**BIOCHEMISTRY**

Students who study biochemistry will experience the chemistry and molecular nature of living things. Biochemistry majors will learn the information and energy flow of cells and organisms, structure and function of biological molecules and how cells do their business.

The Biochemistry major is a dynamic mixture of foundational chemistry and biology courses and a unique mixture of advanced specialized biochemistry classes to give our students a chance to experiment in biochemistry and learn about the chemical properties of biological molecules and systems. Students in the biochemistry major are well prepared for careers in biochemistry, entry into biochemistry or physics. Our new hybrid laboratory course, Molecular Biology (ASBMB). Students earning a biochemistry major can have their degree certified by both the ACS and the ASBMB with the appropriate coursework.

Because biochemistry is a diverse field, students in this major are exposed to advanced biochemistry topics with additional options in chemistry, biology, biochemistry or physics. Our new hybrid laboratory course, Molecular Biology Techniques and other courses ensure our students are ready for jobs, graduate research and careers in the medical field.

The Biochemistry Major

**Preparation for the Major**

The Biochemistry Major is a dynamic mixture of foundational chemistry and biology courses and a unique mixture of advanced specialized biochemistry classes to give our students a chance to experiment in biochemistry and learn about the chemical properties of biological molecules and systems. Students in the biochemistry major are well prepared for careers in biochemistry, entry into biochemistry or physics. Our new hybrid laboratory course, Molecular Biology (ASBMB). Students earning a biochemistry major can have their degree certified by both the ACS and the ASBMB with the appropriate coursework.

Because biochemistry is a diverse field, students in this major are exposed to advanced biochemistry topics with additional options in chemistry, biology, biochemistry or physics. Our new hybrid laboratory course, Molecular Biology Techniques and other courses ensure our students are ready for jobs, graduate research and careers in the medical field.

**Recommended Program of Study: Biochemistry**

The following paradigm is included as a guide only, and should not be interpreted in a rigid sense. The major will is recognized and certified by the American Biochemistry and Molecular Biology Society (ASBMB) as described. Students intending to obtain an ACS-certified degree must take CHEM 440 and submit a final research report. Elective courses in chemistry and biology may be taken at any time as long as the course prerequisites have been satisfied. Students are encouraged to consult with their academic advisor to ensure that their needs and interests will be met.

**Freshman Year**

<table>
<thead>
<tr>
<th>Semester I</th>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 151</td>
<td>General Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 151L</td>
<td>and General Chemistry I Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHM 152</td>
<td>General Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 152L</td>
<td>and General Chemistry II Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHM 220</td>
<td>Analytical Chemistry</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 150</td>
<td>Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 151</td>
<td>Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOL 240</td>
<td>Bioenergetics and Systems</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 240L</td>
<td>and Bioenergetics and Systems Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOL 242</td>
<td>Genomes and Evolution</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 242L</td>
<td>and Genomes and Evolution Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 270</td>
<td>Introduction to Mechanics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 270L</td>
<td>and Mechanics Lab</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 271</td>
<td>Introduction to Electricity and Magnetism</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 271L</td>
<td>and Introduction to Electricity and Magnetism Lab</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Total Units</strong></td>
<td></td>
<td><strong>35</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Semester I</th>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 300</td>
<td>Genetics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHM 301</td>
<td>Organic Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 301L</td>
<td>and Organic Chemistry I Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHM 302</td>
<td>Organic Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&amp; 302L</td>
<td>and Organic Chemistry II Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHM 330</td>
<td>Techniques in Molecular Biology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHM 311</td>
<td>Physical Chemistry I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or CHM 312</td>
<td>Physical Chemistry II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHM 331</td>
<td>Biochemistry</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHM 332</td>
<td>Biochemistry II</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Electives**

- Select one elective - see note below for list
- CHM 435  Biochemistry Laboratory  4

**Total Units**  31.5

Electives may be chosen upper-division chemistry courses or Biology restricted electives: BIOL 342, BIOL 376, BIOL 480, BIOL 482 or BIOL 484 or PHYS 340.

Majors must complete 31.5 units of upper division coursework in chemistry or the approved restricted electives. CHEM 496 or CHEM 498 may not be applied toward the 31.5 unit requirement. Those planning for graduate work are recommended to take additional Upper-Division Electives in chemistry, biochemistry or biology depending on the area of interest.

As written the student will earn an ASBMB certified bachelor's degree. To obtain a second certification from the ACS, biochemistry majors must complete CHEM 440, select one upper division chemistry course (as either the elective or an additional course) and complete a research report with their research mentor.

