

# BIOLOGY AND CHEMISTRY

## Degrees Majors

- Bachelor of Arts with a Major in Biology (BA) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/bachelor-arts-major-biology-ba/>)
- Bachelor of Arts With A Major In Biology with Grades 7-12 Certification (BA) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/bachelor-arts-major-biology-grades-7-12-certification-ba/>)
- Bachelor of Science with a Major in Biology (BS) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/bachelor-science-major-biology-bs/>)
- Bachelor of Science with a Major in Chemistry (BS) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/bachelor-science-major-chemistry-bs/>)

## Minors

- Biology (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/biology-minor/>)
- Chemistry (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/chemistry-minor/>)
- Environmental Science (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/biology-chemistry/environmental-science-minor/>)

## Courses

### BIOL 1101 Supplemental Laboratory

This course allows a transfer student to make up a laboratory deficiency at the introductory level. May be taken only for introductory courses. Laboratory fee applicable.

Prerequisites: Permission of Department Chair.

### BIOL 1106 Principles of Biology I-Lab

Laboratory course to accompany BIOL 1306. Practical exercises reinforce BIOL 1306 lecture material. Topics will include include biochemistry, cell structure and function, photosynthesis and respiration, DNA structure and function, mitosis, meiosis, and Mendelian genetics. Must be taken concurrently with BIOL 1306. Laboratory fee applicable.

TCCN: BIOL 1106

### BIOL 1111 Principles of Biology II-Lab

Laboratory course to accompany BIOL 1311. Practical exercises reinforce BIOL 1311 lecture material. Emphasis will be on characteristics of the plant kingdom, but the relevant features of algae and fungi will also be discussed. General topics will include plant structure, physiology and development, evolution and ecology. Must be taken concurrently with BIOL 1311. Laboratory fee applicable.

TCCN: BIOL 1111

### BIOL 1170 Survey of Life Science Lab

Laboratory course to accompany BIOL 1370. Must be taken concurrently with BIOL 1370. Required for elementary education certification. Not for students majoring or minoring in science. Fulfills the laboratory science core curriculum requirement. Laboratory fee applicable.

TCCN: BIOL 1108

### BIOL 1171 Human Biology-Lab

Laboratory course to accompany BIOL 1371. Practical exercises reinforce BIOL 1371 lecture material. Topics include the basic anatomy and functioning of systems of the human body, including musculoskeletal, reproductive, circulatory, respiratory, immune, nervous, endocrine, urinary, and digestive systems. Not for students majoring or minoring in biology. Fulfills the laboratory science core curriculum requirement. Must be taken concurrently with BIOL 1371. Laboratory fee applicable.

### BIOL 1306 Principles of Biology I

A study of the basic principles of Biology. Topics will include biochemistry, cell structure and function, photosynthesis and respiration, DNA structure and function, mitosis, meiosis, and Mendelian genetics. Required for all biology majors. Concurrent enrollment in CHEM 1311/1111 is strongly recommended; concurrent enrollment in BIOL 1106 is required. Fulfills the laboratory Science core requirement. May be taken by non-science majors with permission of instructor.

TCCN: BIOL 1306

### BIOL 1311 Principles of Biology II

This course is designed to give the students a broad introduction to botany. Emphasis will be on characteristics of the plant kingdom, but the relevant features of algae and fungi will also be discussed. General topics will include plant structure, physiology and development, evolution and ecology. Concurrent enrollment in BIOL 1111 is required. May be taken by non-science majors with permission of instructor.

TCCN: BIOL 1311

### BIOL 1370 Survey of Life Science

A basic introductory course stressing fundamental biological principles and concepts. It is designed to acquaint the future elementary teacher with the various structures, functions, life histories, and occurrence of local plants and animals. Must be taken concurrently with BIOL 1170. Required for elementary education certification. Not for students majoring or minoring in science. Fulfills the laboratory science core curriculum requirement.

TCCN: BIOL 1308

### BIOL 1371 Human Biology

A survey of the basic anatomy and functioning of systems of the human body, including musculoskeletal, reproductive, circulatory, respiratory, immune, nervous, endocrine, urinary, and digestive systems. Not for students majoring or minoring in biology. Must be taken concurrently with BIOL 1171. Fulfills the laboratory science core curriculum requirement.

### BIOL 1413 Principles of Biology III

A survey of the kingdom Animalia which considers the fundamentals of biology. Includes classification, phylogeny, evolution, anatomy, physiology and behavior of animals and related taxa in the protista. Lecture/laboratory. May be taken by non-science majors with permission of instructor. Laboratory fee applicable. Must be taken concurrently with BIOL 1013.

