

# CHEMISTRY, BS

## Program Description

The chemistry faculty seeks to provide a high quality educational experience for students majoring in chemistry in preparation for industrial or government positions, for graduate study, and for entry to medical or dental schools. The program is also designed for those planning to teach chemistry or physics at the 7-12 level, or who need chemical knowledge and skills relevant to future studies in the sciences.

## Student Learning Outcomes

Students will:

- Demonstrate a broad understanding of chemical concepts
- Analyze and interpret a variety of chemical data
- Communicate chemical information effectively at the undergraduate level, in oral and written form, with appropriate use of technology

The student who wishes to obtain a Bachelor of Science Degree in Chemistry may do so by following one of the four curriculum plans referred to as Concentrations. The options include general, environmental, biochemistry, and physical science education concentrations. Students who are pre-medical, pre-dental, pre-optometry, pre-pharmacy, or pre-veterinary medicine may follow the biochemistry concentration. In addition, the biochemistry concentration offers an option which would allow students to pursue certification in clinical chemistry while obtaining their Bachelors in Chemistry.

A prospective 7-12 physical science (chemistry or physics) teacher could obtain a BS in Chemistry while following the physical science education concentration. Details on the requirements for the physical science education concentration and for obtaining a teaching certificate are in the College of Science: Science, Mathematics and Technology Education section of this catalog.

The BS in Chemistry requires at least 120 semester hours with a university required minimum number of 45 upper-division hours. Students may have to take additional hours to meet university general education requirements such as First-Year Seminar courses. The major consists of at least 52 semester hours (24 upper-division), some of which may be designated courses outside of chemistry. Every candidate for the BS in Chemistry following the general, environmental, or biochemistry concentration must complete the CHEM 4085 Major Field Test in Chemistry (0 sch) during their senior year, prior to graduation. The details of the general, environmental, and biochemistry concentrations follow.

## General Requirements

Requirements	Credit Hours
First-Year Seminars (when applicable) <sup>1</sup>	0-2
Core Curriculum Program ( <a href="http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/">http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/</a> )	42
Special Foundations	21
Chemistry Major (depends on area of concentration)	45-46

Electives (depends on area of concentration) 12

**Total Credit Hours 120-123**

1

Full-time, first time in college students are required to take the first-year seminars.

- UNIV 1101 University Seminar I (1 sch)
- UNIV 1102 University Seminar II (1 sch)

## Program Requirements

Code	Title	Hours
<b>Full-time, First-year Students</b>		
First year seminars		0-2
UNIV 1101	University Seminar I	
UNIV 1102	University Seminar II	
<b>Core Curriculum Program</b>		
University Core Curriculum		42
Students majoring in chemistry should take: <sup>1</sup>		
CHEM 1411	General Chemistry I (Life and Physical Sciences component)	
CHEM 1412	General Chemistry II (Life and Physical Sciences component)	
MATH 2413	Calculus I (Mathematics requirement)	
MATH 2414	Calculus II (Component Area Option)	
<b>Special Foundations</b>		
Select one of the following Concentrations:		21
General Concentration (p. 1)		
Environmental Concentration (p. 2)		
Biochemistry/Preprofessional Concentration (p. 2)		
<b>Chemistry Major</b>		
Select one of the following Concentrations:		45-46
General Concentration (p. 1)		
Environmental Concentration (p. 2)		
Biochemistry/Preprofessional Concentration (p. 2)		
Physical Science Education Concentration (p. 3)		
<b>Electives</b>		
Courses may be selected from any area to accumulate a total of 120 semester hours with the required number of upper-division hours. In some cases these hours may be used to obtain a minor in another subject		12
<b>Total Hours</b>		<b>120-123</b>

1

Note for 4 hours courses such as General Chemistry and Calculus that are taken as Foundational Component Area requirements, students may count the extra 1 credit hour of each course as part of the Component Area Option (to a maximum of three credit hours). See catalog section on University Core Curriculum Programs.

