Chemistry

College of Natural Science and Mathematics
Department of Chemistry and Biochemistry
907-474-5510
www.uaf.edu/chem/

B.A., B.S. Degrees

Minimum Requirements for Degrees: 130 credits

Graduates qualify for employment as teachers of chemistry; supervisors in industry; technical sales personnel; research chemists in federal, state, municipal, academic or industrial laboratories; in pre-medicine; and as laboratory technicians. Graduates also find positions in the environmental sciences, oceanography and related interdisciplinary fields. Many chemistry graduates elect to pursue advanced M.S., Ph.D., pharmacology or M.D. degrees.

The chemistry curriculum meets the American Chemical Society standards of introducing the basics of general, organic, inorganic, physical and analytical chemistry, and biochemistry. Undergraduate research leading to publications is strongly encouraged and many of the laboratory-based courses have a research component built into them. There are also options for an ACS-accredited degree which provides students additional exposure to environmental chemistry, biochemistry or forensic chemistry. Limited teaching assistantships are often available for upper division students, which strengthens leadership and communication skills.

The Bachelors degree in Environmental Chemistry prepares students for public and private sector jobs related to Environmental Science and Technology, or for graduate programs in Environmental Chemistry and related disciplines. The degree program is designed to provide students with core training in the chemical sciences, while providing exposure to a broad range of related disciplines. Students work with a faculty advisor to select required elective courses that best meets their interests and academic goals.

Students are also required to enroll in research credits with a focus on an Environmental Chemistry topic. This provides an opportunity for students to gain first hand experience working on advanced topics that are generally outside of the scope of an undergraduate curriculum. For a description of the field of Environmental Chemistry, see the Environmental Chemistry graduate program.

The chemistry and biochemistry department is housed in the Natural Sciences Facility, which is equipped with research-grade instrumentation, including a high field nuclear magnetic resonance spectrometer, FT infrared spectrometers, atomic absorption spectrometer, UV-VIS diode array spectrometers, two gas chromatographs interfaced with mass spectrometers, a gas chromatograph with a flame ionization detector, high performance liquid chromatograph, capillary electrophoresis and a modern glove box for handling air sensitive chemicals. Equipment for specialized X-ray diffractometry, electron microscopy, liquid scintillation counting, atomic force-field microscopy, dynamic light scattering analyses, etc. is available in cooperation with other UAF departments and institutes. Two computer laboratories equipped with modern chemical software (HyperChem, ACD Labs, ChemDraw, Chem Sketch, Mestrec) and other software such as Word, Excel, PowerPoint and Endnote are available for all students enrolled in F200-level or above courses.

Major — B.A. Degree

1. Complete the general university requirements. (See page 124. As part of the core curriculum requirements, complete: MATH F200X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.A. degree requirements. (See page 128. As part of the B.A. degree requirements, complete: MATH F201X.)
3. Complete the following program (major) requirements:*
   - CHEM F105X—General Chemistry 4
   - CHEM F106X—General Chemistry 4
   - CHEM F202—Basic Inorganic Chemistry 3
   - CHEM F212—Chemical Equilibrium and Analysis 3
   - CHEM F313—Chemical Analysis of Dynamic Systems 2
   - CHEM F321—Organic Chemistry 3
   - CHEM F322—Organic Chemistry 3
   - CHEM F324W—Organic Laboratory 4
   - CHEM F331—Physical Chemistry 3
   - CHEM F332—Physical Chemistry 3
   - CHEM F412—Instrumental Analytical Methods 3
   - CHEM F413W—Analytical Instrumental Laboratory 3
   - CHEM F434W—Instrumental Methods in Physical Chemistry 3
   - CHEM F481—Seminar 1
   - CHEM F482O—Seminar 2
4. Complete the following:
   - MATH F202X—Calculus 4
5. Minimum credits required 130