**Recommended Program of Study: Biochemistry**

The following paradigm is included as a guide only, and should not be interpreted in a rigid sense. The major will is recognized and certified by the American Biochemistry and Molecular Biology Society (ASBMB) as described. Students intending to obtain an ACS-certified degree must take CHEM 440 and submit a final research report. Elective courses in chemistry and biology may be taken at any time as long as the course prerequisites have been satisfied. Students are encouraged to consult with their academic advisor to ensure that their needs and interests will be met.
**PHYS 270** & 270L  
Introduction to Mechanics  
4

**Biol 300**  
Genetics  
3

**Junior Year**

**Semester I**

**CHEM 331**  
Biochemistry  
3

**PHYS 271** & 271L  
Introduction to Electricity and Magnetism  
4

Core or electives  
6-9

**Semester II**

**CHEM 330**  
Techniques in Molecular Biology  
3

**CHEM 312**  
Physical Chemistry II (or CHEM 311 in Fall Senior Year)  
3

**Core or electives**  
6-9

**Senior Year**

**Semester I**

**CHEM 311**  
Physical Chemistry I (Or CHEM 312 in Spring Junior Year)  
3

**CHEM 435**  
Biochemistry Laboratory  
4

Core or electives  
6-9

**Semester II**

**UD CHEM, BIOL of PHYS elective**  
3-4

**Core or electives**  
8-12

**Recommended Program of Study: Integrated Teacher Preparation Program (ITPP) Pathway**

The Integrated Teacher Preparation Program (ITPP) provides paths to 4-year science and math degrees that include a teaching credential and preparation for the California Subject Examination for Teachers (CSET). Students who are interested in middle or secondary education (grades 6-12) in California may earn a degree in biochemistry while simultaneously completing requirements for a teaching credential. The degree integrates content knowledge and laboratory practices in the discipline, evidence-based teaching/learning theories, teaching performance expectations, and pre-student teaching clinical practice while satisfying baccalaureate degree requirements and CTC single subject credential standards. There is some flexibility to meet individual needs. Students are encouraged to consult the ITPP website (http://www.sandiego.edu/itpp) and advisors (itpp@sandiego.edu) to ensure that their needs and interests will be met.

In addition to all courses for the biochemistry major, students completing the ITPP pathway must also take the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDSP 389P</td>
<td>Healthy Environments and Inclusive Education in a Global Society</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 382</td>
<td>Psychological Foundations of Education in a Diverse Society</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 384C</td>
<td>Methods of Teaching English Language and Academic Development in Crosscultural Contexts</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 491P</td>
<td>Student Teaching for the Single Subject Credential</td>
<td>9</td>
</tr>
<tr>
<td>EDUC 491S</td>
<td>Student Teaching Seminar for the Single Subject Credential</td>
<td>3</td>
</tr>
</tbody>
</table>

The following paradigm is included as a guide only, and should not be interpreted in a rigid sense. Elective courses in chemistry may be taken at any time as long as the course prerequisites have been satisfied.

**Freshman Year**

**Semester I**

**CHEM 151** & 151L  
General Chemistry I  
4-5

**MATH 150**  
Calculus I  
4

CC or Electives  
6-8

**Semester II**

**CHEM 152** & 152L  
General Chemistry II  
4

**CHEM 435**  
Biochemistry Laboratory  
4

Core or electives  
6-9

**Semester III (Summer)**

**BIOL 240** & 240L  
Bioenergetics and Systems  
4

**EOSC 110**  
Introduction to Geosciences  
4

**Sophomore Year**

**Semester I**

**CHEM 301** & 301L  
Organic Chemistry I  
4

**CHEM 396**  
Methods of Chemical Research  
1.5

**PHYS 270** & 270L  
Introduction to Mechanics  
4

**EDUC 381C**  
Multicultural and Philosophical Foundations in a Global Society  
3

CC or Electives  
3-4

**Semester II**

**CHEM 302** & 302L  
Organic Chemistry II  
4

**CHEM 220**  
Analytical Chemistry  
3

**PHYS 271** & 271L  
Introduction to Electricity and Magnetism  
4

**EDUC 382**  
Psychological Foundations of Education in a Diverse Society  
3

**Semester III (Summer)**

**EDSP 389P**  
Healthy Environments and Inclusive Education in a Global Society  
3

**BIOL 242** & 242L  
Genomes and Evolution  
4
Semester I  
CHEM 331  Biochemistry  
CHEM 311  Physical Chemistry I  
BIOL 300  Genetics  
PHIL 341  Ethics and Education  