## Concentrations

### Chemistry General Concentration

Code	Title	Hours
<b>Special Foundations</b>		
PHYS 2425	University Physics I	4

PHYS 2426	University Physics II	4
Biology, Geology, or Environmental Science		
MATH 2413	Calculus I <sup>1</sup>	4
MATH 2414	Calculus II <sup>2</sup>	4
MATH 2415	Calculus III	4
<b>Chemistry Major</b>		
CHEM 1411	General Chemistry I (included in Core) <sup>1</sup>	4
CHEM 1412	General Chemistry II (included in Core) <sup>1</sup>	4
CHEM 3411	Organic Chemistry I	4
CHEM 3412	Organic Chemistry II	4
CHEM 3417	Quantitative Analysis	4
CHEM 3418	Instrumental Analysis	4
CHEM 4085	Major Field Test in Chemistry	0
CHEM 4423	Physical Chemistry I	4
CHEM 4424	Physical Chemistry II	4
CHEM 4292	Senior Chemistry Seminar	2
CHEM 4401	Biochemistry I	4
CHEM 4407	Inorganic Chemistry	4
Select 18 hours of the following:		18
CHEM 4320	Drugs, Toxins and Natural Products Chemistry	
CHEM 4341	Organic Synthesis	
CHEM 4344	Chemical Oceanography	
CHEM 4350	Polymer Chemistry	
CHEM 4360	Molecular Spectroscopy	
CHEM 4402	Biochemistry II	
CHEM 4309	Advanced Instrumental Analysis	
CHEM 4443	Environmental Chemistry	
CHEM 4490	Special Topics	
CHEM 4696	Directed Independent Study	
Any Upper division Chemistry course not on the elective list and not listed as a specific Chemistry required course can be taken as an elective		
<b>Total Hours</b>		<b>88</b>

1

Nine of the 12 hours from General Chemistry I & II and Calculus I should be used to fulfill the University Core Curriculum Life and Physical Sciences and the Math components of the University Core Curriculum requirements. The other three hours of the lab portion of those courses should be used to fulfill three hours of the Component Area Option of the University Core Curriculum requirements.

2

Calculus II should be used to fulfill the other 3 hours of the Component Area Option. See catalog section on University Core Curriculum Programs.

### Environmental Chemistry Concentration

Code	Title	Hours
<b>Special Foundations</b>		
Physics, one year with laboratory		8
Biology, Geology, or Environmental Science		8
MATH 1442	Statistics for Life	4
MATH 2413	Calculus I <sup>1</sup>	4
MATH 2414	Calculus II <sup>2</sup>	4

### Chemistry Major

CHEM 1411	General Chemistry I (included in Core) <sup>1</sup>	4
CHEM 1412	General Chemistry II (included in Core) <sup>1</sup>	4
CHEM 3411	Organic Chemistry I	4
CHEM 3412	Organic Chemistry II	4
CHEM 3417	Quantitative Analysis	4
CHEM 3418	Instrumental Analysis	4
CHEM 4085	Major Field Test in Chemistry	0
CHEM 4292	Senior Chemistry Seminar	2
CHEM 4344	Chemical Oceanography	3
CHEM 4423	Physical Chemistry I	4
CHEM 4424	Physical Chemistry II	4
CHEM 4443	Environmental Chemistry	4
Select 18 hours of the following:		18
CHEM 4341	Organic Synthesis	
CHEM 4350	Polymer Chemistry	
CHEM 4360	Molecular Spectroscopy	
CHEM 4407	Inorganic Chemistry	
CHEM 4309	Advanced Instrumental Analysis	
CHEM 4490	Special Topics	
CHEM 4696	Directed Independent Study	
ESCI 4301	Environmental Regulations	
ESCI 4230	Oil Spill Prevention and Response Theory	
ESCI 4130	Oil Spill Prevention and Response Lab	
ESCI 4270	Hazardous Waste Operations and Emergency Response Theory	
ESCI 4170	Hazardous Waste Operations and Emergency Response Lab	
Any Upper division Chemistry course not on the elective list and not listed as a specific Chemistry required course can be taken as an elective		

**Total Hours** **87**

1

Nine of the 12 hours from General Chemistry I & II and Calculus I should be used to fulfill the University Core Curriculum Life and Physical Sciences and the Math components of the University Core Curriculum requirements. The other three hours of the lab portion of those courses should be used to fulfill three hours of the Component Area Option of the University Core Curriculum requirements.

2

Calculus II should be used to fulfill the other 3 hours of the Component Area Option. See catalog section on University Core Curriculum Programs.

