Biology

Bachelor of Science

The Bachelor of Science in Biology program guides students in the study of the structure, function, growth, development, reproduction, origin, evolution, and distribution of living organisms. Students gain a strong foundation of knowledge in the biological sciences and develop their scientific skills needed to succeed in careers or post-graduate study. Guided by expert faculty, students can choose from a variety of authentic hands-on learning experiences including undergraduate research, service-learning, internships, human dissection, or working with our turtle assurance colony. Students can also practice leadership skills and engage in extracurricular biology through involvement in our award-winning biological honors society or other registered student clubs. Students in this program select one of three concentrations; Environmental Sciences, General Biology, and Pre-Health Sciences as described further below.

General Biology:

This concentration provides students the opportunity to study a broad range of subjects across the biological sciences. This track is designed to allow flexibility in preparing students for a multitude of biological roles. Students can design a course of study that will prepare them for work in private sectors, government agencies or for continued graduate education.

Environmental Sciences: This concentration integrates the biological, chemical, and physical sciences providing students with a strong foundation in how earth’s systems function and ways our environmental and human health can be protected. Many environmental scientists work for local, state, or federal governments conducting research or monitoring and advising on policy, non-governmental organizations or in academia.

Pre-Health Sciences: This concentration provides students with a strong foundation in a variety of the clinical sciences required for entry into and success in post-graduate professional programs and degrees including medicine, physician assistant, physical therapy, occupational therapy, dentistry, pharmacy, biomedical engineering, veterinary medicine, and advanced research degrees in these fields.

Recommended minors: Chemistry, Geography, Business for Non-Business Majors, or Psychology

This degree prepares students for variety of career opportunities ranging from applied or basic laboratory research and field studies in state and federal organizations and industry, to education in public and private school systems. Furthermore, the degree provides the ideal preparation for entry into professional school and graduate programs including medical school, dental school, and veterinary school or advanced studies in the Biological Sciences.

Area A: Essential Skills

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<tr>
<th>Course</th>
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<th>Units</th>
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<tbody>
<tr>
<td>ENGL 110</td>
<td>English Composition I</td>
<td>3</td>
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<tr>
<td>ENGL 112</td>
<td>English Composition II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1113</td>
<td>Precalculus Mathematics</td>
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Area B: Institutional Options

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<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>COMM 1110</td>
<td>Fundamentals of Speech</td>
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One of the following electives:

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<thead>
<tr>
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<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>COMM 1120</td>
<td>Argumentation and Advocacy</td>
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Area C: Humanities/Fine Arts

Choose one to two ENGL course(s):

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<thead>
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<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGL 2000</td>
<td>Topics in Literature &amp; Culture</td>
<td>3-6</td>
</tr>
<tr>
<td>ENGL 2111</td>
<td>World Literature I</td>
<td>3</td>
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<tr>
<td>ENGL 2112</td>
<td>World Literature II</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 2120</td>
<td>British Literature I</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 2121</td>
<td>British Literature II</td>
<td>3</td>
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<tr>
<td>ENGL 2130</td>
<td>American Literature I</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 2131</td>
<td>American Literature II</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 2201</td>
<td>Intro to Film as Literature</td>
<td>3</td>
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If only one ENGL course chosen, add one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ARTS 1100</td>
<td>Art Appreciation</td>
<td>0-3</td>
</tr>
<tr>
<td>HUMN 1201</td>
<td>Expressions of Culture I</td>
<td>3</td>
</tr>
<tr>
<td>HUMN 1202</td>
<td>Expressions of Culture II</td>
<td>3</td>
</tr>
<tr>
<td>MUSC 1100</td>
<td>Music Appreciation</td>
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<tr>
<td>MUSC 1110</td>
<td>World Music</td>
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<tr>
<td>MUSC 1120</td>
<td>American Music</td>
<td>3</td>
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<tr>
<td>THEA 1100</td>
<td>Theatre Appreciation</td>
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Area D: Science/Mathematics/Technology

