

DEPARTMENT OF CHEMISTRY AND PHYSICS COLLEGE OF ARTS AND SCIENCES

FACULTY

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<https://bulldog.swosu.edu/academics/chemistry-physics/index.php>

CHEMISTRY

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CHEMISTRY GOALS AND OBJECTIVES

1. To prepare students for chemistry careers in industry, academics, research, government, non-profit, and entrepreneurship, as well as for post-baccalaureate studies in chemistry through the following objectives as set forth by the American Chemical Society:
 - Delivering a broad-based chemistry education through a layered curriculum consisting of Introductory, Foundational, In-Depth, and Independent Research experiences.
 - Ensuring a rigorous chemistry curriculum that requires students to be actively engaged, responsible for their own learning, and develop progressively the ability to analyze, synthesize, and solve complex problems.
 - In recognition that chemistry is an experimental science, offering at least 400 hours laboratory experience beyond the introductory chemistry laboratory, with emphasis on classic laboratory methodology that builds student competency in the safe and environmentally benign synthesis, measurement, determination, and computational analysis of chemical structure.
 - Integrating hands-on exposure to the operation and theory of modern day instrumentation and its use in solving chemical problems, providing opportunity for students to understand and apply nuclear magnetic resonance spectroscopy, optical molecular spectroscopy, atomic absorption spectroscopy, mass spectrometry, chromatography and separations, and electrochemistry.
 - Providing experiences that go beyond chemistry content knowledge to develop competence in other critical skills necessary for a professional chemist, including analytical reasoning and critical thinking, literature searching and information management, laboratory safety, verbal and written communication, ethical considerations in research, data management, and publication, and serving the larger community as science specialists through service learning opportunities.

2. To provide supportive coursework for students in:
 - Professional studies in Medicine, Dentistry, Veterinary Science, Optometry, Engineering, and Pharmacy;
 - STEM-oriented, baccalaureate programs such as Engineering Physics, Biology, Health Sciences, Nursing, Medical Technology, Industrial Technology, and Engineering Technology;
 - Elementary and Secondary Science Education; and
 - Non-STEM disciplines seeking General Education competency in the physical sciences.
3. To establish an environment in which students are afforded a chemistry faculty continuously stimulated to evaluate their teaching skills, to develop their expertise as chemists, and to be creative members of the ACS faculty and professional community by providing encouragement and support toward the following:
 - Attending professional conferences and workshops;
 - Conducting appropriate research activities that involve undergraduate students as integral components;
 - Exploring pedagogical innovation;
 - Participating in Departmental and University committees, recruiting activities, and advisement of students; and
 - Participating in the greater Weatherford and Southwestern Oklahoma communities as chemistry experts and/or scientifically literate citizens willing to contribute to many diverse activities.

ENGINEERING PHYSICS GOALS AND OBJECTIVES

1. To provide a specialized training in classical and modern physics for students majoring in engineering physics through dedication to the following program objectives set forth by

the Accreditation Board for Engineering and Technology.

- Delivering an integrated curriculum characterized by the following elements:
 - Basic science content that includes an introduction to Physics and laboratory experiences;
 - Mathematical content that includes the application of integral and differential calculus, differential equations, systems of equations using linear algebra, and probability and statistics;
 - Technical core that prepares students for the increasingly complex technical specialties they will experience later in the curriculum;
 - Integration of content in specialty courses that develops student competencies in applying both scientific and mathematical skills in solving problems.
 - Preparing students with the factual knowledge, theoretical insight, and skills necessary to:
 - Construct an appropriate understanding of physical phenomena in an applied and interdisciplinary context;
 - Communicate effectively;
 - Develop as emerging leaders in engineering, physics, academia, medicine, business, and public service.
 - Participate ethically as members of the global society throughout their careers.
2. To prepare scientifically and mathematically competent students to join the engineering staff of industries or of government laboratories.
 3. To prepare scientifically and mathematically competent students to pursue graduate education in a broad range of programs including but not limited to physics, engineering, and astrophysics.
 4. To provide a broad foundation in the physical sciences for students who wish to pursue careers in physics, engineering, medicine, pharmacy, optometry, or education.
 5. To provide general education courses for all students in the College of Arts and Sciences to enrich their educational experience in physical sciences.

CHEMISTRY PROGRAMS OF STUDY

- Majors:** B.S. Chemistry (Professional)
B.S. Chemistry
B.A. Chemistry
- Biochemistry specialization
 - Environmental chemistry specialization
- B.S.Ed. in Natural Science Education
(Listed in Dept. of Education)
- Minor:** Chemistry
- Pre-Professional:** Pre-Medicine
Pre-Optometry
Pre-Dental
Pre-Veterinary Medicine
Pre-Engineering

The Chemistry Program offers two degree plans, the B.A. and the B.S. The latter degree has two options: B.S. and B.S. Professional. The B.S. Professional option is certified by the American Chemical Society and is designed for the chemistry student who intends to pursue an advanced degree or wants a competitive advantage in employment after graduation. ACS-certified degrees are recognized by industry and graduate schools as meeting the standards set forth by the ACS Committee on Professional Training. The B.S. degree is designed for the student who plans to

seek employment in a chemistry field upon graduation. The B.A. degree is designed for the student who plans to use a background in chemistry in association with another area of work such as business, journalism, marketing, or law. Many pre-medicine, pre-veterinarian, pre-dental, and pre-optometry students find the BA in Chemistry an excellent major in their pursuit of a professional degree. Graduates with B.A. degrees also obtain jobs in analytical, environmental, and drug testing labs. Students in the B.A. program may choose to specialize in biochemistry or environmental chemistry by selecting the options shown in the program description.

PHYSICS PROGRAMS OF STUDY

- Majors:** B.S. in Engineering Physics
B.S.Ed. in Natural Science Education
- Minors:** Physics
Physical Science
- Pre-Professional:** Pre-Engineering
Pre-Medicine
Pre-Optometry
- Master:** M.Ed. Natural Sciences
(See Graduate Catalog for more information.)

