CHEMISTRY AND PHYSICS

Department Description

The Department of Chemistry and Physics offers majors in chemistry, chemistry with a concentration in biochemistry, and physics. Minors in chemistry and physics are also offered. The courses of study are designed to meet the highest professional standards and are attuned to meet the needs of students with individual variations in preparation, interests, and career goals. Graduates of the chemistry and physics programs are well prepared to undertake careers in industry or teaching, graduate work in chemistry or physics, or advanced study in professional programs such as law or the health professions (including medicine, pharmacy, or dentistry). The majors in chemistry and physics also allow students to seamlessly participate in the Five-Year Dual-Degree Engineering Program with the University of Notre Dame.

Some courses in chemistry and physics are offered as a service to the other departments that require backgrounds in chemistry or physics for their students. Other courses are specifically designed to fulfill the General Education Program requirements in the natural sciences for students who are not science majors but who seek to understand scientific concepts and processes that affect their daily lives in a technology-dependent world.

Certain course substitutions may be made with the consent of the department to meet the specialized needs of individual students. Students interested in attending graduate school in chemistry, biochemistry, or physics are strongly encouraged to participate in research and should consult the department chair about enrolling in additional chemistry, mathematics, and/or biology courses.

Study Abroad

Saint Mary's has a long history of providing quality international programs as an essential part of our educational mission—forming women leaders who will make a difference in the world. As this world becomes increasingly interdependent, the College offers an expanding range of semester, year, semester break, and summer study and service programs in a wide variety of countries, and encourages students to take advantage of them. Learn more about the various Study Abroad opportunities (https://catalog.saintmarys.edu/undergraduate/academic-life/international-programs/).

Programs

- Biochemistry Concentration, Chemistry Major, Bachelor of Science
 BIOC (https://catalog.saintmarys.edu/undergraduate/programs/ chemistry-physics/biochemistry-concentration-bachelor-science/)
- Chemistry, Bachelor of Science CHEM (https:// catalog.saintmarys.edu/undergraduate/programs/chemistryphysics/chemistry-bachelor-science/)
- Chemistry, Minor CHEM (https://catalog.saintmarys.edu/ undergraduate/programs/chemistry-physics/chemistry-minor/)
- Physics, Bachelor of Arts PHYS (https://catalog.saintmarys.edu/ undergraduate/programs/chemistry-physics/physics-bachelor-arts/)
- Physics, Bachelor of Science PHYS (https://catalog.saintmarys.edu/ undergraduate/programs/chemistry-physics/physics-bachelorscience/)
- Physics, Minor PHYS (https://catalog.saintmarys.edu/ undergraduate/programs/chemistry-physics/physics-minor/)

Department Chair

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CHEMISTRY Faculty

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Physics Program Director

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PHYSICS Faculty

M. Gebran, S. Ghonge, C. Peters

Chemistry Courses

CHEM 101 Mystery, Mayhem, and Murder: Chemistry for the Citizen (3,4)

A survey course for students majoring in disciplines other than the natural sciences. Application of fundamental chemical principles to selected inorganic, organic, and biological systems, with particular emphasis on topics of interest to citizens in a technological society. Offered in fall or spring semester for 4 credits (Three hours lecture and one two-hour laboratory) or summer session for 3 credits (Three hours lecture, no laboratory).

CHEM 101L Mystery, Mayhem, and Murder: Chemistry for the Citizen Laboratory (0)

One two-hour laboratory per week. Corequisite: CHEM 101.

CHEM 102 Chemistry in Everyday Life (3)

This course seeks to make the Saint Mary's College student aware of the chemicals that affect her directly as she lives her daily life. (Three lecture hours per week).

CHEM 103 FYS: Power Up: Understanding Energy in Everyday Life (3)

Energy drives everything we do, from charging our phones to fueling global economies. This course explores the fascinating world of energy in ways that are accessible and engaging for non-science majors. We'll unravel the mysteries of how energy is produced, consumed, and impacts our planet. Through real-world examples, we'll investigate topics like biological energy, renewable energy, batteries, climate change, and the ethical dimensions of energy use in society. Students will also reflect on their personal energy consumption and explore how individual choices contribute to larger societal trends. By the end of the course, students will be equipped to think critically about energy issues and their role in shaping a sustainable future. No prior science background is required —just curiosity and a willingness to explore the forces that power our modern lives.