TCCN: BIOL 1413

### BIOL 2101 Anatomy & Physiology I-Lab

Laboratory course to accompany BIOL 2301. Practical exercises reinforce BIOL 2301 lecture material. Topics include of the structure and function of the human body including cells, tissues, and organs of the following systems: integumentary, skeletal, muscular, nervous system and special senses. Not for students majoring or minoring in biology. Fulfills the laboratory science core curriculum requirement. Carries no credit for biology majors. Must be taken concurrently with BIOL 2301. Laboratory fee applicable.

TCCN: BIOL 2101

**BIOL 2102 Anatomy & Physiology II-Lab**

Laboratory course to accompany BIOL 2302. Practical exercises reinforce BIOL 2302 lecture material. Topics include endocrine, circulatory, respiratory, digestive, urinary, and reproductive systems. Other topics include metabolism, acid-base balance, development, and heredity. Carries no credit for biology majors. Must be taken concurrently with BIOL 2302. Laboratory fee applicable. TCCN: BIOL 2102

**BIOL 2301 Anatomy & Physiology I**

A study of the structure and function of the human body including cells, tissues, and organs of the following systems: integumentary, skeletal, muscular, nervous system and special senses. Must be taken concurrently with BIOL 2101. Carries no credit for biology majors.

Prerequisites: Consult your departmental advisor or obtain instructor's permission.

TCCN: BIOL 2301

**BIOL 2302 Anatomy & Physiology II**

A study of the structure and function of the human body including endocrine, circulatory, respiratory, digestive, urinary, and reproductive systems. Other topics include metabolism, acid-base balance, development, and heredity. Must be taken concurrently with BIOL 2102. Carries no credit for biology majors.

TCCN: BIOL 2302

**BIOL 2415 Microbiology for Allied Health**

Clinically oriented overview of basic medical microbiology. Topics discussed include cell structure and function, microbial growth and its control, immunology, and genetics. Carries no credit for biology majors. Lecture/laboratory. Laboratory fee applicable. Must be taken concurrently with BIOL 2015.

Prerequisites: Consult School of Nursing.

TCCN: BIOL 2420

**BIOL 2421 General Microbiology**

A survey of microbiology. Topics include structure, growth, reproduction, metabolism, genetics, and taxonomy of microorganisms; a survey of microorganisms of soil, water, foods, and industry. Lecture /laboratory. Laboratory fee applicable. Must be taken concurrently with BIOL 2021.

Prerequisites: BIOL 1306/1106, and CHEM 1311/1111.

TCCN: BIOL 2421

**BIOL 3401 Environmental Science**

An interdisciplinary course including the following topics: ecosystems, population dynamics, flow of energy and materials and their transformations, renewable and non-renewable resources, wastes, energy, solid wastes, control of weeds and pests, environment and human health and anthropogenic effects on the environment. Required for Environmental Science majors. Laboratory fee applicable. Cross-listed with ENSC 3401. Must be taken concurrently with BIOL 3001.

Prerequisites: Eight hours of major's biology or permission of instructor.

**BIOL 3403 Human Anatomy**

A laboratory-based intensive study of the gross structure of organs and organ systems. Suggested for prehealth professional students. Lecture/laboratory. Laboratory fee applicable. Must be taken concurrently with BIOL 3003.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

**BIOL 3405 Human Physiology**

A study of the function of the human body including cell function, tissue functions, homeostasis, metabolism, nervous system, endocrine system, muscle function, cardiovascular system, breathing and gas exchange, digestive system, urinary system, water and electrolyte balance, acid base balance. Lecture/Laboratory. Laboratory fee applicable. Must be taken concurrently with BIOL 3005.

Prerequisites: Twelve hours of Biology, BIOL 3403, and junior standing.

**BIOL 3406 Evolution**

Genetic and ecological basis of evolutionary changes within populations of plants and animals. Historical, morphological, biochemical, behavioral, and biogeographical evidence will be considered.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

**BIOL 3410 Ecology**

A study of inter-relationships of plants and animals and their natural environment. Topics include distribution and abundance of plants and animals with respect to population, community, and ecosystem structure and function. Emphasis will be placed on local flora, and fauna. Extensive field work required. Required for biology majors. Laboratory fee applicable. Must be taken concurrently with BIOL 3010.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

**BIOL 3412 Cell Biology**

An introduction to the structure and function of eukaryotic cells. Emphasis is placed on the biochemical and biological characteristics of macromolecules and organelles. The major experimental tools used in modern cell biology are presented in the context of research. Topics include membranes, structure and function of proteins, energy conversion, the maintenance of cellular compartments, and transmembrane and cell-cell signaling. Laboratory fee applicable. Must be taken concurrently with BIOL 3012.

Prerequisites: BIOL 1306/1106 and BIOL 1311/1111, BIOL 1413 or BIOL 2421 and CHEM 2423 or permission of instructor.

**BIOL 3413 Intro to Genetics**

A study of the basic principles of the science of heredity, with an emphasis in classical and molecular genetics. Classical and molecular approaches are discussed as applied to a range of organisms from bacteria to man. Laboratory fee applicable. Must be taken concurrently with BIOL 3013.