In addition to the students in the programs above, the Physics faculty advises students whose career choices include meteorology, architecture, electronics and aerospace. The Physics faculty provides service courses for general education, teacher education, pre-pharmacy, pre-physical therapy, and for students who are studying for majors in the biological sciences, chemistry and industrial technology

CHEMISTRY GENERAL INFORMATION

The diversity in academic backgrounds and experiences of the Chemistry faculty members and their commitment to high-quality education give the Southwestern Oklahoma State University chemistry major a competitive edge for success. Each area of specialization is taught by an instructor with a Ph.D. in that area, such as organic chemistry, analytical chemistry, inorganic chemistry, biochemistry, and physical chemistry. The small class and laboratory sizes allow extensive class discussions and one-on-one interactions with the instructor. Students have ample opportunities to ask their instructor questions.

Laboratory experience is essential for a well-prepared chemist. The Chemistry program at SWOSU emphasizes this side of chemical education through a variety of laboratory classes, each taught by a Ph.D. chemist. Junior and senior students working on either B.S. degree select a research project under the direction of a Chemistry professor. This allows one-on-one instruction on projects of current scientific interest. Students will gain experience not only in traditional chemistry techniques but will also have an opportunity to operate modern scientific instrumentation. Selected laboratory experiments are interfaced directly to computers for convenient real time data collection and analysis.

Graduates of the Chemistry program have held positions at ConocoPhillips, Dow, DuPont, Halliburton, Imation, Merck, Chevron Phillips, 3M, Oklahoma State Bureau of Investigation (forensics lab), and other companies. Past graduates have taken positions on the faculties of Xavier University, Oregon State University, University of Illinois, Texas A & M, Louisiana State University, and the University of Tulsa. Graduates from the Chemistry program are in demand at graduate schools across the

nation where they are offered scholarships that finance their graduate education. Many graduates opt for this advanced degree opportunity. Currently, SWOSU Chemistry graduates are pursuing advanced degrees at Harvard University and Oxford University (UK) as well as other prestigious universities around the country. Chemistry graduates from SWOSU have also had a high acceptance rate at professional (medical, dental, and optometry) schools.

The Donald V. Hertzler Scholarship covering tuition and fees for one year is awarded annually by the department to an outstanding high school student matriculating to SWOSU as a Chemistry major. Information about applying can be obtained from the department chair. A number of other scholarships are available for Chemistry majors. These are described in the introduction to this catalog.

PHYSICS GENERAL INFORMATION

The individual who gets a degree in engineering physics can apply the fundamental knowledge of physical processes (1) to the development of solutions for a variety of practical problems that occur in an industrial setting, (2) to the advancement of the frontiers of knowledge through research, and (3) to transmit to others our understanding of the laws of nature and the ways of investigating them.

The field of physics is the foundation of many sciences and engineering disciplines: For example, the technological developments in the fields of mechanics, thermodynamics, acoustics, optics, electricity, and nuclear physics have resulted in separate disciplines, such as mechanical and aerospace engineering, laser and applied optics, materials science, electrical engineering, and nuclear engineering. As advances open up new fields of study, the boundaries between engineering and physics fields blur, and we see more and more engineers and physicists working side by side on the same problems. Furthermore, Engineering Physics graduates have a solid foundation upon which to build as their interests change or as the job market changes.

Students who choose to major in physics have two options. The most commonly chosen is the B.S. in Engineering Physics. This option combines fundamental physics courses with applied physics courses such as rigid body mechanics, strength of materials, materials science, fluid mechanics, heat transfer, and electronics. The B.S. in Engineering Physics is designed to prepare students for direct entry into the job market as an engineer or for graduate work in physics or engineering. The second option is the B.S.Ed. in Natural Science Education. This program is designed to prepare high school science teachers. It includes a selection of courses in physics, chemistry, biology, earth science and professional education courses.

The success of any academic program is predicated on the quality of the students, the faculty, and the academic programs. We have been fortunate to attract a sufficient number of talented students to

maintain a good balance of course offerings for our majors. We have also been successful in recruiting faculty who have received their doctorates from prestigious universities. The expertise of the faculty, coupled with the information we receive from our physics alumni, has allowed us to develop and maintain academic programs in physics that meet the needs of today's scientific world.

In addition to the general physics laboratory equipment, a variety of technical laboratory facilities are available for students' use: gamma ray nuclear lab facilities with germanium and sodium-iodide detectors, a helium refrigeration system to do low temperature studies such as superconductivity, an observatory that is equipped with a 14-inch telescope, several smaller telescopes, and various photometric and spectroscopic capabilities, an electronics lab, a high vacuum facility, laser and optics equipment and on-line computers to do automatic measurements and analysis of data. These facilities provide opportunities for the students to conduct undergraduate research under the supervision of faculty members in the department. Students are encouraged to gain experience through work in the department as laboratory assistants and tutors. Application for such employment can be made in the department office. Career counseling is also available to physics students in the department.

A small number of scholarships are available through endowments in the SWOSU Foundation for students who have significant financial needs and have maintained high grade point averages. Applications for scholarships can be made in the department office.

The Physics faculty sponsors a chapter of the national Society of Physics Students that is affiliated with the American Institute of Physics. The SWOSU chapter has been recognized many times as an outstanding chapter in the nation for its accomplishments and level of activity. This organization has also received many grants for research projects and for the promotion of physics. Students in the Engineering Physics program should become involved in these activities as early as possible in order to develop professionally and socially. The local student organization is the Physics and Engineering Club. Both local and national memberships are strongly encouraged.

Students receive many benefits from their involvement in physics activities. Our students have been quite successful after graduation. Many have attended graduate school in physics or engineering programs at prestigious universities across the nation. Others have taken employment with national laboratories, defense industries, and many major corporations. Still others have become high school teachers, physicians, optometrists, and military officers.