CHEM 104 Pop Culture Chemistry (3)

Through this course, you will be exposed to examples of chemistry in different popular culture mediums, including books, movies, television shows, the internet, and social media. Through investigation of the accuracy and validity of the science, you will learn principles of chemistry and biochemistry and will learn how to critique depictions of science in the media. In addition, this course will explore how real-world applications of chemistry influence pop culture and vice-versa. This course is for students majoring in non-science disciplines which fulfills the Natural Science (no lab) general education requirement.

CHEM 105 The Principles, Promise, and Perils of Artificial Intelligence (3)

What is Al? How does it "learn" from data? Where does the data come from? How do artificial intelligence and human intelligence differ? What are the ethical implications of artificial intelligence? What is the environmental impact of artificial intelligence? Throughout this onesemester introduction to the principles, promises, and perils of artificial intelligence, we will introduce the concepts and tools necessary to investigate and explore such questions. Specifically, we will delve into the history of computers and machine intelligence; learn how to read and utilize a machine learning algorithm; explore natural language processing algorithms such as ChatGPT; and investigate the ethical concerns regarding the training, utilization, and energy needs of artificial intelligence. We will also utilize artificial intelligence as a tool to help with brainstorming, outlining, and gathering references for a thesis-driven essay.

CHEM 118 Integrated General, Organic and Bio-Chemistry (4)

An introduction to the fundamental concepts of general chemistry, organic chemistry and biochemistry with applications to the field of nursing. Laboratory experiments will closely correspond with the lecture material. (Four hours lecture and one two-hour laboratory) Prerequisite: One year high school chemistry and MATH 102 or concurrent enrollment in any higher level math course; or permission of the instructor.

CHEM 118L Integrated General, Organic and Bio-Chemistry Laboratory (0)

One two-hour laboratory per week. Corequisite: CHEM 118.

CHEM 121 Principles of Chemistry I (4)

This course is an introduction to chemical stoichiometry, atomic and molecular structure, and bonding. Laboratory will explore principles presented in lecture. (Three-hour lecture and one three-hour laboratory). Prerequisite: high school chemistry or permission of the instructor; students must be calculus-ready. For biology, chemistry, physics, and engineering intended majors. This course also satisfies the LO2 Critical Thinking Seminar.

CHEM 121L Principles of Chemistry I Laboratory (0)

One three-hour laboratory per week. Corequisite: CHEM 121.

CHEM 122 Principles of Chemistry II (4)

An introduction to chemical energetics, chemical equilibria, acid-base chemistry, and kinetics. Laboratory will explore principles presented in lecture. (Three hours lecture and one three-hour laboratory) Prerequisite: CHEM 121 or permission of instructor.

CHEM 122L Principles of Chemistry II Laboratory (0)

One three-hour laboratory per week. Corequisite: CHEM 122.

CHEM 221 Organic Chemistry I (3)

An introduction to the theory and practice of organic chemistry. The course focuses on the foundational principles of organic chemistry, including properties, structure, nomenclature, and structural analysis of organic compounds. Reactions of alkenes, alkyl halides, and aromatic compounds are studied in depth with building a foundation of synthesis strategies. (Three hours lecture per week) Prerequisite: CHEM 122.

CHEM 221L Organic Chemistry I Laboratory (1)

A course in a variety of organic laboratory skills, including separation and purification techniques. One three hour lab per week. Corequisite: CHEM 221.

CHEM 222 Organic Chemistry II (3)

A continuation of organic chemistry I (CHEM 221), with a focus on the study of reactions and synthesis of alcohols and carbonyl compounds. Radical and cycloaddition reactions are discussed in addition to varied topics in modern organic chemistry with a focus on synthesis. (Three hours lecture per week) Prerequisite: CHEM 221.

CHEM 222L Organic Chemistry II Laboratory (1)

A course in organic chemistry laboratory skills, including emphasizing qualitative analysis using chemical and instrumental methods. One three hour lab per week. Corequisite: CHEM 222.

CHEM 311 Thermodynamics (3)

A detailed study of thermodynamics, statistical mechanics, and kinetics. This calculus- based course integrates concepts of chemistry and physics. Three hours lecture. Prerequisites: CHEM 122, PHYS 122; Recommended: CHEM 221.

CHEM 312 Quantum Chemistry (3)

A detailed study of quantum chemistry, including techniques and applications of quantum theory, atomic and molecular structure, bonding, symmetry, group theory, and spectroscopy. (Three hours lecture) Prerequisites: CHEM 122, PHYS 122. Recommended: CHEM 221, 231.

