

Chemistry and Biochemistry

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The Department of Chemistry and Biochemistry at Taylor University provides high-quality training in chemistry and biochemistry while providing opportunities for meaningful spiritual and interpersonal experiences that will enable students to move successfully into the next phase of their professional training or the career of their choice.

The bachelor of arts degree in chemistry requires completion of two years, sequential study in one foreign language. Both the bachelor of arts and bachelor of science degrees are available in chemistry-environmental science.

Chemistry (BA)

The bachelor of arts degree with a major in chemistry requires two years of one foreign language and 60-66 hours in the major. This program is suitable for students wishing to enter either graduate school or the chemical industry.

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab
CHE 432	3	Physical Chemistry II
CHE 432L	1-2	Physical Chemistry II Lab

Select *one* of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Additional Major Requirements

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select *one* option from the following:

MAT 151	4	Calculus I
iMAT 145	3	Introduction to Functions and Calculus
and		
iMAT 146	3	Functions and Calculus

iMAT 145 and MAT 146 combination meets requirement.

Recommended Electives

CHE 412	3	Biochemistry II
MAT 240	4	Calculus III
MAT 251	4	Differential Equations
MAT 352	4	Mathematical Statistics
COS xxx		

NAS 480 is recommended in the junior or senior year.

Chemistry/Systems (BS)

The bachelor of science degree with a major in chemistry/systems consists of 52-56 hours in the major and curriculum requirements in systems analysis. This program is especially attractive to students planning to enter either graduate school or the chemical industry. *All systems curriculum courses must be completed with a grade of C- or better.*

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab
CHE 432	3	Physical Chemistry II
CHE 432L	1-2	Physical Chemistry II Lab

Select *one* of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Additional Major Requirements

PHY 211	4	University Physics I
PHY 212	5	University Physics II

Systems Requirements

COS 120	4	Introduction to Computer Science I
COS 121	4	Introduction to Computer Science II
ENP 341	4	Microcomputer Interfacing
IAS 330	3	Human Relations in Organizations
MAT 230	4	Calculus II
MAT 382	3	Advanced Statistical Methods
ENP 331	4	Introduction to Electronics
SYS 101	3	Introduction to Systems
SYS 402	4	Modeling and Simulation
CHE 393	3-4	Practicum

Select *one* course from the following:

MAT 210	4	Introductory Statistics
MAT 352	4	Mathematical Statistics

Select *one* option from the following:

MAT 151	4	Calculus I
iMAT 145	3	Introduction to Functions and Calculus
and		
iMAT 146	3	Functions and Calculus

iMAT 145 and MAT 146 combination meets requirement.

Chemistry (BS)

The bachelor of science degree with a major in chemistry consists of 68 hours in the major and curriculum requirements in systems analysis. This program is especially attractive to students planning to enter either graduate school or the chemical industry.

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 412	3	Biochemistry II
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab
CHE 432	3	Physical Chemistry II
CHE 432L	1-2	Physical Chemistry II Lab
CHE 450	6	Directed Research

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Additional Requirements

†MAT 151	4	Calculus I
†MAT 230	4	Calculus II
†PHY 211	4	University Physics I
†PHY 212	5	University Physics II

†Course does not count toward major GPA.

Recommended Electives

BIO 101	4	Principles of Cell Biology
MAT 240	4	Calculus III
MAT 251	4	Differential Equations
MAT 352	4	Mathematical Statistics

Chemistry/Biochemistry Concentration (BA)

The bachelor of arts degree with a major in chemistry and a concentration in biochemistry requires two years of one foreign language and 68-71 hours. This program prepares students for a career in biochemistry, medicine, molecular biology and other related fields.

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 412	3	Biochemistry II
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Additional Major Requirements

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II
BIO 101	4	Principles of Cell Biology

Select one option from the following:

MAT 151	4	Calculus I
†MAT 145	3	Introduction to Functions and Calculus
and		
†MAT 146	3	Functions and Calculus

†MAT 145 and MAT 146 combination meets requirement.