For more information, visit our web site at:

<https://bulldog.swosu.edu/academics/chemistry-physics/index.php>

<https://bulldog.swosu.edu/academics/education/index.php>

BACHELOR OF ARTS CHEMISTRY B.A. (CHEMA.BA)

GENERAL EDUCATION (Min. 40 hours)

Courses that are required. Courses that are recommended.

Communication..... 9

ENGL	1113	English Composition I
ENGL	1213	English Composition II
COMM	1313	Introduction to Public Speaking OR
TECH	3143	Technical Presentations (if permitted by degree program)

Quantitative Reasoning..... 3

Select one course.

MATH	1143	Mathematical Concepts
MATH	1153	Mathematical Applications
MATH	1193	Elementary Statistics
MATH	1313	Functions and Modeling
MATH	1513	College Algebra or a higher numbered math course

U. S. History..... 3

Select one course.

HIST	1043	U.S. History to 1877
HIST	1053	U.S. History since 1877

American Government..... 3

POLSC	1103	American Government & Politics
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Science..... 7-8

Select one course from Life Science and one course from Physical Science. One Science course must be a lab science.

Life Science.....3-4

BIOL	1004	Biological Concepts w/Lab
BIOL	1013	Current Issues in Biology
BIOL	1054	Principles of Biology I w/Lab

Physical Science.....3-4

ASTRO	1904	Astronomy
CHEM	1004	General Chemistry w/Lab or a higher numbered chemistry or physics course
GEOL	1934	Physical Geology w/Lab
PHY	1044	Basic Physics I w/Lab
PHY	1063	General Physics (or a higher numbered chemistry or physics course)
SCI	1501	Concepts of Physical Science Lab
SCI	1513	Conc of Phy Science (can be taken w/wo lab)

Humanities and Social Science.....12

Select one course from each sub-category and one additional course from any subcategory below.

Humanities..... 3

GEOG	1103	World Cultural Geography
HIST	1033	World History
HUM	1103	Introduction to Humanities

Fine Arts..... 3

ART	1223	Art Survey
COMM	1263	Introduction to Theatre
LIT	2333	Introduction to Film
LIT	2413	Introduction to Literature
MUSIC	1013	Introduction to Music I
MUSIC	1103	Music and Culture (Music majors only)
MUSIC	1123	History of Rock-n-Roll
PHILO	1453	Introduction to Philosophy

Social and Human Sciences..... 3

ASL	2163	American Sign Language I
ECONO	2263	Intro to Macroeconomics
ECONO	2363	Intro to Microeconomics
ENTRP	1123	Intro to Business
FINAN	2113	Personal Financial Planning
ITAL	1004	Elementary Italian I
KINES	1133	Wellness Conc & Exercise Applications
LATIN	1054	Elementary Latin I (or higher number)
PSYCH	1003	General Psychology
SOCIO	1003	Introduction to Sociology
SPAN	1054	Elementary Spanish I (or higher number)
TECH	1223	Technology and Society

Computer Proficiency.....0-3

COMSC 1023 Computers and Info Access or the SWOSU Proficiency Exam, or HS course clearly defined to meet our goals.

GE Elective.....0-3

Students who meet the computer proficiency by exam or HS course must choose an additional GE course from any category.

CHEMISTRY MAJOR (B.A.)

Required Core Curriculum for all emphases..... 26-28

CHEM	4900	Seminar Attendance (enroll each semester)
CHEM	1203	General Chemistry I
CHEM	1252	General Chemistry I Lab
CHEM	1303	General Chemistry II
CHEM	1352	General Chemistry II Lab
CHEM	2612	Principles of Laboratory Safety
CHEM	3124	Quantitative Analysis
CHEM	3013	Organic Chemistry I AND
CHEM	3111	Organic Chemistry I Lab
OR		
CHEM	3015	Organic Chemistry I
CHEM	4113	Organic Chemistry II AND
CHEM	4021	Organic Chemistry II Lab
OR		
CHEM	4115	Organic Chemistry II
CHEM	3901	Seminar in Chemistry I
CHEM	4901	Seminar in Chemistry II

Choose a degree option below..... 12-14

Secondary Requirements for all emphases..... 17-18

MATH	Higher numbered math course beyond MATH 1513 (MATH 3433 Statistics I is required for students choosing the Environmental Chemistry Emphasis.)	
Life Sciences (7 hours beyond GE requirement)		
PHY	1044	Basic Physics I w/Lab OR
PHY	1063	General Physics
AND		
PHY	1054	Basic Physics II

Minor..... 18-22

Recommended Minors: Art, Biology, Computer Science, Electronics, Management, Marketing, Mathematics, Physics, or Political Science

Free electives to bring total to..... 120

General Option

Electives and Advanced Chemistry..... 12-14

Choose courses from the following list to give a total of at least 39 hours of chemistry courses including Core Curriculum:

CHEM	2112	Structure and Bonding
CHEM	3233	Inorganic Chemistry
CHEM	3211	Inorganic Chemistry Lab
CHEM	3244	Environmental Chemistry
CHEM	3343	Physical Chemistry I
CHEM	4001-4	Chemistry Research
CHEM	4011-4	Seminar in Chem Spec Topics
CHEM	4124	Biochemistry
CHEM	4234	Instrumental Analysis
CHEM	4254	Industrial Chem. and Environ Regs
CHEM	4313	Advanced Organic Synthesis
CHEM	4353	Materials Chemistry
CHEM	4554	Advanced Organic Spectroscopy
CHEM	4673	Advanced Metabolism

Continued on next page

Biochemistry Option

Required7

CHEM 4124 Biochemistry
CHEM 4673 Advanced Metabolism

Electives5-7

Choose courses from the following list to give a total of at least 39 hours of chemistry courses including Core Curriculum and required courses:

CHEM 2112 Structure and Bonding
CHEM 3233 Inorganic Chemistry
CHEM 3211 Inorganic Chemistry Lab
CHEM 3244 Environmental Chemistry
CHEM 3343 Physical Chemistry I
CHEM 4001-4 Ind Research in Biochem or related area
CHEM 4011-4 Seminar in Chem Spec Topics
CHEM 4234 Instrumental Analysis
CHEM 4313 Advanced Organic Synthesis
CHEM 4353 Materials Chemistry
CHEM 4554 Advanced Organic Spectroscopy
BIOL 3253 Genetics
BIOL 3152 Genetics / Cell Biology Lab
BIOL 4935 Cell and Molecular Biology
BIOL 4964 Molecular Biology
BIOL 4213 Immunology
BIOL 4355 Microbiology

Environmental Chemistry Option

Required 8

CHEM 3244 Environmental Chemistry
CHEM 4254 Industrial Chem and Environ Regs

Electives (chosen from this list)..... 4-6

Choose courses from the following list to give a total of at least 39 hours of chemistry courses including Core Curriculum and required courses:

GEOG 4083 Environmental Studies
MNGMT 3623 Risk Management
CHEM 2112 Structure and Bonding
CHEM 3233 Inorganic Chemistry
CHEM 3211 Inorganic Chemistry Lab
CHEM 3343 Physical Chemistry I
CHEM 4001-4 Chemistry Research
CHEM 4011-4 Seminar in Chem Spec Topics
CHEM 4124 Biochemistry
CHEM 4234 Instrumental Analysis
CHEM 4313 Advanced Organic Synthesis
CHEM 4353 Materials Chemistry
CHEM 4554 Advanced Organic Spectroscopy
CHEM 4673 Advanced Metabolism

TOTAL HOURS..... 120

REGULATIONS PERTAINING TO GRADUATION

Minimum credit hours for graduation..... 120
Minimum credit hours in the liberal arts & sciences.....80
Minimum credit hours in upper-division
(3000/4000 courses).....40
Minimum credit hours (3000/4000 courses)
in major completed at SWOSU 8
Minimum credit hours at SWOSU (including last 8).....30
Minimum Grade Point Average in all coursework..... 2.00
Minimum Grade Point Average in major..... 2.00
Minimum Grade Point Average in minor 2.00

CHEMISTRY (B.A.) (CHEMA.BA)

Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1023 Computers & Info Access (3) 1113 English Comp I (3) 1513 College Algebra (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 4900 Seminar Attendance (0)	1213 English Comp II (3) 1303 General Chem II (3) 1352 General Chem II Lab (2) 2612 Principles of Laboratory Safety (2) 4900 Seminar Attendance (0) General Ed Course (3) Math Elective (3-4)
Total (15)	Total (16-17)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
1044 Basic Physics I (4) 1054 Principles of Biology I (4) 3015 Organic Chemistry I (5) 4900 Seminar Attendance (0) General Ed Course (3)	1054 Basic Physics II (4) 4015 Organic Chemistry II (5) 4900 Seminar Attendance (0) General Ed Courses (6)
Total (16)	Total (15)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
3124 Quantitative Analysis (4) 4900 Seminar Attendance (0) General Ed Course (3) Life Science Elective (4) Minor Elective (4)	4900 Seminar Attendance (0) Chemistry Elective (4) General Ed Course (3) Life Science Elective (4) Minor Elective (4)
Total (15)	Total (15)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3901 Seminar in Chemistry I (1) 4900 Seminar Attendance (0) Chemistry Elective (3-4) General Ed Courses (6) Minor Elective (4)	4900 Seminar Attendance (0) 4901 Seminar in Chemistry II (1) Chemistry Electives (3-4) Free Electives (3) Minor Electives (8)
Total (14-15)	Total (15-16)

*First time entering SWOSU students need to take 1051 SWOSUConnect.

CHEMISTRY (B.A.) (CHEMA.BA)
Biochemistry Emphasis
Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1023 Computers & Info Access (3) 1113 English Comp I (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 1513 College Algebra (3) 4900 Seminar Attendance (0)	1213 English Comp II (3) 1303 General Chem II (3) 1352 General Chem II Lab (2) 2612 Principles of Laboratory Safety (2) 4900 Seminar Attendance (0) General Ed Course (3) Math Elective (3-4)
Total (15)	Total (16-17)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
1044 Basic Physics I (4) 1054 Principles of Biology I (4) 3015 Organic Chemistry I (5) 4900 Seminar Attendance (0) General Ed Course (3)	1054 Basic Physics II (4) 1254 Principles of Biology II (4) 4015 Organic Chemistry II (5) 4900 Seminar Attendance (0) General Ed Course (3)
Total (16)	Total (16)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
3124 Quantitative Analysis (4) 4124 Biochemistry (4) 4900 Seminar Attendance (0) General Ed Course (3) Minor Elective (4)	4673 Advanced Metabolism OR Biochemistry Elective (3-4) 4900 Seminar Attendance (0) Biochem Elective (4) Gen Ed Course (3) Minor Elective (4)
Total (15)	Total (14-15)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3901 Seminar in Chemistry I (1) 4900 Seminar Attendance (0) Biochemistry Elective (3-4) General Ed Courses (6) Minor Elective (4)	4673 Advanced Metabolism OR Biochemistry Elective (3-4) 4900 Seminar Attendance (0) 4901 Seminar in Chemistry II (1) Free Electives (8) Minor Electives (4)
Total (14-15)	Total (16-17)

*First time entering SWOSU students need to take 1051 SWOSUConnect.