CHEM 324 Biochemistry (3)

A study of the chemical reactions of cells, the major metabolic pathways, and the interrelationship of these pathways. (Three hours lecture per week) Prerequisites: CHEM 222.

CHEM 332 Analytical Chemistry (3)

Quantitative methods of analysis are explored. The theory and application of wet chemical techniques and modern instrumental techniques (spectroscopy, chromatography and electrochemistry) are introduced with a focus on method selection and underlying chemical concepts. Analytical chemistry uses of statistics and equilibrium are also discussed. (Three hours lecture per week). Prerequisites: CHEM 221.

CHEM 342 Bio-Inorganic Chemistry (3)

This course explores the properties and bonding of inorganic elements that are important to biological systems and biologically-inspired inorganic materials. Students will apply chemical principles in understanding the endogenous roles of metals in charge balance, catalysis, and structure. Students will learn how inorganic chemists design metal-based drugs and imagining agents to solve problems in human health, and how reverse-engineering of bio-inorganic systems have led to revolutionary inorganic solid state- and nano-materials. (Three hours lecture per week) Prerequisite: CHEM 222.

CHEM 361 Advanced Laboratory I (4)

Laboratory methods in chemistry are explored. Students will learn how to design and conduct experiments and gain hands-on experience with various laboratory techniques within the overall context of answering chemical questions. They will learn the basic chemical and physical principles upon which these varied techniques are based, plus they will demonstrate and apply their overall chemical knowledge from their first through third years of courses and laboratories. Students will also learn scientific presentation and writing skills. (Two 4-hour laboratories per week). Prerequisites: CHEM 222 and CHEM 222L.

CHEM 362 Advanced Laboratory II (4)

A continuation of CHEM 361, students will explore more advanced laboratory techniques, building upon their experience of the previous course. Students will also build their scientific writing and presentation skills. (Two 4-hour laboratories per week). Prerequisite: CHEM 361.

CHEM 424 Advanced Biochemistry (3)

Advanced topics in the chemistry and chemical mechanisms involved in intermediary metabolism and developmental processes with consideration of the biochemistry current in the literature. (Three hours lecture per week). Prerequisites: CHEM 324, CHEM 311, or permission of instructor.

CHEM 431 Advanced Inorganic Chemistry (3)

A study of modern inorganic chemistry with emphasis on the principles, properties, and chemical trends of coordination compounds, This course will also explore the essentials of structure, bonding, symmetry, spectroscopy, and reactivity. (Three hours lecture per week). Prerequisite: CHEM 342.

CHEM 485 Research (1-3)

Participation in original experimental or theoretical investigation in collaboration with a member of the faculty. Prerequisite: Permission of the instructor. May be repeated.

CHEM 490 Topics in Chemistry (2,3)

Topics in Chemistry not covered in the regular department offerings and selected according to the interests of the students and instructor. Offered according to student demand. (Two or three lectures per week) Prerequisite: Permission of the instructor. May be repeated for credit with a different topic.

CHEM 495 Senior Seminar (1)

A professional development course for Chemistry and Physics majors. The course will cover various topics with a focus on writing, presentation and critical thinking skills as used in the physical sciences

CHEM 497 Independent Study (1-2)

Topics in Chemistry not covered in the regular department offerings and selected according to the interests of the students and instructor. Offered according to student demand. (Two or three lectures per week) Prerequisite: Permission of the instructor. May be repeated for credit with a different topic.

CHEM 499 Chemistry Internship (1-4)

Experience in a chemistry internship. Graded S/U. May be repeated.Prerequisites:Permission of department required.

Physics Courses

PHYS 101 Intro Topics in Physics:Motion (4)

This course provides an introduction to the concepts and applications of physics through an exploration of everyday motion. This course will involve discussions of conceptual models to facilitate analyzing and viewing the natural world. The lab component of the course introduces fundamental principles in scientific investigation and will utilize the scientific method.

PHYS 101L Intro Topics PHYS: Motion-Lab (0)

One two-hour laboratory per week. Corequisite: PHYS 101.

PHYS 102 Introductory Topics in Physics: Energy (3)

An introduction to concepts, and applications of physics through the lens of energy. This course deals with the science of national and global energy concerns. The laboratory introduces fundamental principles of scientific investigation via experimental exploration. This course is intended for students not majoring in science. (Three hours lecture and a two-hour laboratory). Prerequisite: None.