Electives

Select two elective biology courses (6 hours).

Chemistry/Pre-Medicine Concentration (BA)

The bachelor of arts degree with a major in chemistry and a pre-professional concentration in pre-medicine requires two years, sequential study of one foreign language and 67-73 major hours.

Students interested in the pre-medicine curriculum should check out during their sophomore year the medical school admissions requirements for the school(s) to which they plan to apply. The Medical School Admission Requirements guide published annually by AAMC is the best resource for this information. It is important to meet the specific entrance requirements of the medical school(s) chosen.

Maintaining at least an A- average and scoring well on the MCAT test (usually taken in the spring of the junior year) are common prerequisites for acceptance to a medical school. Assistance is available in preparing for the MCAT examinations.

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Additional Major Requirements

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one option from the following:

MAT 151	4	Calculus I
†MAT 145	3	Introduction to Functions and Calculus

and

†MAT 146	3	Functions and Calculus
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†MAT 145 & 146 count as one option.

Select three biology courses from the following:

*BIO 101	4	Principles of Cell Biology
BIO 104	3	Introductory Animal Biology
*BIO 203	4	Principles of Genetics
BIO 312	4	Cellular and Molecular Biology
*BIO 331	4	Comparative Anatomy
BIO 432	4	Developmental Biology
*BIO 452	4	Animal Physiology
BIO 471	4	Microbiology and Immunology

*BIO 101; 203; and 331 or 452 are highly recommended.

Recommended Elective

CHE 412	3	Biochemistry II
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Chemistry/Systems—Pre-Medicine Concentration (BS)

The bachelor of science degree with a major in chemistry/systems and a pre-professional concentration in pre-medicine consists of the 67-73 major hours in addition to the curriculum requirements in systems analysis. All systems curriculum courses must be completed with a grade of C- or better.

Students interested in the pre-medicine curriculum should check out during their sophomore year the medical school admissions requirements for the school(s) to which they plan to apply. The Medical School Admission Requirements guide published annually by AAMC is the best resource for this information. It is important to meet the specific entrance requirements of the medical school(s) chosen.

Maintaining at least an A- average and scoring well on the MCAT test (usually taken in the spring of the junior year) are common prerequisites for acceptance to a medical school. Assistance is available in preparing for the MCAT examinations.

Major Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Select three biology courses from the following:

*BIO 101	4	Principles of Cell Biology
BIO 104	3	Introductory Animal Biology
*BIO 203	4	Principles of Genetics
BIO 312	4	Cellular and Molecular Biology
*BIO 331	4	Comparative Anatomy
BIO 432	4	Developmental Biology
*BIO 452	4	Animal Physiology
BIO 471	4	Microbiology and Immunology

*BIO 101; 203; and 331 or 452 are highly recommended.

Recommended Elective

CHE 412	3	Biochemistry II
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Systems Requirements

COS 120	4	Introduction to Computer Science I
COS 121	4	Introduction to Computer Science II
ENP 341	4	Microcomputer Interfacing
IAS 330	3	Human Relations in Organizations
MAT 230	4	Calculus II
MAT 382	3	Advanced Statistical Methods
ENP 331	4	Introduction to Electronics
SYS 101	3	Introduction to Systems
SYS 402	4	Modeling and Simulation
CHE 393	3-4	Practicum

Select one course from the following:

MAT 210	4	Introductory Statistics
MAT 352	4	Mathematical Statistics

Select one option from the following:

MAT 151	4	Calculus I
†MAT 145	3	Introduction to Functions and Calculus

and

†MAT 146	3	Functions and Calculus
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†MAT 145 & 146 count as one option.

Additional Major Requirements

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one option from the following:

MAT 151	4	Calculus I
†MAT 145	3	Introduction to Functions and Calculus

and

†MAT 146	3	Functions and Calculus
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†MAT 145 & 146 count as one option.