### Biochemistry/Preprofessional Concentration

Code	Title	Hours
<b>Special Foundations</b>		
Physics, one year with laboratory		8
BIOL 1406	Biology I	4
BIOL 1407	Biology II	4
MATH 1442	Statistics for Life	4
MATH 2413	Calculus I <sup>1</sup>	4
MATH 2414	Calculus II <sup>2</sup>	4
<b>Chemistry Major</b>		

CHEM 1411	General Chemistry I (included in Core) <sup>1</sup>	4
CHEM 1412	General Chemistry II (included in Core) <sup>1</sup>	4
BIOL 2416	Genetics	4
BIOL 2421	Microbiology	4
CHEM 3411	Organic Chemistry I	4
CHEM 3412	Organic Chemistry II	4
CHEM 3417	Quantitative Analysis	4
CHEM 3418	Instrumental Analysis	4
CHEM 4085	Major Field Test in Chemistry	0
CHEM 4292	Senior Chemistry Seminar	2
CHEM 4401	Biochemistry I	4
CHEM 4402	Biochemistry II	4
CHEM 4423	Physical Chemistry I	4
Select at least 13 hours of the following:		13
MATH 2415	Calculus III	
CHEM 4320	Drugs, Toxins and Natural Products Chemistry	
CHEM 4341	Organic Synthesis	
CHEM 4350	Polymer Chemistry	
CHEM 4360	Molecular Spectroscopy	
CHEM 4407	Inorganic Chemistry	
CHEM 4420	Physical Biochemistry	
CHEM 4424	Physical Chemistry II	
CHEM 4443	Environmental Chemistry	
Any Upper division Chemistry course not on the elective list and not listed as a specific Chemistry required course can be taken as an elective		
<b>Total Hours</b>		<b>87</b>

1

Nine of the 12 hours from General Chemistry I & II and Calculus I should be used to fulfill the University Core Curriculum Life and Physical Sciences and the Math components of the University Core Curriculum requirements. The other three hours of the lab portion of those courses should be used to fulfill three hours of the Component Area Option of the University Core Curriculum requirements.

2

Calculus II should be used to fulfill the other 3 hours of the Component Area Option. See catalog section on University Core Curriculum Programs.

### Physical Science Education Concentration

Information on the physical science education concentration and requirements for teaching certification can be found in the College of Science: Science, Mathematics and Technology Education section of the catalog.

## Course Sequencing

### Chemistry General Concentration

#### First Year

Fall		Hours
UNIV 1101	University Seminar I	1
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
HIST 1301	U.S. History to 1865	3

Biology, Geology, or Environmental Science Course		4
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
UNIV 1102	University Seminar II	1
CHEM 1412	General Chemistry II	4
MATH 2413	Calculus I	4
ENGL 1302	Writing and Rhetoric II	3
HIST 1302	U.S. History Since 1865	3
<b>Hours</b>		<b>15</b>
<b>Second Year</b>		
<b>Fall</b>		
CHEM 3411	Organic Chemistry I	4
PHYS 2425	University Physics I	4
MATH 2414	Calculus II	4
Biology, Geology, or Environmental Science Course		4
<b>Hours</b>		<b>16</b>
<b>Spring</b>		
CHEM 3412	Organic Chemistry II	4
PHYS 2426	University Physics II	4
POLS 2305	U.S. Government and Politics	3
MATH 2415	Calculus III	4
Language, Philosophy & Culture Core Requirement		3
<b>Hours</b>		<b>18</b>
<b>Third Year</b>		
<b>Fall</b>		
CHEM 4401	Biochemistry I	4
POLS 2306	State and Local Government	3
CHEM 4407	Inorganic Chemistry	4
CHEM 3418	Instrumental Analysis	4
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
CHEM 4402	Biochemistry II	4
CHEM 3417	Quantitative Analysis	4
General Chemistry Elective		4
General Chemistry Elective		4
<b>Hours</b>		<b>16</b>
<b>Fourth Year</b>		
<b>Fall</b>		
CHEM 4423	Physical Chemistry I	4
Social and Behavioral Sciences Core Requirement		3
General Chemistry Elective		4
Elective to meet 120		2
<b>Hours</b>		<b>13</b>
<b>Spring</b>		
CHEM 4424	Physical Chemistry II	4
CHEM 4292	Senior Chemistry Seminar	2
CHEM 4085	Major Field Test in Chemistry	0
General Chemistry Elective		3
Creative Arts Core Requirement		3
<b>Hours</b>		<b>12</b>
<b>Total Hours</b>		<b>120</b>