CHEMISTRY (B.A.) (CHEMA.BA)
Environmental Chemistry Emphasis
Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1023 Computers & Info Access (3) 1113 English Comp I (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 1513 College Algebra (3) 4900 Seminar Attendance (0)	1213 English Comp II (3) 1303 General Chem II (3) 1352 General Chem II Lab (2) 2612 Principles of Laboratory Safety (2) 3433 Statistics I (3) 4900 Seminar Attendance (0) General Ed Course (3)
Total (15)	Total (16)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
1044 Basic Physics I (4) 1054 Principles of Biology I (4) 3015 Organic Chemistry I (5) 4900 Seminar Attendance (0) General Ed Course (3)	1054 Basic Physics II (4) 4015 Organic Chemistry II (5) 4900 Seminar Attendance (0) General Ed Courses (6)
Total (16)	Total (15)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
3124 Quantitative Analysis (4) 4900 Seminar Attendance (0) General Ed Course (3) Life Science Elective (4) Minor Elective (4)	3244 Environmental Chemistry OR 4254 Ind Chem & Env Regs (4) 4900 Seminar Attendance (0) Gen Ed Course (3) Life Science Elective (4) Minor Elective (4)
Total (15)	Total (15)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3901 Seminar in Chemistry I (1) 4900 Seminar Attendance (0) Environ Chem Elective (4) General Ed Courses (6) Minor Elective (4)	3244 Environmental Chemistry OR 4254 Ind Chem & Env Regs (4) 4900 Seminar Attendance (0) 4901 Seminar in Chemistry II (1) Free Electives (4) Minor Electives (8)
Total (15)	Total (17)

*First time entering SWOSU students need to take 1051 SWOSUConnect.

BACHELOR OF SCIENCE CHEMISTRY (CHEMB.BS)

GENERAL EDUCATION (Min. 40 hours)

Courses that are required. *Courses that are recommended.*

Communication 9

ENGL	1113	English Composition I
ENGL	1213	English Composition II
COMM	1313	Introduction to Public Speaking OR
TECH	3143	Technical Presentations (if permitted by degree program)

Quantitative Reasoning 3

Select one course.

MATH	1143	Mathematical Concepts
MATH	1153	Mathematical Applications
MATH	1193	Elementary Statistics
MATH	1313	Functions and Modeling
MATH	1513	College Algebra

or a higher numbered math course

U. S. History 3

Select one course.

HIST	1043	U.S. History to 1877
HIST	1053	U.S. History since 1877

American Government 3

POLSC	1103	American Government & Politics
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Science 7-8

Select one course from Life Science and one course from Physical Science. One Science course must be a lab science.

Life Science 3-4

BIOL	1004	Biological Concepts w/Lab
BIOL	1013	Current Issues in Biology
BIOL	1054	Principles of Biology I w/Lab

Physical Science 3-4

ASTRO	1904	Astronomy
CHEM	1004	General Chemistry w/Lab or a higher numbered chemistry or physics course
GEOL	1934	Physical Geology w/Lab
PHY	1044	Basic Physics I w/Lab
PHY	1063	General Physics (or a higher numbered chemistry or physics course)
SCI	1501	Concepts of Physical Science Lab
SCI	1513	Conc of Phy Science (can be taken w/wo lab)

Humanities and Social Science 12

Select one course from each sub-category and one additional course from any subcategory below.

Humanities 3

GEOG	1103	World Cultural Geography
HIST	1033	World History
HUM	1103	Introduction to Humanities

Fine Arts 3

ART	1223	Art Survey
COMM	1263	Introduction to Theatre
LIT	2333	Introduction to Film
LIT	2413	Introduction to Literature
MUSIC	1013	Introduction to Music I
MUSIC	1103	Music and Culture (Music majors only)
MUSIC	1123	History of Rock-n-Roll
PHILO	1453	Introduction to Philosophy

Social and Human Sciences 3

ASL	2163	American Sign Language I
ECONO	2263	Intro to Macroeconomics
ECONO	2363	Intro to Microeconomics
ENTRP	1123	Intro to Business
FINAN	2113	Personal Financial Planning
ITAL	1004	Elementary Italian I
KINES	1133	Wellness Conc & Exercise Applications
LATIN	1054	Elementary Latin I (or higher number)
PSYCH	1003	General Psychology
SOCIO	1003	Introduction to Sociology
SPAN	1054	Elementary Spanish I (or higher number)
TECH	1223	Technology and Society

Computer Proficiency 0-3
COMSC 1023 Computers and Info Access or the SWOSU Proficiency Exam, or HS course clearly defined to meet our goals.

GE Elective 0-3
Students who meet the computer proficiency by exam or HS course must choose an additional GE course from any category.

CHEMISTRY MAJOR (B.S.)

Required Courses 35-39

CHEM	4900	Seminar Attendance (enroll each semester)
CHEM	1203	General Chemistry I
CHEM	1252	General Chemistry I Lab
CHEM	1303	General Chemistry II
CHEM	1352	General Chemistry II Lab
CHEM	2112	Structure and Bonding Theory
CHEM	2612	Principles of Laboratory Safety
CHEM	3015	Organic Chemistry I
CHEM	3124	Quantitative Analysis
CHEM	3343	Physical Chemistry I
CHEM	4001-4	Chemistry Research (min 2 hrs)
CHEM	4115	Organic Chemistry II
CHEM	3901	Seminar in Chemistry I
CHEM	4901	Seminar in Chemistry II

Students with 8 hours each of General and/or Organic Chemistry and changing majors to Chemistry may make up the hours by taking one of the chemistry electives below.