* *Student must earn a C grade or better in each course.*

Major — B.S. Degree

1. Complete the general university requirements. (See page 124. As part of the core curriculum requirements, complete: MATH F200X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.S. degree requirements. (See page 129. As part of the B.S. degree, complete: MATH F201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the program (major) requirements as listed under Chemistry — B.A. Degree.
4. Complete the following:*
   - CHEM F402—Inorganic Chemistry** 3
   - CHEM F450—General Biochemistry Macromolecules (3) or CHEM F451—General Biochemistry Metabolism 3
   - CHEM F488—Undergraduate Chemistry and Biochemistry Research** 4
5. Minimum credits required 130

* *Student must earn a C grade or better in each course.*

** *Advanced courses in the physical or biological sciences or mathematics may be substituted with permission of the head of the chemistry and biochemistry department. However, the student will not receive an ACS-certified degree.*

Note: Upon completing the recommended curriculum and fulfilling all general university requirements, the student will receive a bachelor's degree certified by the American Chemical Society.

Note: The electives must include at least 6 credits at the upper-division level (to satisfy the UAF general degree requirements for 39 upper-division.)

Concentrations: Biochemistry/Molecular Biology, Environmental Chemistry, Forensic Chemistry

Biochemistry/Molecular Biology

1. Complete the general university requirements. (See page 124. As part of the core curriculum requirements, complete: MATH F200X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.S. degree requirements. (See page 129. As part of the B.S. degree requirements, complete: MATH F201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the following program (major) requirements:*
   - BIOL F115X—Fundamentals of Biology I....4
   - BIOL F116X—Fundamentals of Biology II....4
   - BIOL F342—Microbiology (4) or BIOL F362—Principles of Genetics (4) or BIOL F418W—Developmental Biology (4) 4
   - CHEM F105X—General Chemistry 4
   - CHEM F106X—General Chemistry 4
   - CHEM F212—Chemical Equilibrium and Analysis....3
   - CHEM F313—Chemical Analysis of Dynamic Systems....2
   - CHEM F321—Organic Chemistry....3
   - CHEM F322—Organic Chemistry....3
   - CHEM F324W—Organic Laboratory....4
   - CHEM F331—Physical Chemistry....3
   - CHEM F332—Physical Chemistry....3
   - CHEM F413W—Analytical Instrumental Laboratory** (3) or CHEM F434W—Instrumental Methods in Physical Chemistry (3) 3
   - CHEM F450—General Biochemistry Macromolecules (3) or CHEM F451—General Biochemistry Metabolism 3
   - CHEM F481—Seminar....1
   - CHEM F482O—Seminar....2
   - CHEM F488—Undergraduate Chemistry and Biochemistry Research (3) 3
   - Major elective (approved by department head)*** 6
4. Complete the following:
   - MATH F202X—Calculus....4
5. Minimum credits required....130

* *Student must earn a C grade or better in each course.*
** *Requires CHEM F412 as prerequisite.*
*** *CHEM F202, F402 required for ACS-accredited degree.*

Environmental Chemistry

1. Complete the general university requirements. (See page 124. As part of the core curriculum requirements, complete: MATH F200X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.S. degree requirements. (See page 129. As part of the B.S. degree, complete: MATH F201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the following:*
   - CHEM F105X—General Chemistry 4
   - CHEM F106X—General Chemistry 4
   - CHEM F202—Basic Inorganic Chemistry....3
   - CHEM F212—Chemical Equilibrium and Analysis....3
   - CHEM F313—Chemical Analysis of Dynamic Systems....2
   - CHEM F321, F322—Organic Chemistry 6
   - CHEM F324W—Organic Laboratory....4
   - CHEM F331, F332—Physical Chemistry....6
   - CHEM F412—Instrumental Analytical Methods 3
   - CHEM F413W—Analytical Instrumental Laboratory....3
   - CHEM F434W—Instrumental Methods in Physical Chemistry 3
   - CHEM F450—General Biochemistry Macromolecules (3) or CHEM F451—General Biochemistry Metabolism 3
   - CHEM F481—Seminar....1
   - CHEM F482O—Seminar....2
   - CHEM F488—Undergraduate Chemistry and Biochemistry Research (Environmental Topic) 2
4. Complete the following:
   - MATH F202X—Calculus....4
   - STAT F300—Statistics....3
5. Complete two of the following courses:*
   - BIOL F115X—Fundamentals of Biology I....4
   - BIOL F116X—Fundamentals of Biology II....4
   - GEOS F101X—The Dynamic Earth 4
   - GEOS F125X—Humans, Earth, and the Environment 4
   - ATM F101X—Weather and Climate of Alaska 4
6. Complete one of the following advanced courses:*
   - BIOL F271—Principles of Ecology....4
   - BIOL F342—Microbiology 4
   - BIOL F443W—Microbial Ecology....3
   - BIOL F483—Stream Ecology....3
   - ENVE F458—Energy and the Environment....3
   - NRM F380W—Soils and the Environment 3
   - ATM F401—Introduction to Atmospheric Science 3
   - CHEM F402—Advanced Inorganic Chemistry 3
7. Complete one of the following advanced courses:*
   - BIOL F442W,O/2—Advanced Microbiology 4
   - CHEM F406—Atmospheric Chemistry....3
   - CE F441—Environmental Engineering....4
   - GEOS F417—Introduction to Geochemistry 3
8. Minimum credits required....130