Prerequisites: BIOL 1306/1106 and BIOL 1311/1111, BIOL 1413 or BIOL 2421 and CHEM 2423 or permission of instructor.

**BIOL 3414 Invertebrate Zoology**

The class serves to give the student an appreciation for invertebrate form, function, natural history, evolution and systematics. Field work required. Laboratory fee applicable. Must be taken concurrently with BIOL 3014.

Prerequisites: Eight SCH lower-level Biology for majors including BIOL 1413 or permission of instructor.

**BIOL 3416 Intro to Biological Statistics**

An introduction to statistical methodology applied to biology. Topics covered include the scientific method, biological experimental design, data management, probability distributions, hypothesis testing, analysis of variance, regression analysis, correlation analysis, analysis of frequencies, and an introduction to multivariate analysis. A special emphasis will be given to the application of these techniques for the student's own research. Lecture/laboratory.

Prerequisites: BIOL 1306/1106, 1311/1111, 1413 or permission of instructor.

**BIOL 3425 Paleontology and Earth History**

An examination of the geologic history of the Earth focusing on the fossil and rock record. Specifically, this course will consider the development and history of life as documented by the fossil record and earth's history from a stratigraphic perspective. Includes three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with BIOL 2025. Prerequisites: Junior Standing.

**BIOL 3451 Biochemistry I**

An introduction to modern biochemistry using fundamental chemical principles. Topics covered include proteins, carbohydrates, lipids, nucleic acids, bioenergetics, enzymology, and metabolism with an emphasis on interrelationships between metabolic pathways and regulation. Cross-listed with CHEM 3451. Credit cannot be given for both BIOL 3451 and CHEM 3451. Laboratory fee applicable. Must be taken concurrently with BIOL 3051. Prerequisites: BIOL 1306/1106 and CHEM 2423 or permission of instructor.

**BIOL 4170 Biology Seminar**

A study of current biological literature and the discussion of research in progress. May be repeated when topic changes. Required of all biology majors in their junior or senior year.

**BIOL 4173 Undergraduate Research**

A course adapted to the study of special topics in biology. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with the approval of the instructor prior to registration. Course may be repeated but not to exceed eight semester hours for biology majors and not exceed four hours for all other students. Laboratory fee applicable. Prerequisites: Permission of instructor.

**BIOL 4273 Undergraduate Research**

A course adapted to the study of special topics in biology. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with the approval of the instructor prior to registration. Course may be repeated but not to exceed eight semester hours for biology majors and not exceed four hours for all other students. Laboratory fee applicable. Prerequisites: Permission of instructor.

**BIOL 4371 Current Topics in Biology**

A seminar course on topics of current biological interest. Laboratory section included at discretion of instructor. May be repeated when topic changes. Prerequisites: Junior standing and permission of instructor.

**BIOL 4373 Undergraduate Research**

A course adapted to the study of special topics in biology. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with the approval of the instructor prior to registration. Course may be repeated but not to exceed eight semester hours for biology majors and not exceed four hours for all other students. Laboratory fee applicable. Prerequisites: Permission of instructor.

**BIOL 4402 Mammalogy**

A study of anatomy, evolution, distribution, systematics, ecology, and physiology of mammals, with special emphasis on local representatives. Laboratory fee applicable. Must be taken concurrently with BIOL 4002. Prerequisites: Eight SCH lower-level Biology for majors including BIOL 1413 or permission of instructor.

**BIOL 4404 Herpetology**

A study of the anatomy, evolution, distribution, systematics, ecology, and physiology of amphibians and reptiles; primarily North American species with special emphasis on local representatives. Saturday field trips required. Lab fee: \$30. Must be taken concurrently with BIOL 4004. Prerequisites: Eight SCH lower-level Biology for majors including BIOL 1413 or permission of instructor.

**BIOL 4407 Behavioral Ecology**

A course in the function of behavior in the context of ecology and evolution. Topics will include foraging behavior, habitat selection, mating behavior, parental care, and social behavior. Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

**BIOL 4408 Entomology**

An introduction to the study of insects (and arachnids). Topics will include anatomy and physiology, evolution, ecology, and behavior. Special emphasis will be placed on insect diversity and identification of local families of insects (and arachnids). A collection of local representatives is required. Saturday field trips required. Laboratory fee applicable. Must be taken concurrently with BIOL 4008. Prerequisites: Eight SCH lower-level Biology for majors including BIOL 1413 or permission of instructor.

**BIOL 4409 Molecular Sys Biol&Chem Gene**

A course dedicated to the discussion of current approaches to study "Omics" or systems biology, and the impact of chemical genetics in understanding how to activate or inactivate gene products as a way to determine the cellular functions of proteins. The course covers topics at the molecular level, including research in the evolving areas of genomics, proteomics, metabolomics, bioinformatics, microbial systems, and the integration of cell signaling and regulatory networks. Laboratory fee applicable. Cross-listed with CHEM 4409 and BIOL 5409. Must be taken concurrently with BIOL 4009. Prerequisites: Permission of instructor.