Electives and Advanced Chemistry (chosen from this list) 12

CHEM	3233	Inorganic Chemistry
CHEM	3211	Inorganic Chemistry Lab
CHEM	3244	Environmental Chemistry with lab
CHEM	4011-4	Sem in Chem Spec.Topics (when offered)
CHEM	4124	Biochemistry
CHEM	4223	Polymer Chemistry
CHEM	4234	Instrumental Analysis
CHEM	4254	Industrial Chem. and Env Regs
CHEM	4313	Advanced Organic Synthesis
CHEM	4353	Materials Chemistry
CHEM	4455	Physical Chemistry II
CHEM	4554	Advanced Organic Spectroscopy
CHEM	4673	Advanced Metabolism

Secondary Requirements 18-21

MATH	1613	College Trigonometry
MATH	1834	Calculus I, preferred AND
MATH	2834	Calculus II, preferred
OR		
MATH	2823	Applied Calculus AND
MATH	1834	Calculus I
PHY	2145	General Physics I, preferred AND
PHY	2155	General Physics II, preferred
OR		
PHY	1044	Basic Physics I AND
PHY	1054	Basic Physics II

Minor 18-22

Recommended Minors: Art, Biology, Computer Science, Electronics, Management, Marketing, Mathematics, Physics, or Political Science

TOTAL HOURS 120

REGULATIONS PERTAINING TO GRADUATION	
Minimum credit hours for graduation	120
Minimum credit hours in the liberal arts & sciences	55
Minimum credit hours in upper-division (3000/4000 courses)	40
Minimum credit hours (3000/4000 courses) in major completed at SWOSU	8
Minimum credit hours at SWOSU (15 of the last 30)	30
Minimum Grade Point Average in all coursework	2.00
Minimum Grade Point Average in major	2.00
Minimum Grade Point Average in minor	2.00

CHEMISTRY (B.S.) (CHEMB.BS)

Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1113 English Comp I (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 1613 College Trig (3) 4900 Seminar Attendance (0) General Ed Course (3)	1023 Comp & Info Access (3) 1213 English Comp II (3) 1303 General Chemistry I (3) 1352 General Chemistry II Lab (2) 1834 Calculus I (4) 2612 Principles of Lab Safety (2) 4900 Seminar Attendance (0)
Total (15)	Total (17)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
2834 Calculus II (4) 3015 Organic Chemistry I (5) 3124 Quantitative Analysis (4) 4900 Seminar Attendance (0) General Ed Course (3)	2112 Struct & Bond Theory (2) 2415 Gen Physics I (5) 3834 Calculus III (4) 4115 Organic Chemistry II (5) 4900 Seminar Attendance (0)
Total (16)	Total (16)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
2155 Gen Physics II (5) 3343 Physical Chem I OR Chemistry Elective (3-4) 4900 Seminar Attendance (0) General Ed Courses (6)	4900 Seminar Attendance (0) Chemistry Electives (7-8) Free Elective (3) General Ed Courses (6)
Total (14-15)	Total (16-17)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3343 Physical Chem I OR Chemistry Elective (3-4) 3901 Seminar in Chemistry I (1) 4001 Chemistry Research (1) Chemistry Elective (3-4) General Ed Courses (6)	4001 Chemistry Research (1) 4900 Seminar Attendance (0) 4901 Seminar in Chemistry II (1) Chemistry Elective (3-4) Free Elective (3) General Chemistry Electives (6)
Total (14-16)	Total (14-15)

*First time entering SWOSU students need to take 1051 SWOSUConnect.

BACHELOR OF SCIENCE CHEMISTRY – PROFESSIONAL (CHEMPRO.BS)

GENERAL EDUCATION (Min. 40 hours)

Courses that are required. *Courses that are recommended.*

Communication..... 9

ENGL	1113	English Composition I
ENGL	1213	English Composition II
COMM	1313	Introduction to Public Speaking OR
TECH	3143	Technical Presentations (if permitted by degree program)

Quantitative Reasoning..... 3

Select one course.

MATH	1143	Mathematical Concepts
MATH	1153	Mathematical Applications
MATH	1193	Elementary Statistics
MATH	1313	Functions and Modeling
MATH	1513	College Algebra

or a higher numbered math course

U. S. History..... 3

Select one course.

HIST	1043	U.S. History to 1877
HIST	1053	U.S. History since 1877

American Government..... 3

POLSC	1103	American Government & Politics
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Science..... 7-8

Select one course from Life Science and one course from Physical Science. One Science course must be a lab science.

Life Science.....3-4

BIOL	1004	Biological Concepts w/Lab
BIOL	1013	Current Issues in Biology
BIOL	1054	Principles of Biology I w/Lab

Physical Science.....3-4

ASTRO	1904	Astronomy
CHEM	1004	General Chemistry w/Lab or a higher numbered chemistry or physics course
GEOL	1934	Physical Geology w/Lab
PHY	1044	Basic Physics I w/Lab
PHY	1063	General Physics (or a higher numbered chemistry or physics course)
SCI	1501	Concepts of Physical Science Lab
SCI	1513	Conc of Phy Science (can be taken w/wo lab)

Humanities and Social Science.....12

Select one course from each sub-category and one additional course from any subcategory below.

Humanities..... 3

GEOG	1103	World Cultural Geography
HIST	1033	World History
HUM	1103	Introduction to Humanities

Fine Arts..... 3

ART	1223	Art Survey
COMM	1263	Introduction to Theatre
LIT	2333	Introduction to Film
LIT	2413	Introduction to Literature
MUSIC	1013	Introduction to Music I
MUSIC	1103	Music and Culture (Music majors only)
MUSIC	1123	History of Rock-n-Roll
PHILO	1453	Introduction to Philosophy

Social and Human Sciences..... 3

ASL	2163	American Sign Language I
ECONO	2263	Intro to Macroeconomics
ECONO	2363	Intro to Microeconomics
ENTRP	1123	Intro to Business
FINAN	2113	Personal Financial Planning
ITAL	1004	Elementary Italian I
KINES	1133	Wellness Conc & Exercise Applications
LATIN	1054	Elementary Latin I (or higher number)
PSYCH	1003	General Psychology
SOCIO	1003	Introduction to Sociology
SPAN	1054	Elementary Spanish I (or higher number)
TECH	1223	Technology and Society

Computer Proficiency.....0-3

COMSC 1023 Computers and Info Access or the SWOSU Proficiency Exam, or HS course clearly defined to meet our goals.

GE Elective.....0-3

Students who meet the computer proficiency by exam or HS course must choose an additional GE course from any category.