* *Student must earn a C grade or better in each course.*

Forensic Chemistry

1. Complete the general university requirements. (See page 124. As part of the core curriculum requirements, complete: MATH F200X; PHYS F103X and PHYS F104X, or PHYS F211X and PHYS F212X.)
2. Complete the B.S. degree requirements. (See page 129. As part of the B.S. degree, complete: MATH F201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the program (major) requirements as listed under Chemistry — B.A. degree.
4. Complete the following chemistry requirements:*
   CHEM F402—Inorganic Chemistry 3
   CHEM F450—General Biochemistry Macromolecules (3)
   or CHEM F451—General Biochemistry Metabolism 3
   CHEM F488—Undergraduate Chemistry and Biochemistry Research (Environmental Topic) 2
5. Complete the following justice requirements:*
   JUST F110—Introduction to Justice.....3
   JUST F222—Research Methods.....3
   JUST F251—Criminology 3
   JUST F300X—Ethics and Justice** 3
   JUST F354—Procedural Law.....3
   JUST F454W—Advanced Problems in Procedural Law 3
6. Minimum credits required 130

* *Student must earn a C grade or better in each course.*
** *JUST F300X may not be used to fulfill core ethics requirement.*

Requirements for Chemistry Teachers (grades 7 – 12)

1. Complete all the requirements of the chemistry B.A. or B.S. degree you wish to seek.
2. All prospective chemistry teachers must complete the following:
   CHEM F450—General Biochemistry Macromolecules (3)
   or CHEM F451—General Biochemistry Metabolism 3
   CHEM F488—Undergraduate Chemistry and Biochemistry Research 4
3. All prospective science teachers must complete the following:
   PHIL F481—Philosophy of Science (3).....3

Note: We strongly recommend that prospective secondary science teachers seek advising from the UAF School of Education early in your undergraduate degree program so that you can be appropriately advised of the state of Alaska requirements for teacher licensure. You will apply for admission to the UAF School of Education's post-baccalaureate teacher preparation program, a one-year intensive program, during your senior year. Above requirements apply to all candidates who apply to the UAF School of Education Spring 2006 or later for licensure in chemistry.

Minor

Chemistry

1. Complete the following:
   CHEM F105X—General Chemistry 4
   CHEM F106X—General Chemistry 4
2. Complete the following approved electives:
   CHEM F212—Chemical Equilibrium and Analysis* 3
   CHEM F321 & CHEM F322—Organic Chemistry 6
   CHEM F331 & CHEM F332—Physical Chemistry 6
3. Complete two of the following chemistry lab courses:
   CHEM F202—Basic Inorganic Chemistry 3
   CHEM F313—Chemical Analysis of Dynamic Systems* 2
   CHEM F324—Organic Chemistry Lab.....4
4. Minimum credits required .....22 – 24