**BIOL 4411 Animal Nutrition**

A study of nutritive requirements for domestic animals, including ruminants, and monogastrics. Topics covered include the digestive system, nutrient metabolism, design of diets from available feed stuffs, and an introduction to feed and labeling laws. Prerequisites: Consent of instructor.

**BIOL 4418 Community Ecology**

A study of biotic and abiotic interactions determining community structure emphasizing models, observations and field experiments on communities. Topics will include diversity, food webs, succession, the factors determining the composition of communities, and the functioning of ecosystems. Independent study of a selected community ecology topic required. Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

**BIOL 4420 Environmental Microbiology**

An overview of the relationship between microbial metabolism, physiology, and the environment. The application of modern microbiological concepts to address and solve current environmental problems is emphasized. Topics include air, water and soil microbiology, geochemical activities of microbes, biotransformation, pollution, and pollution abatement using microbes. Laboratory fee applicable. Cross-listed with ENSC 4420/BIOL 5420. Must be taken concurrently with BIOL 4020. Prerequisites: BIOL 2421 or permission of instructor.

**BIOL 4424 Medical Microbiology**

This is an advance course which explores the infectious diseases and health relationships between microorganisms and humans. Students will learn the biology of medically important bacterial, viral, fungal, and parasitic pathogens and the disease etiology, epidemiology, host defenses, identification and diagnosis, prevention, and control of each microorganism. No laboratory section included. This is an applied microbiology course.

Prerequisites: BIOL 2421

**BIOL 4425 Immunology**

A detailed study of the immune response and related events. Emphasis is placed on cellular and humoral branches of immunity, including the study of blood (serology) as a diagnostic tool. Laboratory fee applicable. (Cross-listed with BIOL 5425).

Prerequisites: BIOL 2421 or permission of instructor.

**BIOL 4430 Limnology**

Study of the structure and function of inland waters, ecology of freshwater systems such as lakes, ponds, rivers, and streams. Topics include physical and chemical properties of freshwater, habitats, biotic composition, and productivity water use. Laboratory fee applicable. Cross-listed with ENSC 4430. Must be taken concurrently with BIOL 4030.

Prerequisites: BIOL 3410 or permission of instructor.

**BIOL 4432 Biodiversity and Conservation**

Biodiversity is an emerging and highly integrative field of research dealing with all aspects of biological diversity and its relationship to the functioning of earth's ecosystems. This course will address approaches and techniques for the measurement, assessment, monitoring, and management of biodiversity from genes to ecosystems. We will incorporate social, ecological, and evolutionary perspectives to understand patterns, structure, and drivers of biodiversity and its importance to human health and society. Laboratory fee applicable.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

Corequisites: BIOL 4032.

**BIOL 4434 Range Plant Ecology**

Plants are essential organisms on this planet and as a species we have a direct dependence on plants for our survival. This course is designed for students seeking to enhance their working knowledge of plant anatomy, plant physiology, plant nutrition, and soil characteristics. Students will be introduced to concepts of plant ecology and their application at the individual, population, and community levels. Although this course will explore global vegetation patterns, special focus will be on semi-arid environments found within the Tamaulipan Biotic Province.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

Corequisites: BIOL 4034.

**BIOL 4436 Wildlife Ecology**

The course will focus on the application of ecological principles of the management and conservation of wildlife. We will cover the history and development of wildlife ecology as a science; characteristics of, and factors affecting wildlife populations; techniques and theories of management; ecology of wildlife species; and wildlife conservation. This course will use a wide array of scientific literature within a discussion format to expose students to theoretical principles of the ecology and management of wildlife resources. Additionally, we will delve into different techniques, perspectives, and approaches to both identify and achieve wildlife management goals. Laboratory fee applicable.

Prerequisites: Eight SCH lower-level Biology for majors or permission of instructor.

Corequisites: BIOL 4036.

**BIOL 4445 Medicinal Chemistry**

This is a lecture/lab course that addresses the role of organic chemistry in the design and action of drugs. The principles of drug discovery, drug development, drug/receptor interactions and structure/activity relationships will be covered in the class. Aspects of biochemistry and physical organic chemistry will also be covered as necessary to understand the chemistry of drug action and metabolism in the body. Examples from the major classes of drugs will be used to facilitate discussion and examine the role of medicinal chemistry as witnessed today. Laboratory fees applicable. This course is interchangeable with CHEM 4445.

Prerequisites: CHEM 2423.

Corequisites: BIOL 4045.

**BIOL 4452 Biochemistry II**

A detailed study, using primary literature sources, of carbohydrates, amino acids, nucleic acids, and lipid metabolic pathways. Special attention is given to human metabolism in health and disease. Cross-listed with BIOL 4452.