PHYS 103 Faster, Higher, Stronger: Science of Olympic Sports (3)

Faster, Higher, Stronger. Science of Olympic Sports is a topics course for students majoring in non-science disciplines which fulfills the Natural Science general education requirement. In this course, we will discuss real-life examples of physics in the sports of the summer Olympic games. Through examination of a wide variety of sports, including track & field, gymnastics, swimming, soccer, and basketball, you will learn physics concepts such as force, momentum, torque, and pressure while gaining a deeper appreciation of the performance of Olympic athletes.

PHYS 104 Physics of Sound (3)

This course is intended for students not majoring in science or mathematics. (Three hours lecture). The course will introduce students to the scientific method in the context of acoustics. The students will learn the physical concepts of waves and oscillations and their applications in music and speech. Students will also apply these concepts to understand natural phenomena and technologies related to sound.

PHYS 105 Astronomy (3)

A study of stars and galaxies within the Universe from our Earth based perspective. Scientific techniques and the history of scientific observation are included in addition to the properties of light and gravity. This course is intended for students not majoring in science or mathematics. (Three hours lecture). Prerequisite: None.

PHYS 107 Artificial Intelligence in Science and Everyday Life (3)

This course is an introduction to concepts and applications of Artificial Intelligence (AI) in Science and everyday life. It aims to give an understanding of the use and interpretation of available data and more particularly the STEM scientific data to recover accurate information using prediction techniques. This course will be based on the use of AI interactively with the students to solve real problems and predict solutions.

PHYS 111 College Physics I: Mechanics (4)

An introduction to mechanics. This is the first semester of a two-part algebra-based physics sequence designed primarily for students in lifesciences (biology, and neuroscience), speech language and pathology, and environmental studies. (Three hours of lecture and two hours laboratory.) Prerequisite: MATH 103.

PHYS 111L College Physics I Laboratory (0)

One two-hour laboratory per week. Corequisite: PHYS 111.

PHYS 112 College Physics II: Waves, Temperature, and Electricity (4)

An introduction to waves, thermodynamics, electricity, magnetism, and optics. This is the second semester of a two-part algebra-based physics sequence designed primarily for students in life-sciences (biology, and neuroscience), speech language and pathology, and environmental studies. (Three hours of lecture per week and a two-hour laboratory.) Prerequisite: PHYS 111.

PHYS 112L College Physics II Lab (0)

One two-hour laboratory per week. Corequisite: PHYS 112.

PHYS 121 General Physics I: Mechanics and Waves (4)

An introduction to mechanics, and waves. This is the first semester of a two-part calculus-based physics sequence designed for students in science, math, and engineering. (Three hours of lecture and two hours laboratory.) Prerequisite or corequisite: either MATH 131, MATH 132, or MATH 133. (High school physics strongly recommended)

PHYS 121L General Physics I Lab (0)

One two-hour laboratory per week. Corequisite: PHYS 121.

PHYS 122 General Physics II: Temperature, Electricity, and Light (4)

An introduction to thermodynamics, electricity, magnetism, and optics. This is the second semester of a two-part calculus-based physics sequence designed for students in science, math, and engineering. (Three hours of lecture per week and a two-hour laboratory.) Prerequisite: PHYS 121; and corequisite OR prerequisite either MATH 132 or MATH 133

PHYS 122L General Physics II Laboratory (0)

One two-hour laboratory per week. Corequisite: PHYS 122.

PHYS 205 Nuclear Science (3)

Nuclear science of the interplay between mathematics, science and ethics. This course contains a discussion of multiple facets of introductory nuclear science including applications such as nuclear power, nuclear weapons, nuclear medicine and food irradiation. Basic nuclear structure will be discussed as well as nuclear reactions and nucleosynthesis. Mathematical themes including algebra, statistics, probability and differential equations (exponential decay) will be introduced and used at various points in the course.

PHYS 253 General Physics III: Modern Physics (3)

An introduction to the conceptual and mathematical foundations of elementary quantum physics, and the historical framework and methodology of twentieth century physics, including contributions of women scientists. Special relativity and atomic physics are also discussed. (Three hours lecture). Prerequisite: PHYS 112 or PHYS 122; Corequisite MATH 231.

PHYS 272L Computational Physics Laboratory (1)

Computational methods in physics are explored. This course covers computational topics in physics, primarily in astrophysics, biophysics, and quantum mechanics. Offered in the fall on a three-year rotation. (Three hours laboratory). Prerequisite: PHYS 122.

