1810 Principles of Biochemistry
BIOSC 1850 Microbiology
BIOSC 1940 Molecular Biology

Business Option 16 credits

Some students wish to increase their marketability in the business, industry, or research world by pursuing the business option along with a chemistry degree. This option introduces you to the basics of economic theory and accounting, marketing, market research, advertising sales, and management. It is particularly beneficial to students interested in a career in chemical or instrumental sales, technical marketing, or management. The requirements for the business option are as follows:

ECON 0100 Introduction to Microeconomic Theory or ECON 0110 Introduction to Macroeconomic Theory
BUSERV 1920 Financial Accounting
BUSERV 1925 Cost Accounting

Choice of three courses:

BUS 8521 Marketing Research, BUS 8526 Consumer Behavior, or BUS 8531 Advertising and Promotion	BUSERV 1915 Introduction to Management BUSERV 1955 Principles of Selling BUSERV 1980 The Legal Environment of Business BUSERV 1985 Small Business Management
BUSMKT1040 Introduction to Marketing	
BUSERV 1910 Introduction to Business	

You also may wish to consider the School of Arts and Sciences/business dual major program, in which you earn full degrees in both chemistry and business. For more information, contact the Office of Admissions and Financial Aid.

Communications Option 12 credits

The ability to communicate scientific material accurately and imaginatively for technical audiences and laypersons is a valuable skill. The courses available in the communications option introduce you to the language, forms, roles, and audiences of scientific communication as it is used in business, the scientific community, and society in general. This option prepares you for career opportunities in technical writing, marketing, advertising, scientific journalism, and education. The requirements for the communications option are as follows:

Choice of three courses:

ENGCMP 0400 Written Professional Communication	COMMRC 0320 Mass Communication Process
ENGWRT 1310 Newspaper 1	COMMRC 1105 Television and Society
ENGWRT 1320 Newspaper 2	LING 0080 Aspects of Languages
ENGWRT 1330 Nonfiction 1	ENGWRT 1394 Science Writing
ENGWRT 1340 Nonfiction 2	

Photonics Option 12 credits

The photonics industry crosses the boundaries of spectroscopy, imaging, displays, and optical communications—the high tech world. There is strong overlap with chemistry, since modern chemistry involves numerous photonic techniques, including lasers, photon counting, nonlinear optic methods such as four-wave mixing, and ultrafast (femtosecond) time resolution. The photonics option allows students to learn cutting-edge photonics methods in physics and electrical engineering. Students also may continue on to earn the Certificate in Photonics by taking additional courses (see the Web site www.phyast.pitt.edu/~snoke/photonics). The requirements for the photonics option are as follows:

PHYS 1361 Wave Motion Optics
CHEM 1470 Photonics I
CHEM 1472 Photonics II

Choice of one course:

EE 1259 Electromagnetics
PHYS 1225 Analog and Digital Electronics

Education Option 12 credits

The demand for qualified science and math teachers continues to grow as our world becomes increasingly changed by high technology. Combining the education option with your degree in chemistry gives you an introduction to the foundations of science education and educational psychology. Students who earn a degree in chemistry with the education option are qualified to enter a one-year education certification program or a master's degree program in science education in Pitt's School of Education. The requirements for the education option are as follows:

BIOSCI 0050/0150 Foundation of Biology with Laboratory
ADMPS 1001 Social Foundations of Education
I&L 1430 Introduction to Science Education
PSYED 1001 Educational Psychology
or PSYED 1003 Adolescent Psychology

Material Science Option 10 credits

Chemists trained in material science are in great demand in education and industry. This option provides lecture and laboratory experience working with synthetic and naturally occurring large molecules. Students considering graduate study in chemistry or material science, or careers in the chemical industry will find this option useful. The requirements for the material science option are as follows:

CHEM 1600 Synthesis and Characterization of Polymers
CHEM 1605 Polymer Chemistry Laboratory

ENGR 0022 Materials Structure and Properties
CHEM 1620 Atoms, Molecules, and Materials

Special Programs

Undergraduate Research or Teaching

Opportunities are available for earning up to three credits a term conducting undergraduate research or teaching in the chemistry department. Students work closely with a research director on a project related to their interests or teach within the general or organic chemistry laboratory programs. Research projects that undergraduates have worked on involve studying layered polymer strands with lasers, quantifying the chemical processes of systems such as vitamin B12 and photodynamic therapy, designing synthetic mimics of biological function to block cancer cell growth, and using computer graphics and animations to understand chemical reaction mechanisms. The department also participates in the University co-op program. Here students spend alternate terms attending classes and working for a chemical company. This experience usually occurs during the student's junior and senior years.

Faculty

Faculty members in the Department of Chemistry are consistently recognized for their research and teaching accomplishments. These awards include the Presidential Young Investigators Award, Cope Scholar Award, and ACS awards, as well as the Chancellor's Distinguished Research and Teaching and Public Service Awards, Bellet Arts and Sciences Teaching Award, and the Carnegie Science Center Excellence in Teaching Award. Mellon Professor John Yates heads one of the country's strongest research teams in the department's Surface Science Center. Problems currently under study range from the bonding of plastics to metal to the analysis of particulates emitted by diesel engines.

One of the most exciting frontier areas in contemporary chemical research is the field of molecular recognition. Molecular recognition refers to interactions that take place between molecules, often during chemical reaction, that depend upon complementary size, shape, and functionality; i.e., one molecule is unable to "recognize" in another molecule the potential for interaction and/or reaction. Work underway in the chemistry department by Craig Wilcox focuses on synthesis of model organic compounds, which are then tested against each other for effectiveness of intervention or reaction. This work has potential application for chemical purification, synthesis or specific enzyme systems, and specific drug design.

Under the direction of Peter Wipf, the chemistry department houses the first academic combinational center in the nation. The area of organic chemistry research should prove to be an important addition to work being done in the field of drug discovery and synthesis. The PPG Award Materials Characterization lab is also part of the Center for Molecular and Materials Simulation. Under the direction of Ken Jordan, the center is looking at the advanced simulation of the behavior of polymers, colloids, proteins, and semiconductors.

Job Opportunities

Careers directly associated with chemistry: A wide variety of industrial and corporate career opportunities is to be found in agricultural chemistry, food chemistry, environmental science, petrochemicals, pharmaceuticals, semi-conductors, and electronics, as well as in basic research. For those who want to become involved in fundamental chemical research demanding considerable originality, ingenuity, and so on, graduate study is essential. Careers outside the mainstream of chemistry: Many opportunities are available for chemistry majors with skills in business (sales, technical marketing, and management); communications (technical writing, and journalism); computer science (programming, database management, and information science); and biology (drug design and synthesis, drug testing, and healthcare testing).

For advising information, contact:

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For more information about other majors, please contact:

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