

Chemistry and Engineering Science

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Chemistry

Chemistry is often considered the “central science,” because an understanding of chemistry is essential for success in most science-related occupations. The department’s contemporary curricular program equips students for living and working in our modern, technologically advanced society.

Experimentation is at the heart of the program. On campus, students use modern instrumentation in course work and individual research. May Term and summer internships provide authentic research and work experiences at the industrial or university level.

Chemistry faculty members are effective teachers and advisers, and the smaller class size enables faculty and students to become well acquainted.

Program goals:

- To provide a curriculum designed to serve the needs of the following groups of students: (1) chemistry and biochemistry majors intending to continue on to professional study (M.S., Ph.D.), go directly into chemistry- and biochemistry-related employment, or teach chemistry/science at the secondary level; (2) chemistry, biochemistry, and other science majors intending to enter the health professions (M.D., D.O., D.D.S., D.V.M., Pharm D.); (3) other science majors intending to enter allied health fields (medical technology, chiropractic, occupational therapy, optometry, podiatry, physical therapy, and nursing); (4) students interested in environmental studies; and (5) non-science majors interested in the study of chemistry/science as a science component of the liberal arts.
- To challenge students to be critical thinkers and enthusiastic scientists who are capable of independent laboratory experimentation and continued professional growth after completing their college studies.
- To confront students with the needs and priorities of modern society and to emphasize their responsibility to society in their roles as scientists and citizens.

Major in Chemistry

13 ½-14 ½ course credits:

CH 113, 114 Principles of Chemistry I, II (or CH 111, 112 General Chemistry I, II and CH 115 Selected Principles of Chemistry)

CH 211 Organic Chemistry I

CH 212 Organic Chemistry II

CH 217 Analytical Chemistry

CH 315 Physical Chemistry I

CH 340 Analytical and Physical Measurements

CH 461 Science Seminar (½)

MA 201 Calculus I

MA 202 Calculus II

PHY 203, 204 Classical Physics I, II (or PHY 101, 102 General Physics I, II)

Two elective course credits from

CH 316 Physical Chemistry II

CH 371 Internship

CH 400-level course except CH 425

By completing the chemistry major, students have met the requirements for OCAC/ILAC.

DEPARTMENT RECOMMENDATIONS

Students planning graduate study and professional work in chemistry should take

CH 113 Principles of Chemistry I, CH 114 Principles of Chemistry II (or CH 111 General Chemistry I, CH 112 General Chemistry II, CH 115 Selected Principles of Chemistry), CH 211 Organic Chemistry I, CH 212 Organic Chemistry II, CH 217 Analytical Chemistry, CH 315 Physical Chemistry I, CH 316 Physical Chemistry II, CH 325 Biochemistry, CH 340 Analytical and Physical Measurements, CH 420 Advanced Organic Chemistry, CH 421 Advanced Inorganic Chemistry, CH 450 Independent Study

(or CH 371 Internship), CH 461 Science Seminar (½), CH 471 Research; Special Topics courses are recommended when offered. Introductory courses in German or French, computer science courses (CS 120 Introduction to Computers and Programming), and advanced courses in mathematics and physics are also recommended.

Students enrolled in the cooperative degree program in chemical engineering may complete the major in chemistry at Wartburg (B.A. degree) and the chemical engineering major at the cooperating institution (B.S. degree) by taking at least CH 113 Principles of Chemistry I, CH 114 Principles of Chemistry II (or CH 111 General Chemistry I, CH 112 General Chemistry II, CH 115 Selected Principles of Chemistry), CH 211 Organic Chemistry I, CH 212 Organic Chemistry II, CH 217 Analytical Chemistry, CH 315 Physical Chemistry I, plus satisfactorily completing three courses in chemical engineering. This program requires at least five years to complete—three years at Wartburg and two years at the engineering institution.

Students majoring in chemistry and interested in professional work in medicine should consult with Dr. David Hampton for course recommendations in biology.