PHYS 282L Modern Experimental Laboratory (1)

Experimental methods in modern physics are explored. This course covers experimental topics primarily from modern physics and materials science. Offered in the fall on a three-year rotation. (Three hours laboratory). Prerequisite: PHYS 122.

PHYS 292L Wave Mechanics Laboratory (1)

Laboratory methods in physics are explored. This course covers experimental and computational topics related to wave mechanics in both mechanical phenomenon and circuit analysis. Offered in the fall on a three-year rotation. (Three hours laboratory). Prerequisite: PHYS 122.

PHYS 321 Lagrangian Mechanics (1)

This course will cover topics in classical mechanics including wave motion. The primary focus is the Lagrange formalism which is used to setup simple differential equations and solve for equations of motion. This course covers the same material as PHYS 323 but only lasts for the first third of the semester. This course is intended for students who are also required to take additional courses in mechanics. Typically offered fall of even-numbered years. (Three hours lecture). Prerequisite: PHYS 122 and Corequisite: MATH 231

PHYS 323 Classical Mechanics (3)

A detailed study of classical mechanics including Newton's laws, and conservation laws. Equations of motion are derived based on the Lagrange and Hamiltonian formalisms. Typically offered fall of evennumbered years. (Three hours lecture). Prerequisite: PHYS 122 and Corequisite: MATH 231.

PHYS 341 Statistical Mechanics (1)

This course will cover topics in thermodynamics from a statistical mechanics viewpoint. Systems containing large numbers of particles will be analyzed using Boltzmann statistics. This course covers the same material as PHYS 343 but only lasts for the first third of the semester. This course is intended for students who are also required to take additional courses in Thermodynamics. Typically offered fall of odd-numbered years. (Three hours lecture). Prerequisite: PHYS 122 and Corequisite: MATH 231.

PHYS 343 Thermodynamics (3)

A detailed study of statistical mechanics and thermodynamics. Systems containing large numbers of particles will be analyzed using Boltzmann statistics. The laws of thermodynamics will be introduced. Cyclic processes and other thermodynamic concepts will be developed. Typically offered fall of even-numbered years. (Three hours lecture). Prerequisite: PHYS 122 and Corequisite: MATH 231.

PHYS 373 Fundamentals of Astrophysics (3)

The course will include an introduction to astrophysics. The night sky and coordinate systems, Kepler's law, observational astrophysics, magnitudes, and telescope types will all be discussed. The course will also introduce students to stellar physics and the evolution of stars.

PHYS 424 Quantum Mechanics (3)

A detailed physical and mathematical study of quantum mechanics including wave mechanics. Physical applications of quantum mechanics are also discussed. Typically offered spring of odd-numbered years. (Three hours lecture). Prerequisites: PHYS 253 and MATH 326.

PHYS 444 Electricity and Magnetism (3)

A detailed physical and mathematical study of electricity and magnetism focusing on applications from vector calculus. Interactions between electric and magnetic fields are explored including the use of Maxwell's equations. Typically offered spring of even-numbered years. (Three hours lecture). Prerequisites: PHYS 122 and MATH 426.

PHYS 485 Research (1-3)

Participation in original experimental or theoretical investigation in collaboration with a member of the faculty. Prerequisite: Permission of the department chair. May be repeated.

PHYS 490 Special Topics in Physics (1-5)

Topics in Physics not covered in the regular department offerings and selected according to the interests of the students and the instructor. Offered according to student demand. (Two or three lectures per week) Prerequisite: Permission of the instructor. May be repeated for credit with a different topic.

PHYS 495 Senior Seminar (1)

A professional development course for Physics majors. The course will cover various topics with a focus on writing, presentation and critical thinking skills as used in the physical sciences.

PHYS 497 Independent Study (1-3)

Enables properly qualified students to carry out independent study under the guidance of an instructor. Content dependent on student need and interest. Elective with permission of the department chair. Generally graded S/U; may be letter graded. May be repeated with a different topic.

Four Year Plan for Chemistry and Physics Programs

- Chemistry (p. 5)
- Biochemistry (p. 6)
- Physics (p. 7)

Bachelor of Science in Chemistry

The major in Chemistry requires 11 courses in chemistry with flexibility at the upper level. The 4-year schedule below is a model, but students often spread their Chemistry Core and Chemistry Advanced courses out over the junior and senior year. The Advanced Writing Proficiency is usually completed in the fall semester of the senior year, while the Senior Comprehensive is completed in the spring semester of the senior year.