Chemistry–Environmental Science (BS)

This integrated major has a strong emphasis on the physical aspects of environmental studies. It is appropriate for students planning careers in environmental research or industrial or municipal environmental monitoring and control. The bachelor of science degree with a major in chemistry–environmental science requires 90-92 major hours.

Chemistry Requirements

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 330	3	Inorganic Chemistry
CHE 410L	2	Biochemistry Lab
CHE 411	3	Biochemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab
CHE 432	3	Physical Chemistry II
CHE 432L	1-2	Physical Chemistry II Lab

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Physics Requirements

PHY 211	4	University Physics I
PHY 212	5	University Physics II

Environmental Science Requirements

CHE 320	3	Environmental Chemistry
CHE 320L	1	Environmental Chemistry Lab
ENS 204	4	Principles of Ecology
ENS 231	4	Introduction to Environmental Science
ENS 383	4	Environmental Ethics
ENS 402	4	Environmental Law and Policy

Select one course from the following:

CHE 393	2-4	Practicum
ENS 393	2-4	Practicum

Mathematics Requirements

MAT 230	4	Calculus II
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Select one option from the following:

MAT 151	4	Calculus I
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†MAT 145	3	Introduction to Functions and Calculus
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and

†MAT 146	3	Functions and Calculus
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†MAT 145 & 146 count as one option.

Electives (to total 90-92 major hours)

CHE 412	3	Biochemistry II
MAT 210	4	Introductory Statistics
ENP 331	4	Introduction to Electronics
ENS 241	4	Physical Geology

Chemistry Education (BS)

The bachelor of science degree with a major in chemistry education requires 76-80 hours of professional education courses and major courses. Secondary Education majors must complete specific general education requirements as outlined by the Education Department.

Chemistry Courses

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 420	2	Chemistry Seminar
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
*CHE 212	4	College Chemistry II

*CHE 211 and 212 are generally recommended.

Select at least one course from:

CHE 312	4	Organic Chemistry II
CHE 320	3	Environmental Chemistry
CHE 330	3	Inorganic Chemistry
CHE 411	3	Biochemistry I

Professional Education

EDU 150	3	Education in America
EDU 210	3	Writing for Teachers
EDU 260	3	Educational Psychology
EDU 310	2	Discipline and Classroom Management
EDU 309	1	Teaching in Secondary, Junior High/Middle Schools— Special Methods
EDU 415	1	Student Teaching Seminar
EDU 431	15	Supervised Internship in Secondary Schools
NAS 309	2	Science Education Methods
SED 320	3	Exceptional Children

Additional Major Requirements

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one option from the following:

MAT 151	4	Calculus I
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†MAT 145	3	Introduction to Functions and Calculus
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and

†MAT 146	3	Functions and Calculus
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†MAT 145 & 146 count as one option.

Physical Science Education/Chemistry Concentration (BS)

The bachelor of science degree with a major in physical science and a concentration in chemistry requires 76-83 hours of professional education, physical science core and chemistry courses. *Majors must take CAS 110 to meet their general education speaking requirement.*

Physical Science Core

MAT 230	4	Calculus II
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one option from the following:

MAT 151	4	Calculus I
†MAT 145	3	Introduction to Functions and Calculus
and		
†MAT 146	3	Functions and Calculus

†MAT 145 & 146 count as one option.

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

(CHE 211 and 212 are generally recommended)

Chemistry Concentration

CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II
CHE 431	3	Physical Chemistry I
CHE 431L	1-2	Physical Chemistry I Lab

Professional Education

EDU 150	3	Education in America
EDU 210	3	Writing for Teachers
EDU 260	3	Educational Psychology
EDU 310	2	Discipline and Classroom Management
EDU 309	1	Teaching in Secondary, Junior High/Middle Schools—Special Methods
*EDU 332	3	The Junior High/Middle School
EDU 415	1	Student Teaching Seminar
EDU 431	15	Supervised Internship in Secondary Schools
NAS 309	2	Science Education Methods
SED 320	3	Exceptional Children

* EDU 332 is required only for those seeking licensure in junior high/middle school.