CHEMISTRY MAJOR (B.S. Professional)

Required Courses..... 52-54

CHEM	4900	Seminar Attendance (enroll each semester)
CHEM	1203	General Chemistry I
CHEM	1252	General Chemistry I Lab
CHEM	1303	General Chemistry II
CHEM	1352	General Chemistry II Lab
CHEM	2112	Structure and Bonding Theory
CHEM	2612	Principles of Laboratory Safety
CHEM	3015	Organic Chemistry I
CHEM	3124	Quantitative Analysis
CHEM	3233	Inorganic Chemistry
CHEM	3211	Inorganic Chemistry Lab
CHEM	3343	Physical Chemistry I
CHEM	4001-4	Chemistry Research (min 2 hrs)
CHEM	4115	Organic Chemistry II
CHEM	4124	Biochemistry
CHEM	4234	Instrumental Analysis
CHEM	4455	Physical Chemistry II
CHEM	3901	Seminar in Chemistry I
CHEM	4901	Seminar in Chemistry II

Students with 8 hours each of General and/or Organic Chemistry and changing majors to Chemistry may make up the hours by taking one of the chemistry electives below.

Electives and Advanced Chemistry (chosen from this list)..... 8

CHEM	4011-4	Sem in Chem. Spec. Topics (when offered)
CHEM	4223	Polymer Chemistry
CHEM	4313	Advanced Organic Synthesis
CHEM	4353	Materials Chemistry
CHEM	4554	Advanced Organic Spectroscopy
CHEM	4673	Advanced Metabolism

Secondary Requirements..... 22

MATH	1834	Calculus I
MATH	2834	Calculus II
MATH	3834	Calculus III
PHY	2145	General Physics I
PHY	2155	General Physics II

TOTAL HOURS..... 122-124

REGULATIONS PERTAINING TO GRADUATION

Minimum credit hours for graduation.....	122
Minimum credit hours in the liberal arts & sciences.....	55
Minimum credit hours in upper-division (3000/4000 courses).....	40
Minimum credit hours (3000/4000 courses) in major completed at SWOSU.....	8
Minimum credit hours at SWOSU (15 of the last 30).....	30
Minimum Grade Point Average in all coursework.....	2.00
Minimum Grade Point Average in major.....	2.00
Minimum Grade Point Average in minor.....	2.00

CHEMISTRY (B.S. Professional) (CHEMPRO.BS) Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1113 English Comp I (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 1613 College Trig (3) 4900 Seminar Attendance (0) General Ed Course (3)	1023 Comp & Info Access (3) 1213 English Comp II (3) 1303 General Chemistry I (3) 1352 General Chemistry II Lab (2) 1834 Calculus I (4) 2612 Principles of Lab Safety (2) 4900 Seminar Attendance (0)
Total (15)	Total (17)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
2834 Calculus II (4) 3015 Organic Chemistry I (5) 3124 Quantitative Analysis (4) 4900 Seminar Attendance (0) General Ed Course (3)	2112 Struct & Bond Theory (2) 2415 Gen Physics I (5) 3834 Calculus III (4) 4115 Organic Chemistry II (5) 4900 Seminar Attendance (0)
Total (16)	Total (16)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
2155 Gen Physics II (5) 3343 Physical Chem I OR 3233 Inorganic Chem AND 3211 Inorg Chem Lab (3-4) 4900 Seminar Attendance (0) General Ed Courses (6)	4234 Instrum Analysis OR 4124 Biochemistry (4) 4455 Physical Chem II OR Chemistry Elective (4-5) General Ed Courses (6)
Total (14-15)	Total (14-15)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3343 Physical Chem I OR 3233 Inorganic Chem AND 3211 Inorg Chem Lab (3-4) 3901 Seminar in Chemistry I (1) 4001 Chemistry Research (1) 4900 Seminar Attendance (0) Free Elective (3) General Ed Courses (6)	4001 Chemistry Research (1) 4234 Instrum Analysis OR 4124 Biochemistry (4) 4455 Physical Chem II OR Chemistry Elective (4-5) 4900 Seminar Attendance (0) 4901 Seminar in Chemistry II (1) Free Elective (3) General Ed Course (3)
Total (14-15)	Total (16-17)

*First time entering SWOSU students need to take 1051 SWOSUConnect.

BACHELOR OF SCIENCE ENGINEERING PHYSICS (ENGP.HS)

GENERAL EDUCATION (Min. 40 hours)

Courses that are required. Courses that are recommended.

Communication	9
ENGL 1113 English Composition I	
ENGL 1213 English Composition II	
COMM 1313 Introduction to Public Speaking OR	
TECH 3143 Technical Presentations (if permitted by degree program)	
Quantitative Reasoning	3
<i>Select one course.</i>	
MATH 1143 Mathematical Concepts	
MATH 1153 Mathematical Applications	
MATH 1193 Elementary Statistics	
MATH 1313 Functions and Modeling	
MATH 1513 College Algebra	
or a higher numbered math course	
U. S. History	3
<i>Select one course.</i>	
HIST 1043 U.S. History to 1877	
HIST 1053 U.S. History since 1877	
American Government	3
POLSC 1103 American Government & Politics	
Science	7-8
<i>Select one course from Life Science and one course from Physical Science. One Science course must be a lab science.</i>	
Life Science	3-4
BIOL 1004 Biological Concepts w/Lab	
BIOL 1013 Current Issues in Biology	
BIOL 1054 Principles of Biology I w/Lab	
Physical Science	3-4
ASTRO 1904 Astronomy	
CHEM 1004 General Chemistry w/Lab or a higher numbered chemistry or physics course	
GEOL 1934 Physical Geology w/Lab	
PHY 1044 Basic Physics I w/Lab	
PHY 1063 General Physics (or a higher numbered chemistry or physics course)	
SCI 1501 Concepts of Physical Science Lab	
SCI 1513 Conc of Phy Science (can be taken w/wo lab)	
Humanities and Social Science	12
<i>Select one course from each sub-category and one additional course from any subcategory below.</i>	
Humanities	3
GEOG 1103 World Cultural Geography	
HIST 1033 World History	
HUM 1103 Introduction to Humanities	
Fine Arts	3
ART 1223 Art Survey	
COMM 1263 Introduction to Theatre	
LIT 2333 Introduction to Film	
LIT 2413 Introduction to Literature	
MUSIC 1013 Introduction to Music I	
MUSIC 1103 Music and Culture (Music majors only)	
MUSIC 1123 History of Rock-n-Roll	
PHILO 1453 Introduction to Philosophy	
Social and Human Sciences	3
ASL 2163 American Sign Language I	
ECONO 2263 Intro to Macroeconomics OR	
ECONO 2363 Intro to Microeconomics	
ENTRP 1123 Intro to Business	
FINAN 2113 Personal Financial Planning	
ITAL 1004 Elementary Italian I	
KINES 1133 Wellness Conc & Exercise Applications	
LATIN 1054 Elementary Latin I (or higher number)	
PSYCH 1003 General Psychology	
SOCIO 1003 Introduction to Sociology	
SPAN 1054 Elementary Spanish I (or higher number)	
TECH 1223 Technology and Society	
Computer Proficiency	3
COMSC 1033 Computer Science I OR	
MATH 3533 Technology and Programming in Mathematics	