Prerequisites: BIOL 3451 or CHEM 3451 with C or better, or permission of instructor.

**BIOL 4455 Bioinformatics**

Bioinformatics introduces general bioinformatics concepts and their practice. Students will be introduced to current techniques in generation and storage of biological information, biological databases, sequence alignments, molecular phylogeny. They will also learn modern Genomic/proteomic concepts, and the use of publicly available software in biological data analysis. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data. Lab fee: \$30.00.

Prerequisites: BIOL 1311/1111, BIOL 1413 or BIOL 2421.

Corequisites: BIOL 4055.

**BIOL 4460 Geographic Info Systems**

This course will explore fundamental concepts of geographic information technologies with a focus on applications within the geosciences and natural sciences in general. Students will be exposed to the power of geographic information systems to elucidate complex problems. (Cross-listed with GEOL 4460 and BIOL 5460)

Prerequisites: Senior standing.



### **BIOL 4470 Developmental Biology**

A study of the molecular and cellular events that lead to the generation of a multicellular organism from a fertilized egg. Emphasis on cell differentiation, development of an entire organism from a single cell involving several stages of differentiation and cell interaction. The course will investigate the cellular and molecular processes involved in generating an embryo, in creating various tissues and organs. Laboratory fee applicable. Must be taken concurrently with BIOL 4070.

Prerequisites: BIOL 3413.

### **BIOL 4471 Current Topics in Biology**

A seminar course on topics of current biological interest. Laboratory section included and fee applicable. May be repeated when topic changes.

Prerequisites: Junior standing and permission of instructor.

Corequisites: BIOL 4071.

### **BIOL 4472 Current Topics in Biology**

A seminar course on topics of current biological interest. May be repeated when topic changes. No laboratory section included.

Prerequisites: Junior standing or permission of instructor.

### **BIOL 4473 Undergraduate Research**

A course adapted to the study of special topics in biology. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with the approval of the instructor prior to registration. Course may be repeated but not to exceed eight semester hours for biology majors and not exceed four hours for all other students. Laboratory fee applicable.

Prerequisites: Permission of instructor.

### **BIOL 4475 Evolutionary Dev Biology**

The objective of this course is to integrate two disciplines, evolutionary biology and developmental biology into a common framework of genetics. The focus will be on the evolution of developmental genetic pathways in order to explain the evolution of animal development. This course will explore how our growing knowledge of developmental circuits, and their variation, affects our understanding of how organisms evolve.

Prerequisites: BIOL 3413.

### **CHEM 1101 Supplemental Laboratory**

This course allows a transfer student to make up a laboratory deficiency at the introductory level. May be taken only for introductory courses. Laboratory fee applicable.

Prerequisites: Permission of Department Chair.

### **CHEM 1111 General Chemistry I-Lab**

Laboratory course to accompany CHEM 1311. Practical exercises reinforce CHEM 1311. Topics include the basic principles of nomenclature, atomic structure, bonding, thermodynamics, chemical reaction, and stoichiometry. Must be taken concurrently with CHEM 1311. Laboratory fee applicable.

Prerequisites: Placement in College Algebra or higher.

TCCN: CHEM 1111

### **CHEM 1170 Survey of Chemistry Lab**

Laboratory to accompany Survey of Chemistry, CHEM 1370. Not for students majoring or minoring in chemistry or biology. Fulfills the laboratory science core curriculum requirement. Must be taken concurrently with CHEM 1370.

Laboratory fee applicable.

TCCN: CHEM 1105

### **CHEM 1311 General Chemistry I**

Covers the basic principles of nomenclature, atomic structure, bonding, thermodynamics, chemical reaction, and stoichiometry. The first half of a two-semester course. Must be taken concurrently with CHEM 1111.

Prerequisites: Placement in College Algebra or higher.

TCCN: CHEM 1311

### **CHEM 1370 Survey of Chemistry**

An introduction to Chemistry and its relationship to society and the environment. Molecules that control daily life are explored via a conceptual approach. Not for students majoring or minoring in chemistry or biology. Fulfills the laboratory science core curriculum requirement. Must be taken concurrently with CHEM 1170.

TCCN: CHEM 1305

### **CHEM 1412 General Chemistry II**

Covers gas laws, thermodynamics, kinetics and electrochemistry. The second half of a two-semester course. Three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with CHEM 1012.

Prerequisites: CHEM 1411 or CHEM 1311/1111.

TCCN: CHEM 1412

### **CHEM 2423 Organic Chemistry I**

Offers an introduction to organic chemistry. Covers basic nomenclature, spectroscopy, structure and functional groups of organic molecules. A variety of organic reactions are discussed in terms of basic thermodynamics, structure, kinetics, and resonance theory. The first half of a two semester course. Three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with CHEM 2023.

Prerequisites: CHEM 1412.