<table>
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<th>Title</th>
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<tbody>
<tr>
<td>CHEM 1211K</td>
<td>Principles of Chemistry I</td>
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<tr>
<td>CHEM 1212K</td>
<td>Principles of Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1401</td>
<td>Elementary Statistics</td>
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Area E: Social Sciences

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<tbody>
<tr>
<td>HIST 2111</td>
<td>United States History to 1877</td>
<td>3</td>
</tr>
<tr>
<td>or HIST 2112</td>
<td>United States Hist since 1877</td>
<td>3</td>
</tr>
<tr>
<td>POLS 1101</td>
<td>American Government</td>
<td>3</td>
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Two of the following electives:

<table>
<thead>
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<tbody>
<tr>
<td>ANTH 1103</td>
<td>Intro to Cultural Anthropology</td>
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</tr>
<tr>
<td>ECON 2105</td>
<td>Principles of Macroeconomics</td>
<td>6</td>
</tr>
<tr>
<td>ECON 2106</td>
<td>Principles of Microeconomics</td>
<td>6</td>
</tr>
<tr>
<td>GEOG 1100</td>
<td>Introduction to Geography</td>
<td>6</td>
</tr>
<tr>
<td>GEOG 1101</td>
<td>Intro to Human Geography</td>
<td>6</td>
</tr>
<tr>
<td>GEOG 1111</td>
<td>Intro to Physical Geography</td>
<td>6</td>
</tr>
<tr>
<td>HIST 1111</td>
<td>World Civilization to 1500 CE</td>
<td>6</td>
</tr>
<tr>
<td>HIST 1112</td>
<td>World Civilization since 1500</td>
<td>6</td>
</tr>
<tr>
<td>HIST 2111</td>
<td>United States History to 1877</td>
<td>6</td>
</tr>
<tr>
<td>HIST 2112</td>
<td>United States Hist since 1877</td>
<td>6</td>
</tr>
<tr>
<td>PHIL 1103</td>
<td>Intro to World Religions</td>
<td>6</td>
</tr>
<tr>
<td>PHIL 2010</td>
<td>Intro to Philosophical Issues</td>
<td>6</td>
</tr>
<tr>
<td>PHIL 2020</td>
<td>Logic and Critical Thinking</td>
<td>6</td>
</tr>
<tr>
<td>POLS 2101</td>
<td>Intro to Political Science</td>
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</table>
POLS 2201  State and Local Government
POLS 2301  Comparative Politics
POLS 2401  International Relations
PSYC 1101  Introduction to Psychology
PSYC 2101  Psychology of Adjustment
PSYC 2103  Human Development
SOCI 1101  Introduction to Sociology
SOCI 1160  Social Problems

Area F: Major Related
BIOL 1107K  Principles of Biology I  4
BIOL 1108K  Principles of Biology II  4
BIOL 2270  Ethical Issues in Science  2
PHYS 1111K  Introductory Physics I  4
PHYS 1112K  Introductory Physics II  4

Required Biology Courses
BIOL 3000  Research Methods in Biology  3
BIOL 3200K  Cellular Biology  4
BIOL 3400K  Genetics  4
BIOL 3500K  Ecology  4
BIOL 4000  Senior Seminar  2
BIOL 4250  Evolution  3
CHEM 3211K  Organic Chemistry I  4
CHEM 3212K  Organic Chemistry II  4
MATH 2253  Calculus and Analytic Geom I  4
or MATH 3050  Biological Statistics

Choose one Concentration: **/****/****

NOTE: Concentration must be declared through the Registrar's Office.