Semester II  
CHEM 330  Techniques in Molecular Biology  
CHEM 332  Biochemistry II  
EDUC 332P  Curriculum and Methods of Teaching in Today's Global Secondary Classrooms  
EDUC 384C  Methods of Teaching English Language and Academic Development in Crosscultural Contexts  

CC or Electives  

Semester III (Summer)  
CC or Electives  

Senior Year  

Semester I  
EDUC 334P  Methods of Teaching Literacy in Secondary Schools in a Global Society  
EDUC 491P  Student Teaching for the Single Subject Credential  
EDUC 491S  Student Teaching Seminar for the Single Subject Credential  

Semester II  
UD CHEM, BIOL or PHYS elective  
CHEM 435  Biochemistry Laboratory  
CC or Electives  

Courses  

CHEM 101 | CHEMISTRY AND SOCIETY  
Units: 3  
Core Attributes: Science/Tech Inquiry area, Lab  
Course Description: This course is designed for the non-science major with a focus on food, cooking and baking while introducing foundational concepts in chemistry and biochemistry. Using a variety of approaches including hands-on activities, students will learn the chemical and biochemical principles of food and cooking. Students will investigate the molecular structure and changes that take place in food and drink while cooking and baking. Topics may include: making cheese and ice cream, spices and hot sauces, caramelization and food browning reactions, molecular gastronomy, taste and smell, cakes and cookies and chocolate. Students will participate in inquiry-based laboratories integrated throughout the semester while designing and performing scientific experiments to investigate the nature of food and cooking. Two hours of lecture per week and one four hour lab every other week. No prerequisites.  

CHEM 102 | SCIENCE OF FOOD & COOKING  
Units: 3  
Repeatability: No  
Core Attributes: Science/Tech Inquiry area, Lab  
Course Description: This course is designed for the non-science major that focuses on the major ideas of modern chemistry and the role that chemistry plays in a technological society. The evolution of our understanding of atomic and molecular structure and chemical reactivity will be examined as examples of the scientific method and the very human nature of the scientific endeavor. The role of modern chemistry in both the creation and the solution of societal problems will also receive considerable attention. The problems examined, which may vary in different sections, include: the energy crisis, air and water pollution, global warming, nutrition and food additives, household chemicals, pesticides and agrochemicals, and nuclear power. Two lectures weekly.  

CHEM 103 | DNA SCIENCE AND TECHNOLOGY  
Units: 3  
Repeatability: No  
Core Attributes: Science/Tech Inquiry area, Lab  
Course Description: This course is designed for the non-science major that covers basic physical science concepts and how they apply to the discovery and study of DNA as the genetic material, the simplicity of the three-dimensional structure of DNA and the many implications to be drawn from this structure. It explores the concepts involved in recombinant DNA technology and its applications to the pharmaceutical industry, agriculture, forensics, gene therapy and AIDS research. Two lectures weekly.  

CHEM 105 | PHYSICAL SCIENCES FOR K-8 TEACHERS  
Units: 3  
Repeatability: No  
Core Attributes: Science/Tech Inquiry area, Lab  
Course Description: This course is designed for the non-science major with a focus on understanding selected topics in chemistry and physics. The course topics are selected to satisfy the physical science specifications of the science content standards for California Public Schools (K-12). Enrollment is limited to liberal studies majors. Two two-hour class meetings per week. Fall semester. This course is cross-listed with PHYS 105.  

CHEM 111 | CHEMISTRY AND SOCIETY  
Units: 3  
Repeatability: No  
Core Attributes: Science/Tech Inquiry area, Lab  
Course Description: This course is designed for the non-science major that focuses on the major ideas of modern chemistry and the role that chemistry plays in a technological society. The evolution of our understanding of atomic and molecular structure and chemical reactivity will be examined as examples of the scientific method and the very human nature of the scientific endeavor. The role of modern chemistry in both the creation and the solution of societal problems will also receive considerable attention. The problems examined, which may vary in different sections, include: the energy crisis, air and water pollution, global warming, nutrition and food additives, household chemicals, pesticides and agrochemicals, and nuclear power. This course includes a laboratory that will satisfy the Core requirement for Science and Technology Inquiry. Two hours of lecture per week and one four hour lab every other week.
CHEM 151 | GENERAL CHEMISTRY I
Units: 3-4 Repeatability: No
Core Attributes: Science/Tech Inquiry area
Prerequisites: (Passing the appropriate departmental placement test within the previous year or Passing the appropriate departmental placement test within the previous year or Passing the appropriate departmental placement test within the previous year ) or (MATH 115 (Can be taken Concurrently) or MATH 130 (Can be taken Concurrently) or MATH 150 (Can be taken Concurrently)) and CHEM 151L (Can be taken Concurrently)
Part 1 of a two semester lecture course which introduces the fundamental principles of modern chemistry. These principles, which include atomic and molecular structure, periodicity, reactivity, stoichiometry, equilibrium, kinetics, thermodynamics, bonding, acid-base chemistry, redox chemistry, and states of matter, will be used in and expanded upon in more advanced courses. Three lectures weekly.