TCCN: CHEM 2423

### **CHEM 2425 Organic Chemistry II**

Emphasizes the importance of functional groups in organic molecules, particularly in relation to their reaction mechanisms. Covers structure, reactivity and nomenclature of important organic compounds such as aldehydes, ketones, carboxylic acids, esters, amines, amides, phenols, heterocycles, carbohydrates, proteins, and nucleic acids. Second half of a two-semester course. Three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with CHEM 2025.

Prerequisites: CHEM 2423.

TCCN: CHEM 2425

### **CHEM 3400 Environmental Chemistry**

A course that develops quantitative analytical techniques for monitoring and assessing toxins and pollutants in the environment. Three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with CHEM 3000.

Prerequisites: CHEM 1311, 1111 and CHEM 2423.

### **CHEM 3405 Analytical Chemistry**

The principles and theories of modern instrumentation examined through topics selected from electrochemistry, spectroscopy, and chromatography. Three hours of laboratory per week. Laboratory fee applicable.

Prerequisites: CHEM 1412.

Corequisites: CHEM 3005.

### **CHEM 3406 Analytical Chemistry II**

A study of theory and application of modern instrumental methods of analysis, including UV-VIS, FT-IR, GC, NMR and potentiometric methods of titrimetric. Environmental analysis will be included. Laboratory fee applicable. Must be taken concurrently with CHEM 3006.

Prerequisites: CHEM 1411, CHEM 1412.

### **CHEM 3431 Physical Chemistry I**

An understanding of chemical thermodynamics, equilibrium and electrochemistry will be developed. The first half of a two-semester course. Three hours of laboratory per week. Lab fee applicable. Must be taken concurrently with CHEM 3031.

Prerequisites: MATH 2413, CHEM 1412, and PHYS 1302 and PHYS 1102 or PHYS 2326 and PHYS 2126.

### **CHEM 3432 Physical Chemistry II**

An understanding of chemical kinetics, quantum mechanics, statistical mechanics and photochemistry will be examined. The second half of a two-semester course. Three hours of laboratory per week. Laboratory fee applicable. Must be taken concurrently with CHEM 3032.

Prerequisites: CHEM 3431.

### **CHEM 3451 Biochemistry I**

An introduction to modern biochemistry using fundamental chemical principles. Topics covered include proteins, carbohydrates, lipids, nucleic acids, bioenergetics, enzymology, and metabolism, with an emphasis on interrelationships between metabolic pathways and regulation. Cross-listed with BIOL 3451. Credit cannot be given for both BIOL 3451 and CHEM 3451. Laboratory fee applicable. Must be taken concurrently with CHEM 3051.

Prerequisites: BIOL 1306, 1106 and CHEM 2423 or permission of instructor.

### **CHEM 4120 Chemistry Seminar**

A study of the current chemical literature and the discussion of research in progress. May be repeated when topic changes. Required for all chemistry majors in their junior or senior year.

### **CHEM 4198 Investigations in Chemistry**

Independent experimental research in any accredited chemical field performed in affiliation with a faculty member. Course may be repeated but not to exceed five semester hours for chemistry majors and not to exceed four hours for all other students. Laboratory fee applicable.

Prerequisites: Junior or senior standing and permission of instructor.

### **CHEM 4199 Special Topics in Chemistry**

A course involving instruction, laboratory, and/or literature searches in one of the traditional chemistry fields depending on student interest and specialty of instructor. The following topics may be chosen/offered Bioinorganic Chemistry, Transition Metal Chemistry, Solid State Chemistry, Advanced Topics in Organic Chemistry, Statistical Mechanics, and Advanced Topics in Analytical Chemistry. May be repeated for credit when topic changes. (Formerly CHEM 4399).

Prerequisites: Senior standing and permission of instructor.

### **CHEM 4298 Investigations in Chemistry**

Independent experimental research in any accredited chemical field performed in affiliation with a faculty member. Course may be repeated but not to exceed five semester hours for chemistry majors and not to exceed four hours for all other students. Laboratory fee applicable.

Prerequisites: Junior or senior standing and permission of instructor.

### **CHEM 4299 Special Topics in Chemistry**

A course involving instruction, laboratory, and/or literature searches in one of the traditional chemistry fields depending on student interest and specialty of instructor. The following topics may be chosen/offered Bioinorganic Chemistry, Transition Metal Chemistry, Solid State Chemistry, Advanced Topics in Organic Chemistry, Statistical Mechanics, and Advanced Topics in Analytical Chemistry. May be repeated for credit when topic changes. (Formerly CHEM 4399).

Prerequisites: Senior standing and permission of instructor.

### **CHEM 4398 Investigations in Chemistry**

Independent experimental research in any accredited chemical field performed in affiliation with a faculty member. Course may be repeated but not to exceed five semester hours for chemistry majors and not to exceed four hours for all other students. Laboratory fee applicable.