## Environmental Chemistry Concentration

### First Year

Fall		Hours
UNIV 1101	University Seminar I	1
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
Biology, Geology, or Environmental Science Course		4
Creative Arts Core Requirement		3
<b>Hours</b>		<b>15</b>

### Spring

UNIV 1102	University Seminar II	1
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
MATH 2413	Calculus I	4
Biology, Geology, or Environmental Science Course		4
<b>Hours</b>		<b>16</b>

### Second Year

Fall		Hours
CHEM 3411	Organic Chemistry I	4
MATH 1442	Statistics for Life	4
PHYS 1401	General Physics I or PHYS 2425 or University Physics I	4
Language, Philosophy & Culture Core Requirement		3
<b>Hours</b>		<b>15</b>

### Spring

CHEM 3412	Organic Chemistry II	4
PHYS 1402	General Physics II or PHYS 2426 or University Physics II	4
MATH 2414	Calculus II	4
Social and Behavioral Sciences Core Requirement		3
<b>Hours</b>		<b>15</b>

### Third Year

Fall		Hours
CHEM 3418	Instrumental Analysis	4
Environmental Chemistry Elective		4
Environmental Chemistry Elective		4
American History Core Requirement		3
<b>Hours</b>		<b>15</b>

### Spring

CHEM 3417	Quantitative Analysis	4
CHEM 4443	Environmental Chemistry	4
Environmental Chemistry Elective		4
American History Core Requirement		3
<b>Hours</b>		<b>15</b>

### Fourth Year

Fall		Hours
CHEM 4423	Physical Chemistry I	4
POLS 2305	U.S. Government and Politics	3
Environmental Chemistry Elective		4
General Elective		3
<b>Hours</b>		<b>14</b>

### Spring

CHEM 4424	Physical Chemistry II	4
CHEM 4292	Senior Chemistry Seminar	2
CHEM 4344	Chemical Oceanography	3
CHEM 4085	Major Field Test in Chemistry	0
Environmental Chemistry Elective		3
POLS 2306	State and Local Government	3
<b>Hours</b>		<b>15</b>
<b>Total Hours</b>		<b>120</b>

## Biochemistry/Preprofessional Concentration

### First Year

Fall		Hours
UNIV 1101	University Seminar I	1
CHEM 1411	General Chemistry I	4
BIOL 1406	Biology I	4
ENGL 1301	Writing and Rhetoric I	3
HIST 1301	U.S. History to 1865	3
<b>Hours</b>		<b>15</b>

### Spring

UNIV 1102	University Seminar II	1
CHEM 1412	General Chemistry II	4
BIOL 1407	Biology II	4
ENGL 1302	Writing and Rhetoric II	3
MATH 2413	Calculus I	4
<b>Hours</b>		<b>16</b>

### Second Year

Fall		Hours
CHEM 3411	Organic Chemistry I	4
MATH 1442	Statistics for Life	4
PHYS 1401	General Physics I or PHYS 2425 or University Physics I	4
Language, Philosophy & Culture Core Requirement		3
<b>Hours</b>		<b>15</b>

### Spring

CHEM 3412	Organic Chemistry II	4
PHYS 1402	General Physics II or PHYS 2426 or University Physics II	4
MATH 2414	Calculus II	4
HIST 1302	U.S. History Since 1865	3
<b>Hours</b>		<b>15</b>

### Third Year

Fall		Hours
CHEM 4401	Biochemistry I	4
POLS 2305	U.S. Government and Politics	3
BIOL 2421	Microbiology	4
CHEM 3418	Instrumental Analysis	4
<b>Hours</b>		<b>15</b>

### Spring

CHEM 4402	Biochemistry II	4
CHEM 3417	Quantitative Analysis	4
BIOL 2416	Genetics	4

Biochemistry Elective	4
<b>Hours</b>	<b>16</b>
<b>Fourth Year</b>	
<b>Fall</b>	
CHEM 4423 Physical Chemistry I	4
CHEM 4292 Senior Chemistry Seminar	2
POLS 2306 State and Local Government	3
Social and Behavioral Sciences Core Requirement	3
<b>Hours</b>	<b>12</b>
<b>Spring</b>	
CHEM 4085 Major Field Test in Chemistry	0
Biochemistry Elective	3
Biochemistry Elective	3
Biochemistry Elective	3
Creative Arts Core Requirement	3
Elective to reach 120	4
<b>Hours</b>	<b>16</b>
<b>Total Hours</b>	<b>120</b>

## Courses

### CHEM 1305 Introductory Chemistry

#### 3 Semester Credit Hours (3 Lecture Hours)

A one-semester principles course for students in non-science related majors covering the major concepts of chemistry (atomic structure, bonding, stoichiometry, elementary thermodynamics) and the role of chemistry in contemporary society (polymers, energy, pollution, etc.). Will not substitute for CHEM 1411.