General Biology Concentration:
Upper Level Biology Electives (Must include at least one Biology Lab Science (noted with "K`).)
BIOL 3150  Science and Society
BIOL 3300K  Developmental Biology
BIOL 3340K  General Microbiology ****
BIOL 3510K  Plant Biology ****
BIOL 3520K  Invertebrate Zoology
BIOL 3550  Conservation Biology
BIOL 3600K  Ornithology
BIOL 3700  Field Biology Techniques
BIOL 3850  Neuroscience
BIOL 4100  Immunology
BIOL 4275  Bioremediation/Phytoremediatio
BIOL 4350k  Comparative Vertebrate A & P
BIOL 4410K  Molecular Biology
BIOL 4500K  Biotechnology
BIOL 4600  Ecotoxicology
BIOL 4850K  Human Dissection
BIOL 4900  Special Topics in Biology ***

STM Electives  12-13
ASTR 1010  Astronomy of the Solar System
& 1010L  and Astronomy of Solar Sys. Lab
ASTR 1020  Stellar and Galactic Astronomy
& 1020L  and Stellar & Galac. Astronomy Lab
BIOL 1105K  Environmental Studies

BIOL 1203K  Principles of Botany ****
BIOL 1224K  Entomology
BIOL 2212K  Anatomy and Physiology I
BIOL 2213K  Anatomy and Physiology II
BIOL 2215K  Microbiology ****
BUS 3000  Environmental Law and Policy
ENGL 3030  Technical Writing
GEOL 1121K  Principles of Geology
GEOL 1122K  Historical Geology
GEOL 1131K  Geology & the Environment
MATH 2253  Calculus and Analytic Geom I
MATH 2254  Calculus and Analytic Geom II
MATH 2256  Introduction to Linear Algebra
MATH 3050  Biological Statistics

Any 3000 or 4000 BIOL course including BIOL 3900, BIOL 4800, BIOL 4860, and BIOL 4900. **/****
Any 3000 or 4000 level Chemistry course EXCEPT CHEM 4000. **/

Any SUST course EXCEPT SUST 4000.

Environmental Biology Concentration:
Upper Level Environmental Biology Electives (Must include at least one Biology Lab Science (noted with "K`).)
BIOL 3510K  Plant Biology ****
BIOL 3520K  Invertebrate Zoology
BIOL 3550  Conservation Biology
BIOL 3600K  Ornithology
BIOL 3700  Field Biology Techniques
BIOL 4275  Bioremediation/Phytoremediatio
BIOL 4360K  Comparative Vertebrate A & P
BIOL 4600  Ecotoxicology
BIOL 4900  Special Topics in Biology ***

Environmental Biology STM Electives  12-13
ASTR 1010  Astronomy of the Solar System
& 1010L  and Astronomy of Solar Sys. Lab
ASTR 1020  Stellar and Galactic Astronomy
& 1020L  and Stellar & Galac. Astronomy Lab
BIOL 1105K  Environmental Studies

BIOL 1203K  Principles of Botany ****
BIOL 1224K  Entomology
BIOL 2212K  Anatomy and Physiology I
BIOL 2213K  Anatomy and Physiology II
BIOL 2215K  Microbiology ****
BUS 3000  Environmental Law and Policy
ENGL 3030  Technical Writing
GEOL 1121K  Principles of Geology
GEOL 1122K  Historical Geology
GEOL 1131K  Geology & the Environment
MATH 2253  Calculus and Analytic Geom I
MATH 2254  Calculus and Analytic Geom II
MATH 2256  Introduction to Linear Algebra
MATH 3050  Biological Statistics

Any 3000 or 4000 BIOL course including BIOL 3900, BIOL 4800, BIOL 4860, and BIOL 4900. **/****
Any 3000 or 4000 level Chemistry course EXCEPT CHEM 4000. **/

Any SUST course EXCEPT SUST 4000.
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<thead>
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<th>Notes</th>
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<tbody>
<tr>
<td>BIOL 4900</td>
<td>Special Topics in Biology</td>
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<tr>
<td>BIOL 4960</td>
<td>Research in Biology</td>
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<tr>
<td>BUSA 3000</td>
<td>Environmental Law and Policy</td>
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<tr>
<td>CHEM 3311K</td>
<td>Quantitative Analysis</td>
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<tr>
<td>CHEM 3312K</td>
<td>Instrumental Methods of Analysis</td>
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<tr>
<td>CHEM 3700K</td>
<td>Environmental Chemistry</td>
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<tr>
<td>CHEM 4900</td>
<td>Special Topics in Chemistry</td>
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<td>Technical Writing</td>
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<tr>
<td>CHEM 4900</td>
<td>Special Topics in Chemistry</td>
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Pre-Health Sciences Concentration:

Upper Level Pre-Health Biology Electives (Must include at least one Biology Lab Science (noted with "K")):

- BIOL 3150: Science and Society
- BIOL 3300K: Developmental Biology
- BIOL 3340K: General Microbiology
- BIOL 3850: Neuroscience
- BIOL 4100: Immunology
- BIOL 4360K: Comparative Vertebrate A & P
- BIOL 4410K: Molecular Biology
- BIOL 4500K: Biotechnology
- BIOL 4900: Special Topics in Biology

Pre-Health Biology STM Electives:

- BIOL 2212K: Anatomy and Physiology I
- BIOL 2213K: Anatomy and Physiology II
- BIOL 2215K: Microbiology
- BIOL 3150: Science and Society
- BIOL 3300K: Developmental Biology
- BIOL 3340K: General Microbiology
- BIOL 3850: Neuroscience
- BIOL 3900: Readings in Biology
- BIOL 4100: Immunology
- BIOL 4360K: Comparative Vertebrate A & P
- BIOL 4410K: Molecular Biology
- BIOL 4500K: Biotechnology
- BIOL 4800: Service Learning in Biology
- BIOL 4900: Special Topics in Biology
- BIOL 4960: Research in Biology
- CHEM 3311K: Quantitative Analysis
- CHEM 3312K: Instrumental Methods of Analysis
- CHEM 3500: Biochemistry
- CHEM 4430: Advanced Organic Chemistry
- CHEM 4900: Special Topics in Chemistry
- ENGL 3030: Technical Writing

Free Electives:

Select 3 hours from any transfer credit courses in the College curriculum other than PHED courses.

Total Hours: 121-122

** Students are limited to a maximum of eight credit hours in applied learning categories: readings (BIOL 3900 and CHEM 3900), service learning (BIOL 4800 and CHEM 4800), internships (BIOL 4860 and CHEM 4860), and research (BIOL 4960 and CHEM 4960).

*** Students will not be able to count both BIOL 1203K & BIOL 3510K or BIOL 2215K & BIOL 3340K in Upper Level or General Elective areas. A student may take both classes in these pairs, but only one course will count in the Upper Level or General electives. The other course may count as a free elective.

### Courses

**BIOL 1011K. Introduction to Biology. 3-2-4 Units.**

An introduction to fundamental unifying principles in biology. Topics covered in the course include: chemistry of life, cell structure and membranes, cellular functions (metabolism, respiration, photosynthesis, communication, and reproduction), genetics (inheritance patterns, DNA structure and function, gene expression, and biotechnology), and evolution. This course involves both lecture and lab components.

Prerequisites: ENGL 0999 unless exempt.

**BIOL 1100. Human Biology. 3-0-3 Units.**

Prepares students for employment in the health professions. Topics include basic chemistry, cell biology, genetics, and digestive, excretory, respiratory, circulatory, endocrine, reproductive, and skeletal systems. Laboratory demonstrations and practices are included. (Career Course) (F,S,M)

**BIOL 1105K. Environmental Studies. 3-2-4 Units.**

Focuses on the interrelationship of the biological and physical components of the environment and the impact of human activities on the biosphere.(F,S,M)

Prerequisites: ENGL 0999 unless exempt.