Major in Biochemistry

18½-19½ course credits:

CH 113, 114 Principles of Chemistry I, II (or CH 111, 112 General Chemistry I, II and CH 115 Selected Principles of Chemistry)

CH 211 Organic Chemistry I

CH 212 Organic Chemistry II

CH 315 Physical Chemistry I

CH 325 Biochemistry

CH 425 Advanced Biochemistry

CH 455 Methods of Biochemical Research (½)

CH 456 Student Originated Research (½)

CH 461 Science Seminar (½)

BI 151 Ecosystems, Cells, and Evolution

BI 152 Phylogeny, Structure, and Function

BI 211 Genetics

MA 201 Calculus I
MA 202 Calculus II
PHY 203, 204 Classical Physics I, II (or PHY 101, 102 General Physics I, II)

One elective course credit from

BI 221 Cell Biology
BI 304 Developmental Biology
BI 305 Microbiology
BI 335 Neurobiology
BI 414 Molecular Biology

One elective course credit from

CH 217 Analytical Chemistry
CH 316 Physical Chemistry II
CH 420 Advanced Organic Chemistry
CH 421 Advanced Inorganic Chemistry

By completing the biochemistry major, students have met the requirements for OCAC/ILAC.

DEPARTMENT RECOMMENDATIONS

Students planning graduate study and professional work in biochemistry should take additional advanced courses in biology (BI 221 Cell Biology, BI 305 Microbiology, BI 414 Molecular Biology) and in chemistry (CH 316 Physical Chemistry II, CH 340 Analytical and Physical Measurements, CH 420 Advanced Organic Chemistry, and CH 421 Advanced Inorganic Chemistry).

Students majoring in biochemistry and interested in professional work in medicine should consult with Dr. Shawn Ellerbroek for course recommendations in biology and chemistry.

Minor in Chemistry

9-10 course credits:

CH 113, 114 Principles of Chemistry I, II (or CH 111, 112 General Chemistry I, II and CH 115 Selected Principles of Chemistry)

CH 211 Organic Chemistry I
CH 212 Organic Chemistry II
CH 217 Analytical Chemistry
CH 315 Physical Chemistry I (or CH 325 Biochemistry)
MA 201 Calculus I
PHY 203, 204 Classical Physics I, II (or PHY 101, 102 General Physics I, II)

Chemistry Teaching

For the chemistry teaching major endorsements, see Education Department listings.

Engineering Science

The engineering science major seeks to prepare students for the rapidly evolving world of today. Unlike most engineering programs, this major is intentionally designed to give students a breadth of competence in the key areas common to all engineering specialties without sacrificing opportunities to explore the wide variety of experiences a liberal arts setting can afford. The program is built on a solid foundation in mathematics, physics, and chemistry. Technical course work focuses on com-

mon professional practice and developing problem-solving skills in the context of broad areas of engineering analysis.

Program goals:

- Students will master fundamental scientific and technical content and skills.
- Students will acquire an understanding of the ethical, global, and societal dimensions of the profession.
- Students will develop skills in communication, critical thinking, team building, and self-training.

Major in Engineering Science

14 ½ course credits:

CS 120 Introduction to Computers and Programming

MA 201 Calculus I

MA 202 Calculus II

PHY 203 Classical Physics I

PHY 204 Classical Physics II

CH 113 Principles of Chemistry I

CH 114 Principles of Chemistry II

ES 103 Introduction to Engineering

ES 204 Electrical Circuits

ES 205 Structural Statics

ES 206 Thermal Science

ES 402 Engineering Seminar (½)

Three credits from

ES 303 Structural Analysis

ES 304 Fluid Mechanics

ES 305 Electronics and Digital systems

ES 371 Internship

By completing the engineering science major, students have met the requirements for OCAC/ILAC.

Minor in Engineering Science

10 course credits:

MA 201 Calculus I

MA 202 Calculus II

PHY 203 Classical Physics I

PHY 204 Classical Physics II

CH 113 Principles of Chemistry I

CH 114 Principles of Chemistry II

ES 103 Introduction to Engineering

Three courses from

CS 120 Introduction to Computers and Programming

ES 204 Electrical Circuits

ES 205 Structural Statics

ES 206 Thermal Science

ES 303 Structural Analysis

ES 304 Fluid Mechanics

ES 305 Electronics and Digital Systems