TCCNS: CHEM 1305

### CHEM 1406 Introductory Physiological Chemistry

#### 4 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)

Fundamentals of chemistry with a descriptive introduction to organic and physiological chemistry. For students in nursing and other allied health programs which require only one semester of a laboratory chemistry. Safety training given during a laboratory meeting early in the semester is required for continued participation in this course.

Co-requisite: SMTE 0093.

### CHEM 1411 General Chemistry I

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

The foundation course in chemistry. Stoichiometry, chemical equilibria, atomic structure, chemical bonding, periodic properties, thermodynamics, chemical kinetics, and descriptive chemistry of the elements. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum. Either CHEM 1305 - Introductory Chemistry or CHEM 1411, but not both, may be applied towards the core requirement. This course is offered in Fall, Spring and typically during both Summer sessions.

Co-requisite: SMTE 0093.

TCCNS: CHEM 1411

### CHEM 1412 General Chemistry II

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

The continuation of CHEM 1411 - General Chemistry I, the foundation course in chemistry with emphasis on quantitative aspects. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum. CHEM 1411 - General Chemistry I and MATH 1314 - College Algebra or equivalent math competency or higher. This course is offered in Fall, Spring and typically both Summer sessions.

Prerequisite: CHEM 1411 and (MATH 1314, 1316, 1325, 2312, 2413, 2414, 2415 or 2305).

Co-requisite: SMTE 0093.

TCCNS: CHEM 1412

### CHEM 2490 Special Topics

#### 4 Semester Credit Hours (1-4 Lecture Hours, 3 Lab Hours)

May be repeated for credit. Subject materials variable. Offered on sufficient demand.

### CHEM 3411 Organic Chemistry I

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

The structure, nomenclature, synthesis, reactions, and reaction mechanisms of the principal classes of organic compounds. Stereochemistry and spectroscopy of organic compounds. Laboratory involves separation and synthetic techniques and development of basic skills. This course is offered in Fall, Spring and typically during the Summer I session.

Prerequisite: CHEM 1411.

Co-requisite: SMTE 0093.

### CHEM 3412 Organic Chemistry II

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

A continuation of CHEM 3411. The course concludes with a survey of the structures of biomolecules. Laboratory involves spectroscopy and qualitative analysis techniques. This course is offered in Fall, Spring and typically during the Summer II session.

Prerequisite: CHEM 3411.

Co-requisite: SMTE 0093.

### CHEM 3417 Quantitative Analysis

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

A course in quantitative analysis, which includes chemical statistics and the use of acid-base, complexation, precipitation, and redox reactions to perform analyses and separations. Laboratory includes standard volumetric and gravimetric methods and development of basic quantitative techniques. This course is typically offered in Spring.

Prerequisite: CHEM 1412.

Co-requisite: SMTE 0093.

### CHEM 3418 Instrumental Analysis

#### 4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

An introduction to instrumental methods of analysis: spectroscopy, chromatography, and electrochemical methods. Laboratory involves use of instrumentation in chemical analysis. This course is typically offered in Fall and Spring.

Prerequisite: CHEM 1412.

Co-requisite: SMTE 0093.

### CHEM 4085 Major Field Test in Chemistry

#### 0 Semester Credit Hours

The Major Field Test (MFT) in Chemistry is a national examination given in the Fall and Spring semesters only. It is a graduation requirement for all Chemistry students. Students enroll in this course during the semester that they plan to take the MFT. There is no cost to the student for either this course or for the MFT.

**CHEM 4292 Senior Chemistry Seminar****2 Semester Credit Hours (2 Lecture Hours)**

Presentation and discussion of selected topics in chemistry. Includes literature searches and reviews, paper presentations, survey of professional opportunities and requirements, career guidance and job searching skills.

**CHEM 4309 Advanced Instrumental Analysis****3 Semester Credit Hours (3 Lecture Hours)**

An advanced course in analytical chemistry covering the underlying theories of instrumental methods. This course is typically offered on an irregular basis.