Chemistry Minor

The chemistry minor requires a minimum of 21 hours and includes at least four semesters of core chemistry lab courses.

Minor Requirements

CHE 311	4	Organic Chemistry I
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Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

*CHE 211	4	College Chemistry I
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*CHE 212	4	College Chemistry II
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*CHE 211 and 212 are generally recommended.

Select one of the following chemistry course combinations:

†CHE 301	3	Analytical Chemistry I
CHE 301L	1	Analytical Chemistry I Lab
or		
†CHE 302	3	Analytical Chemistry II
CHE 302L	1	Analytical Chemistry II Lab
or		
†CHE 320	3	Environmental Chemistry
CHE 320L	1	Environmental Chemistry Lab
or		
CHE 330	3	Inorganic Chemistry

†Must be taken with Lab to meet requirement.

Electives

Select at least two upper-division (300/400-level) chemistry courses.

Chemistry Courses

CHE 100

4 hours

Chemistry for Living

A course designed for students who have little or no background in chemistry. Basic principles of chemistry are applied in a social context. Three hours of lecture and one two-hour lab per week. *Meets general education physical science requirement. No prerequisite, although high school algebra is recommended. Offered fall and spring semesters.*

CHE 170

1-4 hours

Selected Topics

A course offered on a subject of interest but not listed as a regular course offering. *May count toward the departmental major and general education requirements.*

CHE 201

4 hours

General Chemistry I

This is the first semester of a two-semester sequence designed for students with minimal backgrounds in chemistry. The two semesters are a comprehensive overview, with the first semester focusing on measurement, chemical reactions, stoichiometry, atomic structure, chemical bonds, molecular shapes, solutions, gases, thermochemistry, redox reactions, and phase changes. Descriptive chemistry and theory are integrated. A variety of applications are used, including astronomy, biology, medicine, geology, environmental chemistry, industrial chemistry, and everyday life. Common organic and inorganic compounds are used as examples. The labs are designed to illustrate concepts discussed in class, develop good lab skills, and enhance problem-solving ability. Designed for those needing a two-semester sequence of basic chemistry with lab. Three hours of lecture and three hours of lab per week. *Meets general education physical science requirement. No college level prerequisites, but high school algebra and chemistry are strongly recommended. Offered fall semester.*

CHE 202

4 hours

General Chemistry II

This is the second semester of a two-semester sequence designed for students with minimal backgrounds in chemistry yet need a solid foundation in chemistry for their major. Typically students who take the CHE 201/202 sequence are not planning to take more advanced courses in chemistry. The second semester focuses on chemical equilibrium, thermodynamics, acid-base chemistry, chemical kinetics, electrochemistry, organic chemistry, and biochemistry. Designed for those needing a two-semester sequence of basic chemistry with lab. Three hours of lecture and three hours of lab per week. *Prerequisite: CHE 201. Offered spring semester.*

CHE 211

4 hours

College Chemistry I

This is a general chemistry course for those intending to take later coursework in chemistry, such as organic, inorganic, analytical, or environmental chemistries. The course thoroughly explores the basic concepts and theories of chemistry, using quantitative skills to predict and characterize chemical properties and changes. The nature of atomic structure and chemical bonding and the properties of solids, liquids, and gases are all presented and studied using lectures, demonstrations, and computer-assisted teaching and testing methods. Chemical change is studied in terms of reaction classes, energy flows, and kinetic theories. *Meets the general education physical science requirement. Offered fall semester.*

CHE 212

4 hours

College Chemistry II

The second general chemistry course for those intending to take later coursework in chemistry, such as organic, inorganic, analytical, or environmental chemistries. This course thoroughly explores the basic concepts and theories of chemistry using quantitative skills to predict and characterize chemical properties and changes. The nature of organic chemistry, complexes, equilibria, electrochemistry, and advanced acid-base properties are all presented and studied using lectures, demonstrations, and computer-assisted teaching and testing methods. Chemical change is studied in terms of entropy, free energy, and kinetic theories. *Prerequisite: CHE 211. Offered spring semester.*