CHEM 151L | GENERAL CHEMISTRY I LABORATORY
Units: 1 Repeatability: No
Core Attributes: Quantitative reasoning comp, Science/Tech Inquiry area, Lab
Corequisites: CHEM 151
Part 1 of a two-semester laboratory course which introduces the concepts and techniques of experimental chemistry. CHEM 151L has one laboratory period that meets biweekly.

CHEM 152 | GENERAL CHEMISTRY II
Units: 3 Repeatability: No
Core Attributes: First Yr Integration (LC Only)
Prerequisites: CHEM 151 and CHEM 151L
Part 2 of a two semester lecture course which introduces the fundamental principles of modern chemistry. These principles, which include atomic and molecular structure, periodicity, reactivity, stoichiometry, equilibrium, kinetics, thermodynamics, bonding, acid-base chemistry, redox chemistry, and states of matter, will be used in and expanded upon in more advanced courses. Three lectures weekly.

CHEM 152L | GENERAL CHEMISTRY II LABORATORY
Units: 1
Core Attributes: Lab
Prerequisites: CHEM 151 and CHEM 151L
Part 2 of a two-semester laboratory course which introduces the concepts and techniques of experimental chemistry. One laboratory period weekly.

CHEM 220 | ANALYTICAL CHEMISTRY
Units: 3
Prerequisites: CHEM 152 and CHEM 152L
An introduction to the principles and practices of analytical chemistry with an emphasis on quantitative methods. Classical methods such as titrimetric and volumetric analyses as well as basic instrumental methods involving spectroscopy, electrochemistry, and chromatography will be performed. Some experiments will be of the project type. One laboratory and one lecture weekly.

CHEM 296 | INTRODUCTION TO UNDERGRADUATE RESEARCH
Units: 1-2
Collaborative student-faculty research in the research laboratory of a faculty member in the Department of Chemistry and Biochemistry. The course is taught on a pass/fail basis only.

CHEM 301 | ORGANIC CHEMISTRY I
Units: 3
Prerequisites: CHEM 152 and CHEM 152L and CHEM 301L (Can be taken Concurrently)
Part 1 of a two semester introduction to basic organic chemistry. The relationship of structure and bonding in organic compounds to reactivity will be emphasized. Reactions will be discussed from mechanistic and synthetic perspectives. Three lectures weekly. Fall Semester.

CHEM 301L | ORGANIC CHEMISTRY I LABORATORY
Units: 1
Core Attributes: Lab
Prerequisites: CHEM 152L and CHEM 301 (Can be taken Concurrently)
This lab is the first semester of a two-semester sequence. It introduces common organic lab techniques (including chromatography, extraction, recrystallization, distillation) used for separating and analyzing organic compounds. One laboratory period weekly. Fall semester.

CHEM 302 | ORGANIC CHEMISTRY II
Units: 3
Prerequisites: CHEM 301 and CHEM 301L and CHEM 302L (Can be taken Concurrently)
Part 2 of a two semester introduction to basic organic chemistry. The relationship of structure and bonding in organic compounds to reactivity will be emphasized. Reactions will be discussed from mechanistic and synthetic perspectives. Three lectures weekly. Spring semester.

CHEM 302L | ORGANIC CHEMISTRY II LABORATORY
Units: 1
Core Attributes: Lab
Prerequisites: CHEM 301 and CHEM 301L
This lab is the second semester of a two-semester sequence. Common organic lab techniques and spectroscopy are used to carry out and analyze multi-step organic syntheses One laboratory period weekly. Spring semester.