ACS CERTIFICATION: Students who wish to take a more rigorous program can opt for the American Chemical Society certified degree.

This program requires 2 more advanced courses as well as two semesters (or a semester and a summer) of research. If interested, students should consult with their adviser or the chair of the department.

STUDY ABROAD: The chemistry program will allow students under normal circumstances to study abroad for a semester, usually in the spring of their junior year. This takes advanced planning in order to make sure all classes will be available for a student, and so students considering this should discuss this with their adviser as soon as possible.

Course	Title	Credits
First Year		
First Semester		
CHEM 121 & 121L	Principles of Chemistry I and Principles of Chemistry I Laboratory (Gen Ed Natural Science)	4
MATH 131 or MATH 132 or MATH 133 or MATH 231	Calculus I (Gen Ed Math (Math depends on placement scores)) or Calculus II or Theory and Application of Calculus or Calculus III	4
AVE 101	College in Practice	1
PHYS 121 & 121L	General Physics I: Mechanics and Waves and General Physics I Lab	4
Gen Ed Language l		4
	Credits	17
Second Semester		
CHEM 122 & 122L	Principles of Chemistry II and Principles of Chemistry II Laboratory (Gen Ed NS)	4

MATH 132 or MATH 231	Calculus II (Math beyond 132 is not required except in specific cases.) or Calculus III	2
PHYS 122 & 122L	General Physics II: Temperature, Electricity, and Light and General Physics II Laboratory	۷
Gen Ed Language		4
	Credits	16
Second Year		
First Semester		
CHEM 221	Organic Chemistry I	4
& 221L	and Organic Chemistry I Laboratory	
Gen Ed W Course		4
Gen Ed		З
Gen Ed		3
Math or Gen Ed		3
	Credits	17
Second Semester	r	
CHEM 222	Organic Chemistry II	4
& 222L	and Organic Chemistry II Laboratory	
CHEM 332	Analytical Chemistry	3
Gen Ed		3
Gen Ed		3
Gen Ed		3
	Credits	16
Third Year		
First Semester		
CHEM 361	Advanced Laboratory I	4
CHEM 311	Thermodynamics (CHEM Core I: Chemistry	3
or CHEM 312	Core classes depend on offerings that	
or CHEM 342	or Quantum Chemistry	
	or Bio-Inorganic Chemistry	
CHEM Core II: Ch offerings that ser	emistry 311, 312 classes depend on nester.	3
CHEM 342	Bio-Inorganic Chemistry	3
Gen Ed		3
	Credits	16
Second Semester	r	
CHEM 362	Advanced Laboratory II	4
CHEM 424	Advanced Biochemistry (Advanced Classes	3
or CHEM 490	depend on offerings that semester.	
or CHEM 311	May be taken senior year as well. These	
OF CHEWI 312	classes often have chemistry of other pre-	
	or Topics in Chemistry	
	or Thermodynamics	
	or Quantum Chemistry	
Chemistry Core II	I: Chemistry Core: Chemistry 311, 312, 342	Э
Elective or Resea	rch	-
Gen Ed		-
	Credits	16

Fourth Year		
First Semester		
CHEM 495	Senior Seminar	1
Gen Ed		3
Gen Ed		3
Elective courses		9
	Credits	16
Second Semester	r	
Electives		15
	Credits	15
	Total Credits	129

Bachelor of Science in Chemistry, Biochemistry Concentration

The major in Chemistry with a Biochemistry Concentration includes courses in chemistry and Biology with flexibility at the upper level. The 4 year schedule below is a model, but students often spread their Chemistry Core and Chemistry Advanced courses out over the junior and senior year. The Advanced Writing Proficiency is usually completed in the fall semester of the senior year, while the Senior Comprehensive is completed in the spring semester of the senior year.

ACS CERTIFICATION: Students who wish to take a more rigorous program can opt for the American Chemical Society certified degree. This program requires 2 more advanced courses as well as two semesters (or a semester and a summer) of research. If interested, students should consult with their adviser or the chair of the department.

STUDY ABROAD: The chemistry program will allow students under normal circumstances to study abroad for a semester, usually in the spring of their junior year. This takes advanced planning in order to make sure all classes will be available for a student, and so students considering this should discuss this with their adviser as soon as possible.