ENGINEERING PHYSICS MAJOR

Required Courses	47-48
PHY 2021 Introduction to Engineering Physics	
PHY 2145 General Physics I	
PHY 2155 General Physics II	
PHY 2203 Rigid Body Mechanics	
PHY 2213 Strength of Materials	
PHY 3413 Analog Electronics OR	
PHY 3544 Digital Electronics	
PHY 3112 Experimental Techniques	
PHY 3311 Modern Physics Lab	
PHY 3403 Modern Physics for Engineers	
PHY 3501 Physics Seminar	
PHY 3563 Thermodynamics	
PHY 3603 Mechanics	
PHY 4644 Electricity & Magnetism I	
PHY 4723 Quantum Mechanics	
Seven hours selected from:	
PHY 3013 Materials Science	
PHY 3424 Optics	
PHY 3573 Heat Transfer	
PHY 3633 Fluid Mechanics	
PHY 4663 Electricity and Magnetism II	
PHY 4001 Indiv Study in Physics (Physics Research) OR	
PHY 4011 Physics Seminar	
Other Requirements (Incl. Mathematics minor)	26-27
MATH 1613 College Trigonometry	
MATH 1834 Calculus I	
MATH 2834 Calculus II	
MATH 3834 Calculus III	
MATH 4213 Differential Equations	
CHEM 1303 General Chemistry II	
CHEM 1352 General Chemistry II Lab	
A 3-4 semester hour course in engineering graphics (TECH 2213 2D CAD or TECH 4264 3D CAD)	
Electives to bring total to 120	3-5
TOTAL HOURS	120
<i>Students who have a strong high school background in mathematics are encouraged to take CLEP examinations and complete additional courses in mathematics. The mathematics requirements above satisfy a minor in mathematics.</i>	
<i>Students pursuing an engineering degree are encouraged to take a course in economics.</i>	
REGULATIONS PERTAINING TO GRADUATION	
Minimum credit hours for graduation.....	120
Minimum credit hours in the liberal arts & sciences.....	55
Minimum credit hours in upper-division (3000/4000 courses).....	40
Minimum credit hours (3000/4000 courses) in major completed at SWOSU.....	8
Minimum credit hours at SWOSU (15 of the last 30).....	30
Minimum Grade Point Average in all coursework.....	2.00
Minimum Grade Point Average in major.....	2.00

ENGINEERING PHYSICS (ENGP.HS)

Suggested Course Sequence

FIRST YEAR

FIRST SEMESTER	SECOND SEMESTER
1051 SWOSUConnect* (1) 1023 Comp & Info Access (3) 1113 English Comp I (3) 1203 General Chemistry I (3) 1252 General Chemistry I Lab (2) 1613 College Trig (3) 2021 Intro to Eng Physics (1)	1213 English Comp II (3) 1303 General Chemistry I (3) 1352 General Chemistry II Lab (2) 1834 Calculus I (4) 2145 Gen Physics I (5)
Total (16)	Total (17)

SECOND YEAR

FIRST SEMESTER	SECOND SEMESTER
1033 Computer Science I OR MATH 3533 Tech & Programming in Math (3) 2155 Gen Physics II (5) 2203 Rigid Body Mechanics (3) 2834 Calculus II (4)	2213 Strength of Materials (3) 3403 Modern Physics (3) 3411 Modern Physics Lab (1) 3834 Calculus III (4) General Ed Course (3)
Total (15)	Total (14)

THIRD YEAR

FIRST SEMESTER	SECOND SEMESTER
3112 Exptl Techniques OR 4644 Elec & Mag I (2-4) 4213 Diff Equations (3) 4723 Quantum Mechanics OR Physics Elective (3) General Ed Courses (5-7)	3424 Optics OR 3544 Digital Electronics OR 3413 Analog Electronics (3-4) 3603 Mechanics OR 3563 Thermodynamics (3) Engineering Graphics (3) General Education Courses (5-6)
Total (13-17)	Total (14-16)

FOURTH YEAR

FIRST SEMESTER	SECOND SEMESTER
3112 Exptl Techniques OR 4644 Elec & Mag I (2-4) 4723 Quantum Mechanics OR Physics Elective (3-4) General Ed Courses (6-9)	3424 Optics OR 3544 Digital Electronics OR 3413 Analog Electronics (3-4) 3603 Mechanics OR 3563 Thermodynamics (3) 4011 Physics Seminar (1) General Ed Courses (6)
Total (13-14)	Total (13-14)

*First time entering SWOSU students need to take 1051 SWOSUConnect.