**BIOL 1107H. Honors Principle of Biology I. 3-2-4 Units.**

**BIOL 1107K. Principles of Biology I. 3-2-4 Units.**

Introduces fundamental unifying principles of biology. Topics include scientific method, biological chemistry, cell structure and function, energetics, cell division, genetics and evolution.(F,S,M)

Prerequisites: ENGL 0999 unless exempt.
BIOL 1108K. Principles of Biology II. 3-2-4 Units.
Continuation of BIOL 1107. Topics include the structure and function of the following animal, including human, systems: nervous, circulatory, immune, respiratory, digestive, urinary, endocrine, and reproductive, as well as diversity, development, behavior and ecology. (F,S,M)
Prerequisites: BIOL 1107K.

BIOL 1203K. Principles of Botany. 3-2-4 Units.
Introduces students to plant cell biology, anatomy, physiology, genetics, biotechnology, economic importance, diversity, and classification. Teaches students sterile technique, basic plant tissue culture, and techniques for microscopic observation of plants. (S)
Prerequisites: ENGL 0999 unless exempt.

BIOL 1224K. Entomology. 3-2-4 Units.
Presents an introduction to the anatomy, biology, and behavior of insects. The laboratory emphasizes classification and identification of insects to family, which are required as part of assembling a collection during the course. (F)
Prerequisites: ENGL 0999 unless exempt.

BIOL 2212K. Anatomy and Physiology I. 3-3-4 Units.
Focuses on the study of human anatomy and physiology. Topics include chemistry, cells, tissues, and the integumentary, skeletal, muscular, nervous, and endocrine systems. (This course will NOT satisfy an Area D requirement and will only satisfy an Area F requirement only if specifically listed as an option for the program of study.) (F,S,M)
Prerequisites: BIOL 1107K, except Associate of Science in Nursing (2 year) majors, Associate of Applied Science in Radiologic Technology and Associate of Applied Science in Respiratory Therapy.

BIOL 2213K. Anatomy and Physiology II. 3-3-4 Units.
Continues the study of human anatomy and physiology begun in Biology 2212. Topics covered include the circulatory-lymphatic, immune, respiratory, digestive-metabolic, excretory, and reproductive systems and human development and heredity. (This course will NOT satisfy an Area D requirement and will only satisfy an Area F requirement only if specifically listed as an option for the program of study). (F,S,M)
Prerequisites: BIOL 2212K or permission of MLS advisor.

BIOL 2215K. Microbiology. 3-2-4 Units.
Introduces students to the biology of viruses, bacteria, fungi, and protozoan and animal parasites. Teaches students the fundamental principles of microbiology with special emphasis on the relationships of microbes to man. Trains students to isolate, culture, and identify microbes in a laboratory. (This course will satisfy an Area D or Area F requirement only if specifically listed as an option for the program of study). (F,S,M)
Prerequisites: BIOL 1107K or BIOL 2212K.

BIOL 2270. Ethical Issues in Science. 2-0-2 Units.
Provides an introduction to basic ethical concepts and develops the concept of ethical decision-making and how this applies to the increasing number of biological ethics decisions made daily. A variety of bioethical questions will be proposed and students will explore the science and social science aspects of each particular question. (F,S)
Prerequisites: BIOL 1108K.

BIOL 3000. Research Methods in Biology. 3-0-3 Units.
Prepares students for independent research by training them in laboratory safety, storage and disposal of reagents, standard methods and equipment used for research in a range of specialties and the ethical conduct of research. Students will develop skills in critical analysis of literature, experimental design, project proposal preparation, maintain lab log books, data analysis, time-management and oral and written presentation of results. This class is a suggested pre or co-requisite for BIOL 3900 and BIOL 4960. (F,S)
Prerequisites: BIOL 1108K, COMM 1110, MATH 2200 or MATH 1401.

BIOL 3150. Science and Society. 3-0-3 Units.
This course provides historical and contemporary perspectives on the roles of science and technology in society. Specific historical periods will be reviewed, with selected biographical information to gain a social perspective relative to an individual scientist’s contributions to a field, and the impact of science and technology on society. Current topics will be covered. Potential topics may include vaccines (e.g. historical research, currently available vaccines, and social controversies related to usage), climate change (e.g. aspects of ecology, evolution, energy policy & technology), reproductive biology (e.g. birth control, abortion), aging (e.g. theories of aging, medical treatments for age-related pathologies, social and economic costs), or other regional scientific issues and history.
Prerequisites: BIOL 2270, instructor approval for Study Abroad program and Upper division eligibility.