CHE 270

1-4 hours

Selected Topics

A course offered on a subject of interest but not listed as a regular course offering. *May count toward the departmental major and general education requirements.*

CHE 301

3 hours

Analytical Chemistry I

An introduction to modern theories and methods used in separations and quantitative determinations. Topics include basic statistics and treatment of data, gravimetry, volumetric titrations (acid-base, precipitation, complexometric, and redox). Topics correlate with the lab. Three hours of lecture per week. *Prerequisite: CHE 202. Corequisite: CHE 301L. Offered fall semester of odd years.*

CHE 301L

1 hour

Analytical Chemistry I Lab

This lab includes gravimetric and volumetric (acid-base, precipitation, redox, nonaqueous complexometric) titrations. Some instrumentation is used: AA, GC/MS, and computer-controlled titrators. Three hours of lab per week. *Prerequisite: CHE 202. Corequisite: CHE 301. Offered fall semester of odd years.*

CHE 302

3 hours

Analytical Chemistry II

A continuation of CHE 301 in which instrumental methods of analysis are emphasized. Topics include the general principles underlying selected instrumental methods of analysis. Topics supplement and expand the lab experiences. Three hours of lecture per week. *Prerequisite: CHE 301. Corequisite: CHE 302L. Offered spring semester of even years.*

CHE 302L

1 hour

Analytical Chemistry II Lab

Lab experiences are offered that include optical methods (UV, VIS, AA), electrochemistry, and chromatography (HPLC, GC, IC, GC/MS). Three hours of lab per week. *Corequisite: CHE 302L. Offered spring semester of even years.*

CHE 311

4 hours

Organic Chemistry I

The study of covalent carbon compounds. Nomenclature, properties, and reactions (including reaction mechanisms) of all classes of hydrocarbons, alcohols, ethers, halides, and organometallic substances are studied. NMR and IR spectroscopic methods are learned and applied. The lab includes development of advanced lab skills and study of the kinetics and properties of organic substances in reactions. Three hours of lecture and three hours of lab. *Prerequisites: CHE 211, 212 (recommended) or CHE 201, 202. Offered fall semester.*

CHE 312

4 hours

Organic Chemistry II

Continuation of CHE 311. Focuses on carbonyl and carboxylate compounds and their derivatives, amines, and polyfunctional compounds, including biomolecules. Lab work includes study of the properties of aromatic compounds, qualitative organic analysis, and small group original research projects. Three hours of lecture and three hours of lab. *Prerequisite: CHE 311. Offered spring semester.*

CHE 320

3 hours

Environmental Chemistry

A course that emphasizes principles and analysis of chemical sources, movement, distribution, and effects in natural environments. *Prerequisite: One year of general chemistry. Corequisite: CHE 320L. Offered spring semester of even years.*

CHE 320L

1 hour

Environmental Chemistry Lab

This lab provides experiences in sampling and analysis of water, soil, and air. Experimental work is conducted in both natural habitats and the lab. *Prerequisite: One year of general chemistry. Corequisite: CHE 320. Offered spring semester of odd years.*