Prerequisites: Junior or senior standing and permission of instructor.

### **CHEM 4399 Special Topics in Chemistry**

A course involving instruction, laboratory, and/or literature searches in one of the traditional chemistry fields depending on student interest and specialty of instructor. The following topics may be chosen/offered Bioinorganic Chemistry, Transition Metal Chemistry, Solid State Chemistry, Advanced Topics in Organic Chemistry, Statistical Mechanics, and Advanced Topics in Analytical Chemistry. May be repeated for credit when topic changes. (Formerly CHEM 4399).

Prerequisites: Senior standing and permission of instructor.

### **CHEM 4409 Molecular Sys Biol&Chem Gens**

A course dedicated to the discussion of current approaches to study "Omics" or systems biology, and the impact of chemical genetics in understanding how to activate or inactivate gene products as a way to determine the cellular function of proteins. The course covers topics at the molecular level, including research in the evolving areas of genomics, proteomics, metabolomics, bioinformatics, microbial systems, and the integration of cell signaling and regulatory networks. Laboratory fee applicable. (Cross-listed with BIOL 4409 and BIOL 5409). Must be taken concurrently with CHEM 4009.

Prerequisites: Permission of instructor.

### **CHEM 4411 Inorganic Chemistry**

This course covers the periodic table and trends within it, focusing on metals, ionic compounds, molecular compounds, organometallic complexes, and coordination complexes. Models of chemical bonding will be compared for each class of substance. Special topics such as bioorganic chemistry, nanotechnology and superconductors will be included. Three hours of laboratory per week.

Laboratory fee applicable. Must be taken concurrently with CHEM 4011.

Prerequisites: CHEM 1412.

### **CHEM 4420 Instrumental Analysis**

This is an applied chemistry course designed to provide an in-depth review of general instrumental methods of chemical analysis including atomic and molecular spectroscopy, nuclear magnetic spectroscopy, mass spectroscopy, gas and liquid chromatographic methods, gas and liquid chromatography, capillary electrophoresis, and several hyphenated techniques. This course is designed to provide students with the theoretical background and principles of operation of modern analytical instrumentation and hands-on experience. This is therefore designed to have a lecture and a laboratory component. The lecture component will emphasize the chemical and physical principles behind the instrumentation, the property measured, how the instrument measures that property and ways to increase accuracy, precision and sensitivity. The laboratory component allows students to put these principles learnt in class into practice. The goal is to offer students a broader working knowledge of instruments. Theoretical and practical knowledge of the use these instruments include knowing the appropriate control experiments to conduct. Laboratory fee applicable.

Prerequisites: CHEM 1412.

Corequisites: CHEM 4020.

#### **CHEM 4445 Medicinal Chemistry**

This is a lecture/lab course that addresses the role of organic chemistry in the design and action of drugs. The principles of drug discovery, drug development, drug/receptor interactions and structure/activity relationships will be covered in the class. Aspects of biochemistry and physical organic chemistry will also be covered as necessary to understand the chemistry of drug action and metabolism in the body. Examples from the major classes of drugs will be used to facilitate discussion and examine the role of medicinal chemistry as witnessed today. Laboratory fees applicable. This course is interchangeable with BIOL 4445.

Prerequisites: CHEM 2423.

Corequisites: CHEM 4045.

#### **CHEM 4451 Polymer Chemistry**

A course that develops the understanding of kinetic, synthetic structural and applied aspects of modern polymer chemistry. The course also develops the understanding of polymeric science in industry and materials science and technology. An understanding of mechanistic theory, synthesis using specific reactions and spectroscopic methods of polymers and macromolecules will also be emphasized. Laboratory fee applicable. Must be taken concurrently with CHEM 4051.

Prerequisites: CHEM 2425.

#### **CHEM 4452 Biochemistry II**

A detailed study, using primary literature sources, of carbohydrates, amino acids, nucleic acids, and lipid metabolic pathways. Special attention is given to human metabolism in health and disease. Cross-listed with BIOL 4452.

Prerequisites: BIOL 3451 or CHEM 3451 with C or better, or permission of instructor.

#### **CHEM 4498 Investigations in Chemistry**

Independent experimental research in any accredited chemical field performed in affiliation with a faculty member. Course may be repeated but not to exceed five semester hours for chemistry majors and not to exceed four hours for all other students. Laboratory fee applicable.

Prerequisites: Junior or senior standing and permission of instructor.

#### **CHEM 4499 Special Topics in Chemistry**

A course involving instruction, laboratory, and/or literature searches in one of the traditional chemistry fields depending on student interest and specialty of instructor. The following topics may be chosen/offered Bioinorganic Chemistry, Transition Metal Chemistry, Solid State Chemistry, Advanced Topics in Organic Chemistry, Statistical Mechanics, and Advanced Topics in Analytical Chemistry. May be repeated for credit when topic changes. (Formerly CHEM 4399).