CHEM 311 | PHYSICAL CHEMISTRY I
Units: 3 Repeatability: No
Prerequisites: CHEM 152 and MATH 151 and PHYS 270 and PHYS 271 (Can be taken Concurrently)
This course covers modern physical chemistry, including atomic and molecular structure, and spectroscopy. Three lectures weekly. Fall semester.

CHEM 312 | PHYSICAL CHEMISTRY II
Units: 3 Repeatability: No
Prerequisites: CHEM 152 and MATH 151 and PHYS 270 and PHYS 271 (Can be taken Concurrently)
This course focuses on the classical principles of thermodynamics, kinetics, and statistical mechanics. Three lectures weekly. Spring semester.

CHEM 330 | TECHNIQUES IN MOLECULAR BIOLOGY
Units: 3 Repeatability: No
Prerequisites: (BIOL 190 and BIOL 225 and BIOL 225L) or (BIOL 242 and BIOL 242L)
An introduction to recombinant DNA techniques including bacterial culture, transformation, nucleic acid purification, restriction analysis, DNA cloning, polymerase chain reaction, etc. Computer-based sequence analyses include database accession, BLAST, alignments, restriction analysis, gene-finding, and genomics. A cloning project generating new molecular reagents will be undertaken. One lecture and one laboratory weekly. Completion of CHEM 301 and CHEM301L is recommended.
CHEM 331 | BIOCHEMISTRY
Units: 3
Prerequisites: CHEM 302 and CHEM 302L
The structure, function, and metabolism of biomolecules. Structure and function of proteins, carbohydrates, lipids, nucleic acids, and important accessory molecules (cofactors and metal ions) are covered, as well as enzyme kinetics and mechanism, thermodynamics, metabolism, and the regulation of metabolism. Three lectures weekly.

CHEM 332 | BIOCHEMISTRY II
Units: 3 Repeatability: No
Prerequisites: CHEM 331
This course advances the fundamental concepts of macromolecules, structure/ function paradigms, enzyme mechanism & activity and metabolism gained in CHEM 331. We will study metabolic homeostasis, integrating anabolic/catabolic pathways and energy flux with nutrition/nutrient intake of essential and non-essential molecules. Regulatory control through allosteric, transcriptional/ translational, and post-translational mechanisms will be examined as part of maintaining metabolic homeostasis. Where relevant, disease and pathology will be used to highlight these concepts. We will study signal transduction to address the flow of information within a system. As a capstone to our indepth study of biochemistry, we will examine cross-disciplinary applications of core biochemical concepts (structure/function, homeostasis, energy flow and information flow) in the context of systems biology, chemical biology and synthetic biology.

CHEM 335 | BIOCHEMISTRY LABORATORY
Units: 3
Core Attributes: Writing-Pre F17 CORE
Prerequisites: CHEM 220 and CHEM 331 (Can be taken Concurrently)
An advanced laboratory course that focuses on techniques for the preparation and quantitative analysis of proteins and other biomolecules. Experiments will include preparation of buffers, production and purification of proteins, and analysis of protein structure and function. Two laboratory periods weekly.

CHEM 335 | ENVIRONMENTAL CHEMISTRY
Units: 3
Prerequisites: CHEM 152 and CHEM 152L
A survey of the natural environment from a chemist’s point of view and the evaluation of chemicals from an environmental point of view. This course is concerned with the chemistry of air, water, soil and the biosphere in both pristine and polluted states. Pollution prevention and mitigation schemes are considered. Lab experiments include local fieldwork. Two 3-hour laboratory periods weekly.

CHEM 396 | METHODS OF CHEMICAL RESEARCH
Units: 1.5 Repeatability: No
Core Attributes: Advanced Integration
Prerequisites: (CHEM 152 and CHEM 152L)
Introduction to the principles, methods, and communication of chemical and biochemical research. Techniques for searching the chemical literature, research ethics integrity and professional development are included. One 80 minute lecture per week. Every semester.

CHEM 396W | RESEARCH METHODS
Units: 3
Core Attributes: Writing-Pre F17 CORE
Prerequisites: CHEM 220
Introduction to the principles, methods, and communication of chemical and biochemical research. Lab work includes general and advanced techniques with considerable hands-on use of modern instruments, proper record-keeping, data management, and consideration of laboratory safety. Techniques for searching the chemical literature, peer review and research ethics are included. This course fulfills the upper division writing requirement. Students will write and edit a report in a format suitable for journal publication. May be taken either semester of junior year or fall semester of senior year. One lecture and eight hours of laboratory research weekly. Prereq: CHEM 220 and approval by department chair.