BIOL 3200K. Cellular Biology. 3-3-4 Units.
An exploration of the basic unit of living organisms. Study of the structure and function of cellular structures with emphasis on the unifying nature of cell membrane systems, cellular energetics, motility and transport intercellular interactions, cellular communication, and cell division. Laboratory experiences introduce basic cytological study techniques. (F,S)
Prerequisites: BIOL 1108K, CHEM 1212K.
Corequisites: CHEM 3211K.

BIOL 3300K. Developmental Biology. 3-2-4 Units.
Introduces students to the developmental process in animals with the formation of gametes through the embryonic stages, birth, maturation and aging. Anatomical development, experimental embryology and the molecular mechanisms of cell differentiation will be covered. Laboratory techniques in developmental biology including animal cell and tissue cultures will be utilized. (Spring as enrollment requires)
Prerequisites: BIOL 3200K.

BIOL 3340K. General Microbiology. 3-2-4 Units.
Introduces students to the biology of noncellular, prokaryotic, and eukaryotic microorganism. Topics include microbial metabolism, genetics, systematics, pathogenesis, epidemiology, and ecology. The history of microbiology, host defense against disease, and human exploitation of microbes will also be studied. The laboratory introduces students to the culture and identification of microorganisms. (Fall as enrollment requires)
Prerequisites: BIOL 1108K, CHEM 1211K.

BIOL 3400K. Genetics. 3-3-4 Units.
A study of Mendelian principles, molecular genetics and population genetics. Topics include simple Mendelian inheritance, extensions of Mendelian inheritance, linkage, genetic mapping, quantitative inheritance, population genetics, prokaryotic genetics, and molecular genetics. (F,S,M)
Prerequisites: BIOL 3200K, CHEM 3211K; Corequisite: CHEM 3212K.
BIOL 3500K. Ecology. 3-3-4 Units.
A study of the interrelationships of organisms with their physical and biological environment. Topics include an exploration of adaptations, population structure and dynamics, organization and classification of communities, and nutrient and energy flows in ecosystems. (F,S,M)
Prerequisites: BIOL 1108K.
Corequisites: CHEM 1211K.

BIOL 3510K. Plant Biology. 3-3-4 Units.
An in-depth examination of the structures, growth, reproduction, competition, survival, and diversity of plants. (S)
Prerequisites: BIOL 1108K, CHEM 1211K.

BIOL 3520K. Invertebrate Zoology. 3-3-4 Units.
An in-depth examination of the taxonomy, morphology, physiology, and evolution of the more common invertebrate phyla. A study of the distribution and interspecific relationships among invertebrates and other forms of life. (Fall as enrollment requires)
Prerequisites: BIOL 1108K.

BIOL 3550. Conservation Biology. 3-0-3 Units.
An in-depth study of the biological aspects of environmental crises and how principles from major areas in biology can provide solutions to the conservation of species and ecosystems. Major topics will include population ecology, population genetics, and community ecology. Because of the interdisciplinary nature of conservation we will discuss the social and political aspects of the field. Supplemental readings will come from primary literature. A semester long project which requires developing a management plan for a novel environmental problem is required. (Fall as enrollment requires)
Prerequisites: BIOL 1108K.

BIOL 3600K. Ornithology. 3-3-4 Units.
Birds have been the subjects of scientific investigation for centuries, and research on birds has contributed much to our modern understanding of morphology, physiology, behavior, ecology, evolution, and global change. The purpose of this course is to investigate these myriad but interrelated topics with birds as our focus in both lecture and laboratory settings. The course will involve hands-on learning of ornithology using traditional lecture and lab activities along with experimental design and research. (Spring as enrollment requires)
Prerequisites: BIOL 1108K.