Prerequisites: Senior standing and permission of instructor.

#### **ENSC 1101 Intro to Environmental Sys Lab**

An introductory laboratory course for majors and non-majors that emphasizes the principles of environmental science. Students will conduct observational and manipulative experiments that examine effects of environmental factors on the biology and ecology of an ecosystem. The course will also involve discussions of case studies in environmental sustainability. Must be taken concurrently with ENSC 1301.

TCCN: ENVR 1101

#### **ENSC 1301 Intro to Environmental Syst**

An introductory course for majors and non-majors that applies the principles of the scientific method and critical thinking to environmental issues through a multidisciplinary approach. Students will gain an understanding of biotic interactions in environmental systems and the human impact as it relates to public policy and natural resource use. The course will focus on environmental sustainability and the ecological principles essential to understanding processes in environmental systems. This course is a prerequisite for ENSC/BIOL 3401 and must be taken concurrently with ENSC 1101.

TCCN: ENVR 1301

#### **ENSC 3310 Environmental/Natural Res Con**

Principles of ecology and resource management. The course outlines many of the national and international environmental problems and offers legislative, technological and methodological solutions to these problems.

Prerequisites: ENSC 3401.

#### **ENSC 3340 Environmental Reg&Policies**

A study of American Environmental Regulations. Topics include Clean Water Act, RCRA, UST, CERCLA, EPCRA, NEPA, TSCA, OSHA, FIFRA. Will include site visits.

#### **ENSC 3401 Environmental Sciences**

An interdisciplinary course including the following topics: ecosystems, population dynamics, flow of energy, solid wastes, control of weeds and pests, environment and human health and anthropogenic effects on the environment. Lab fee: \$27.25 (Cross-listed with BIOL 3401)

Prerequisites: Eight hours of major's biology or permission of instructor.

#### **ENSC 4170 Senior Seminar**

A discussion of research and current topics in environmental sciences. Required of environmental sciences minors in their senior year.

#### **ENSC 4173 Undergraduate Research**

A course adapted to the study of special topics in environmental sciences. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with approval of the instructor prior to registration. Lab fee: \$27.25.

Prerequisites: Permission of instructor.

#### **ENSC 4273 Undergraduate Research**

A course adapted to the study of special topics in environmental sciences. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with approval of the instructor prior to registration. Lab fee: \$27.25.

Prerequisites: Permission of instructor.

#### **ENSC 4340 Environmental Reg & Policies**

This course examines United States environmental policy and regulation from a range of perspectives. The course will emphasize the continual struggle to protect natural resources while sustaining society and culture. It will also explore how environmental regulations have been influenced by historic events, economic, and cultural needs. There will be an emphasis on environmental laws, jurisdiction, stakeholder participation/responsibility, enforcement and sustainable development. (Formerly ENSC 3340).

Prerequisites: 8 SCH of natural science and junior or senior standing.

#### **ENSC 4373 Undergraduate Research**

A course adapted to the study of special topics in environmental sciences. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with approval of the instructor prior to registration. Lab fee: \$27.25.

Prerequisites: Permission of instructor.

**ENSC 4410 Environmental Toxicology**

The course serves to provide an introduction to environmental poisons. Topics include general principles of toxicology, biotransformations, testing procedures, target organs, toxic substances and risk assessment including the toxicity of metals and pesticides. Lab fee: \$27.25. (Formerly ENSC 4310)

Prerequisites: Twelve hours of biology and/or environmental sciences or permission of instructor.

**ENSC 4420 Environmental Microbiology**

An overview of the relationship between microbial metabolism, physiology, and the environment. The application of modern microbiological concepts to address and solve current environmental problems is emphasized. Topics include air, water and soil microbiology, geochemical activities of microbes, biotransformations, pollution, pollution abatement using microbes. Lab fee: \$27.25. (Cross-listed with BIOL 4420/5420)

Prerequisites: BIOL 2421 or permission of instructor.

**ENSC 4430 Limnology**

Study of the structure and function of inland waters, ecology of freshwater systems such as lakes, ponds, rivers, and streams. Topics include physical and chemical properties of freshwater, habitats, biotic composition, productivity water use. Lab fee: \$27.25. (Cross-listed with BIOL 4430)

Prerequisites: BIOL 3410 or permission of instructor.

**ENSC 4473 Undergraduate Research**

A course adapted to the study of special topics in environmental sciences. For advanced students capable of developing a problem independently through conference and activities directed by the instructor. Problem is chosen by the student with approval of the instructor prior to registration. Lab fee: \$27.25.

Prerequisites: Permission of instructor.

**NSCI 3301 Current Topics in Science**

A survey of the fields of life science, earth science, and physical science. For preparation of students seeking certification in education (K-8).

Prerequisites: Junior standing and BIOL 1370/1170, EPSC 1370/1170, PHYS 1370/1170.