CHEM 422 | PHYSICAL METHODS
Units: 4 Repeatability: No
Core Attributes: Advanced writing competency, Lab
Prerequisites: CHEM 220 and CHEM 302 and CHEM 302L and CHEM 311 (Can be taken Concurrently)
An advanced laboratory course which probes concepts in physical chemistry using instrumental techniques including spectroscopy, chromatography and microscopy. Modern topics in physical chemistry, new technology in instrumentation, and computational data analysis will be integral parts of the laboratory in addition to some classical experiments and methods.

CHEM 424 | ADVANCED SYNTHESIS LABORATORY
Units: 4 Repeatability: No
Core Attributes: Lab
Prerequisites: CHEM 220 and CHEM 302 and CHEM 302L and CHEM 440 (Can be taken Concurrently)
An advanced laboratory course which integrates theory and experimental techniques from organic and inorganic chemistry. The course will focus on advanced topics of organic and inorganic chemistry (such as bioinorganic chemistry and organic materials) that are not included in CHEM 301, 301L, 302, 302L and 440. Emphasis will be placed on applications to the sub-fields of organic and inorganic chemistry. Two lectures and two laboratory periods weekly. Spring semester.

CHEM 427 | BIOPHYSICAL CHEMISTRY
Units: 4 Repeatability: No
Prerequisites: and CHEM 335CHEM 331 and CHEM 435
This is an advanced lecture and laboratory course applying fundamental theories of physical chemistry in the context of thermodynamic, kinetic and quantum chemistry to understand the behavior of biological molecules and systems. Topics and experiments include spectroscopy, kinetics, thermodynamic of macromolecules, structure and function of protein, lipids, RNA and DNA as well as multimeric complex systems.

CHEM 435 | BIOCHEMISTRY LABORATORY
Units: 4 Repeatability: No
Core Attributes: Advanced writing competency, Lab
Prerequisites: CHEM 220
An advanced laboratory course that focuses on techniques for the preparation and quantitative analysis of proteins, DNA and other biomolecules. Experiments will include preparation of buffers, production and purification of proteins, and analysis of protein structure and function. Two laboratory periods weekly.

CHEM 440 | INORGANIC CHEMISTRY
Units: 3 Repeatability: No
Prerequisites: CHEM 302
The principles of inorganic chemistry, such as atomic and molecular structure, bonding, acid-base theory, and crystal field theory, are examined. Utilizing these principles, the chemistry of the elements of the periodic table is discussed, including the kinetics and mechanisms of reactions. The various fields within inorganic chemistry, including solid-state, coordination and organometallic chemistry are introduced. Three lectures weekly. Fall semester.

CHEM 489 | MAJOR FIELD TEST IN CHEMISTRY
Units: 0
As a part of the department’s assessment program, each graduating senior is required to take the major field test in chemistry. A student who fails to take the major field test may be restricted from graduating. Every year.

CHEM 494 | SPECIAL TOPICS IN CHEMISTRY/BIOCHEMISTRY
Units: 1-4 Repeatability: Yes (Repeatable if topic differs)
Rotating in-depth courses focused on various chemical and biochemical topics based primarily on the expertise of faculty. Repeatability: Yes (Can be repeated for credit when topic changes.) Prereq: Varied.
CHEM 496 | UNDERGRADUATE RESEARCH
Units: 0.5-3 Repeatability: Yes (Can be repeated for Credit)
Core Attributes: Law - Experiential
Collaborative student-faculty research in the research laboratory of a faculty member in the Department of Chemistry and Biochemistry. The course is taught on a pass/fail basis only. Prereq: Approval by department chair.

CHEM 496H | HONORS UNDERGRADUATE RESEARCH (1-3)
Units: 1-3
Collaborative student-faculty research in the research laboratory of a faculty member in the Department of Chemistry and Biochemistry. The course is taught on a pass/fail basis only. Prereq: Approval by department chair, membership in the Honors Program.

CHEM 498 | RESEARCH INTERNSHIP
Units: 1-2 Repeatability: Yes (Can be repeated for Credit)
Prerequisites: CHEM 151 and CHEM 151L
This course offers experience in the practical and experimental application of chemical or biochemical principles. Students will be involved in research projects conducted by agencies and institutions outside the University, such as chemical/biochemical, pharmaceutical and biotechnology industries. Enrollment is arranged on an individual basis according to a student’s interest and background, and is dependent on positions available and faculty approval.