CHE 330 Inorganic Chemistry	3 hours	Coverage of the bonding and properties of the main group and especially transition metal elements with a focus on their coordination and solid-state chemistry. Molecular symmetry principles, spectroscopy, and catalytic applications of these substances are discussed in lecture and studied in lab. Organometallic and bioinorganic chemistry are emphasized in lab studies. Two hours of lecture and three hours of lab. <i>Prerequisite: CHE 311. Offered each January interterm.</i>
CHE 360 Independent Study	1-4 hours	An individualized, directed study involving a specified topic.
CHE 370 Selected Topics	1-4 hours	A course offered on a subject of interest but not listed as a regular course offering. <i>May count toward the departmental major and general education requirements.</i>
CHE 393 Practicum	1-4 hours	Supervised learning involving a first-hand field experience or a project. Generally, one hour of credit is awarded for a minimum of 40 hours of practicum experience. <i>Offered primarily during summer.</i>
CHE 410L Biochemistry Lab	2 hours	The lab uses a case study approach in which an enzyme is isolated and characterized in detail. The molecular genetics, structure, regulation, and kinetics of the enzyme are studied using a wide range of techniques. This course is designed for chemistry and biology majors with a background in organic chemistry. There will be some lecture, but the primary experience will be in the lab. <i>Prerequisite: CHE 411 or consent of instructor. Cell biology is strongly recommended. Offered January interterm.</i>
CHE 411 Biochemistry I	3 hours	An introduction to the principles of biochemistry in which conformation and biosynthesis of macromolecules, bioenergetics, molecular genetics, and techniques of separation and analysis are studied. This course is designed for chemistry and biology majors with a background in organic chemistry. Three hours of lecture per week. <i>Prerequisite: CHE 311 or consent of instructor. Cell biology is strongly recommended. Offered fall semester.</i>
CHE 412 Biochemistry II	3 hours	This course is a continuation of CHE 411. The emphasis is on metabolism, molecular genetics, and molecular physiology. This course is designed for chemistry and biology majors with a background in organic chemistry. Three hours of lecture per week. <i>Prerequisite: CHE 411 or consent of instructor. Cell biology is strongly recommended. Offered spring semester.</i>
CHE 420 Chemistry Seminar	2 hours	In this course, students complete their senior papers, develop and give an oral presentation of this material, and then defend it orally. Discussion and readings on issues related to science and faith are also included. <i>Prerequisite: Successful completion of fall term paper writing workshop (0 hrs. credit). Required of all chemistry seniors. Offered January interterm.</i>
CHE 431 Physical Chemistry I	3 hours	An introduction to the kinetic-molecular theory of gases, the principles of thermodynamics, solutions, electrochemistry, and chemical kinetics. The course is designed for chemistry and physics majors. <i>Prerequisites: CHE 201 and 202 or 211 and 212; PHY 211, 212; and MAT 146 or 151, 230. Corequisite: CHE 431L. Offered fall semester of even years.</i>
CHE 431L Physical Chemistry I Lab	1-2 hours	A lab course that includes vacuum techniques, thermometry and thermoregulation, calorimetry, physical characterization of solutions, and optical techniques. Students opting for two hours apply these techniques to a project. Three to six hours of lab per week. <i>Corequisite: CHE 431L. Offered fall semester of even years.</i>
CHE 432 Physical Chemistry II	3 hours	Emphasis on elementary principles of quantum mechanics, molecular structure, spectroscopy, and photochemistry. The course is designed for chemistry and physics majors. Three hours of lecture per week. <i>Prerequisites: CHE 201 and 202 or 211 and 212; PHY 211, 212; and MAT 146 or 151, 230, with MAT 240, 251, 351 strongly recommended. Corequisite: CHE 432L. Offered spring semester of odd years.</i>
CHE 432L Physical Chemistry II Lab	1-2 hours	Same content as CHE 431L. Students who have taken CHE 431L for one-hour credit do a project in CHE 432L. No student may have more than two hours total lab credit from CHE 431L and CHE 432L. Three to six hours of lab per week. <i>Corequisite: CHE 432. Offered spring semester of odd years.</i>
CHE 450 Directed Research	1-4 hours	Investigative learning involving closely directed research and the use of such facilities as the library or laboratory.
CHE 480 Seminar	1-4 hours	A limited-enrollment course designed especially for upper-class majors with emphasis on directed readings and discussion.
CHE 490 Honors	1-2 hours	Individualized study or research of an advanced topic within a student's major. Open to students with at least a 3.00 GPA in the major field.