**Prerequisite:** (CHEM 3411, 3412 and 3418).

**CHEM 4320 Drugs, Toxins and Natural Products Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

The chemistry and biological activity of pharmaceuticals, toxins and selected natural products. Examines how chemical structure relates to biological activity. Also examines action of antibiotics, chemotherapy agents, analgesics, steroids, and compounds targeting the central and peripheral nervous system. This course is typically offered in Fall and Spring.

**Prerequisite:** CHEM 4401.

**CHEM 4341 Organic Synthesis****3 Semester Credit Hours (3 Lecture Hours)**

This three-credit hour course will entail detailed description of structure, synthesis, and reactions and mechanisms in organic chemistry including important named reactions. This course will also introduce them to the art of writing reaction mechanisms and retrosynthetic analysis. Moreover, they will be learning about separation, purification and characterization of organic compounds followed by scientific abstract writing. Designed only for science major. There is NO laboratory associated with the course.

**Prerequisite:** CHEM 3412.

**CHEM 4344 Chemical Oceanography****3 Semester Credit Hours (3 Lecture Hours)**

The study of the oceans and seas as a chemical system, including interactions with both the biota and the solid earth. This course is typically offered in Spring.

**Prerequisite:** CHEM 1412.

**CHEM 4350 Polymer Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

An advanced lecture course in organic chemistry. Characterization of polymers. Polymerization mechanisms. Current research directions such as biomedical applications and electroactive polymers. This course is offered on an irregular basis.

**Prerequisite:** CHEM 3412.

**CHEM 4360 Molecular Spectroscopy****3 Semester Credit Hours (3 Lecture Hours)**

Spectroscopy and Structure of Organic Compounds is a three-credit that introduce you to concepts used in the identification of organic compounds with methods based on NMR, mass spectrometry, UV and IR.

**Prerequisite:** CHEM 3412.

**CHEM 4401 Biochemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The structure and function of carbohydrates, lipids, proteins, and nucleic acids. An introduction to enzyme kinetics, cell membrane structure and biochemical signaling. Laboratory exercises demonstrate the basic principles and techniques used in Biochemistry. This course is typically offered in Fall, Spring and Summer.

**Prerequisite:** CHEM 3412 and (BIOL 1406 and 1407).

**Co-requisite:** SMTE 0093.

**CHEM 4402 Biochemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4401. Biochemical energetics, including glycolysis, fatty acid oxidation, amino acid oxidation, citric acid cycle, oxidative phosphorylation, photophosphorylation and photosynthesis. Carbohydrate, fatty acid and amino acid biosynthesis. Laboratory is a continuation of biochemical techniques. This course is typically offered in Fall and Spring.

**Prerequisite:** CHEM 4401.

**Co-requisite:** SMTE 0093.

**CHEM 4407 Inorganic Chemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A survey of inorganic chemistry. Theories of atomic structure, covalent bonding, ionic solids, metallic solids, and coordination compounds. Modern acid-base concepts. Laboratory involves the synthesis of inorganic compounds.

**Prerequisite:** CHEM 3412.

**Co-requisite:** SMTE 0093.

**CHEM 4420 Physical Biochemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered on an irregular basis.

**Prerequisite:** CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

**Co-requisite:** SMTE 0093.

**CHEM 4423 Physical Chemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered in Fall.

**Prerequisite:** CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

**Co-requisite:** SMTE 0093.

**CHEM 4424 Physical Chemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4423, including the study of chemical kinetics, electrochemistry, molecular structure, and quantum mechanics. This course is typically offered in Spring.

**Prerequisite:** CHEM 4423.

**Co-requisite:** SMTE 0093.

**CHEM 4443 Environmental Chemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A study of the impact of chemistry on the environment, including topics of air pollution, water pollution, and beneficial chemical modifications of the environment. Laboratory devoted to field techniques of sampling, sample preservation, and analytical techniques applied to the environment. This course is typically offered in Spring.

**Prerequisite:** CHEM 1412.

**Co-requisite:** SMTE 0093.

**CHEM 4490 Special Topics****4 Semester Credit Hours (1 Lecture Hour, 1 Lab Hour)**

May be repeated for credit. Subject materials variable.

**CHEM 4696 Directed Independent Study****1-6 Semester Credit Hours**

Requires a formal proposal of study to be completed in advance of registration, to be approved by the supervising faculty, the chairperson and the dean of the College.