Course	Title	Credits	
First Year			
First Semester			
Gen Ed Language	1	4	
CHEM 121 & 121L	Principles of Chemistry I and Principles of Chemistry I Laboratory (Gen Ed NS)	4	
MATH 131 or MATH 132 or MATH 133 or MATH 231	Calculus I (Gen Ed Math. Math depends on placement.) or Calculus II or Theory and Application of Calculus or Calculus III	4	
BIO 155	Foundations of Molecular Biology	2	
AVE 101	College in Practice	1	
	Credits	15	
Second Semester			
Gen Ed Language II		4	
CHEM 122 & 122L	Principles of Chemistry II and Principles of Chemistry II Laboratory (Gen Ed NS)	4	

MATH 132 or MATH 231	Calculus II (Math beyond 132 is not required except in specific cases.) or Calculus III	4
BIO 157	Foundations of Cellular Biology	2
	Credits	14
Second Year		
First Semester		
CHEM 221 & 221L	Organic Chemistry I and Organic Chemistry I Laboratory	4
Gen Ed W Course		4
PHYS 121	General Physics I: Mechanics and Waves	4
&121L	and General Physics I Lab	
Gen Ed		3
Gen Ed		3
	Credits	18
Second Semester		
CHEM 222	Organic Chemistry II	4
& 222L	and Organic Chemistry II Laboratory	
CHEM 332	Analytical Chemistry	3
PHYS 122	General Physics II: Temperature, Electricity,	4
& 122L	and Light	
Con Ed	and General Physics II Laboratory	0
Gen Ed		3
Gen Eu	Oradita	17
Thind Veen	Credits	17
First Semester		
First Semester		4
	Advanced Laboratory i	4
CHEM 324	Biocnemistry	3
CHEM 342	Bio-inorganic Chemistry	3
senior year. Cours	Elective can be taken any time in junior or es allowed are Biology 221/2211 317/317	4
or 328/328L	cs anowed are blology 221/2212, 511/5112	
Gen Ed		3
	Credits	17
Second Semester		
CHEM 362	Advanced Laboratory II	4
CHEM 311	Thermodynamics	3
CHEM 424	Advanced Biochemistry	3
Gen Ed		3
Gen Ed		3
	Credits	16
Fourth Year		
First Semester		
CHEM 495	Senior Seminar	1
Gen Ed		3
Gen Ed		3
Electives		9
	Credits	16
Second Semester		
Electives		12

Gen Ed		3
	Credits	15
	Total Credits	128

Bachelor of Science in Physics			
Course	Title	Credits	
First Year			
First Semester			
CHEM 121	Principles of Chemistry I	4	
MATH 131	Calculus I	4	
Gen Ed Literature		4	
Gen Ed Language	I	4	
	Credits	16	
Second Semester			
CHEM 122	Principles of Chemistry II	4	
MATH 132	Calculus II	4	
PHYS 121	General Physics I: Mechanics and Waves	4	
Gen Ed Language	II	4	
	Credits	16	
Second Year			
First Semester			
CPSC 207	Computer Programming	3	
MATH 231	Calculus III	4	
PHYS 122	General Physics II: Temperature, Electricity, and Light	4	
Gen Ed	5	3	
Gen Ed		3	
	Credits	17	
Second Semester			
MATH 326	Linear Algebra and Differential Equations	4	
Technical Elective	2	6	
Gen Ed		3	
Gen Ed		3	
	Credits	16	
Third Year			
First Semester			
PHYS 343	Thermodynamics	3	
PHYS 272L	Computational Physics Laboratory	1	
or PHYS 282L	or Modern Experimental Laboratory		
or PHYS 292L	or Wave Mechanics Laboratory		
Gen Ed		3	
Free Electives		9	
	Credits	16	
Second Semester			
PHYS 444	Electricity and Magnetism	3	
Technical Elective		3	
Gen Ed		3	
Gen Ed		3	
Free Electives		3	
	Overdite	15	

Fourth Year		
First Semester		
PHYS 253	General Physics III: Modern Physics	3
PHYS 323	Classical Mechanics	3
PHYS 272L or PHYS 282L or PHYS 292L	Computational Physics Laboratory or Modern Experimental Laboratory or Wave Mechanics Laboratory	1
PHYS 495	Senior Seminar	1
Free Electives		8
	Credits	16
Second Semester		
PHYS 424	Quantum Mechanics	3
Free Electives		13
	Credits	16
	Total Credits	128