* *CHEM F324W may be substituted for both of these courses.*

Biochemistry

1. Complete the following foundation courses:
   CHEM F105X—General Chemistry 4
   CHEM F106X—General Chemistry 4
2. Complete the following:
   CHEM F321—Organic Chemistry.....3
   CHEM F322—Organic Chemistry.....3
   CHEM F331—Physical Chemistry 3
   CHEM F451—General Biochemistry — Metabolism.....3
3. Complete two of the following chemistry lab courses:
   CHEM F202—Basic Inorganic Chemistry 3
   CHEM F313—Chemical Analysis of Dynamic Systems 2
   CHEM F324—Organic Chemistry Lab.....4
4. Minimum credits required .....25 – 27

Baccalaureate Core Requirements

All degrees (e.g. B.A., B.S., etc.) require additional courses. Refer to specific degree and program requirements.

COMMUNICATION (9)

Complete the following:
ENGL F111X ..... (3) _____
ENGL F190H may be substituted.

Complete one of the following:
ENGL F211X **OR** ENGL F213X ..... (3) _____

Complete one of the following:
COMM F131X **OR** COMM F141X ..... (3) _____

PERSPECTIVES ON THE HUMAN CONDITION (18)

Complete all of the following four courses:
ANTH F100X/SOC F100X ..... (3) _____
ECON F100X **OR** PS F100X ..... (3) _____
HIST F100X ..... (3) _____
ENGL/FL F200X ..... (3) _____

Complete one of the following three courses:
ART/MUS/THR F200X, HUM F201X **OR** ANS F202X ..... (3) _____

Complete one of the following six courses:
BA F323X, COMM F300X, JUST F300X, NRM F303X,
PS F300X **OR** PHIL F322X ..... (3) _____

OR complete 12 credits from the above courses PLUS
- two semester-length courses in a single Alaska Native language or other non-English language **OR**
- three semester-length courses (9 credits) in American Sign Language taken at the university level.

MATHEMATICS (3)

Complete one of the following:
MATH F103X, MATH F107X, MATH F161X **OR**
STAT F200X ..... (3 – 4) _____
** No credit may be earned for more than one of MATH F107X or F161X.*

OR complete one of the following:*
MATH F200X, MATH F201X, MATH F202X,
MATH F262X **OR** MATH F272X ..... (4) _____
**Or any math course having one of these as a prerequisite.*

NATURAL SCIENCES (8)

Complete any two (4-credit) courses:
ATM F101X ..... (4) _____
BIOL F100X ..... (4) _____
BIOL F103X ..... (4) _____
BIOL F104X ..... (4) _____
BIOL F111X ..... (4) _____
BIOL F112X ..... (4) _____
BIOL F115X ..... (4) _____
BIOL F116X ..... (4) _____
CHEM F100X ..... (4) _____
CHEM F103X ..... (4) _____
CHEM F104X ..... (4) _____
CHEM F105X ..... (4) _____
CHEM F106X ..... (4) _____
GEOG F205X ..... (4) _____
GEOS F100X ..... (4) _____
GEOS F101X ..... (4) _____
GEOS F112X ..... (4) _____
GEOS F120X ..... (4) _____
GEOS F125X ..... (4) _____
MSL F111X ..... (4) _____
PHYS F102X ..... (4) _____
PHYS F103X ..... (4) _____
PHYS F104X ..... (4) _____
PHYS F115X ..... (4) _____
PHYS F116X ..... (4) _____
PHYS F175X ..... (4) _____
PHYS F211X ..... (4) _____
PHYS F212X ..... (4) _____
PHYS F213X ..... (4) _____

LIBRARY AND INFORMATION RESEARCH (0 – 1)
Successful completion of library skills competency test **OR**
LS F100X or F101X prior to junior standing ..... (0 – 1) _____

UPPER-DIVISION WRITING AND ORAL COMMUNICATION (0)

Complete the following:
Two writing intensive courses designated (W) ..... (0) _____
One oral communication intensive course designated (O) ..... (0) _____
OR two oral communication intensive courses designated (O/2), at the upper-division level (see degree and/or major requirements) ..... (0) _____

TOTAL CREDITS REQUIRED ..... 38 – 39

UNIVERSITY OF ALASKA FAIRBANKS
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