BIOL 3700. Field Biology Techniques. 3-0-3 Units.
This course is designed to expose students to standard field techniques for collecting habitat and specimen data. Additionally, this course is designed to expose students to current peer reviewed literature, learn basics of scientific writing and grant writing, and explore career options for students in biology. (Summer, Even Years)
Prerequisites: Any 3-4000 level BIOL courses (excludes BIOL 3900, BIOL 4800, BIOL 4960).

BIOL 3850. Neuroscience. 3-0-3 Units.
This course introduces the cellular mechanisms of neural signals, neural systems for sensory and motor functions, and the basics of higher order brain functions. Research techniques are discussed in the context of the material. (Fall as enrollment requires)
Prerequisites: BIOL 3200K, CHEM 1212K.

BIOL 3900. Readings in Biology. 2-0-2 Units.
Independent study of the literature within a topic of current research in Biology. (F,S,M)
Prerequisites: 12 hours of Biology courses and approval of a faculty supervisor and Chair of Department of Life Science required before registration.

BIOL 4000. Senior Seminar. 2-0-2 Units.
Survey of various topics, especially highlighting the interdisciplinary nature of biology. (F,S)
Prerequisites: 19 hours of 3000/4000 level Biology.

BIOL 4100. Immunology. 3-0-3 Units.
Provides an introduction to the cellular and molecular basis of the immune response, which includes antigen presentation, immunogenetics, effector mechanisms, and medical immunology. (Spring as enrollment requires)
Prerequisites: BIOL 3200K.

BIOL 4250. Evolution. 3-0-3 Units.
A study of the principles of evolutionary biology including discussions of natural selection, adaptation, population genetics, speciation, and phylogeny reconstruction, and the distribution, abundance and adaptations of living organisms as mediated by the environment and natural selection. (F,S,M)
Prerequisites: BIOL 3400K, CHEM 1212K.

BIOL 4275. Bioremediation/Phytoremediation. 3-0-3 Units.
Bioremediation and phytoremediation use microbes and plants, respectively, in the treatment of contaminated soils and water. These methods are increasingly utilized at sites requiring remediation, either individually or in conjunction with more traditional remediation techniques. This course will examine the histories, theories, benefits, drawbacks and applications of various bioremediation and phytoremediation techniques of organic and inorganic pollutants. Some of the techniques addressed will be natural attenuation, biodegradation, bio filtration, phyto extraction and phyto stabilization. (Spring as enrollment requires)
Prerequisites: BIOL 1108K.

BIOL 4360K. Comparative Vertebrate A & P. 3-3-4 Units.
Broad comparative analysis of vertebrate morphology by considering anatomical structure and function and the integration of these structures in the individual organism, as well as the functional process of vertebrate organs and organ systems, and their physiological integration. Consideration will be given to the relationship between structure and functional demands of vertebrates to particular environments as well as the details of each vertebrate organ system, emphasizing the structure-function relationship of the organs/organ systems, and the range of structural and evolutionary modifications of organ systems seen in different vertebrate classes. (Spring as enrollment requires)
Prerequisites: Any 3-4000 level BIOL courses (excludes BIOL 3900, BIOL 4800, BIOL 4960).

BIOL 4410K. Molecular Biology. 3-3-4 Units.
In depth examination of the molecular aspects of cell structure and function, emphasizing the chemical and molecular basis of cellular physiology. Addresses genetic function at the chromosomal and molecular levels, gene expression, and regulation. (Spring as enrollment requires)
Prerequisites: BIOL 3400K, CHEM 3211K.

BIOL 4500K. Biotechnology. 3-3-4 Units.
A study of the applied aspects of biochemistry and molecular biology in various fields, with emphasis on the use of recombinant DNA methods and protein engineering. (Fall as enrollment requires)
Prerequisites: BIOL 3400K.
BIOL 4600. Ecotoxicology. 3-0-3 Units.
This course provides an introduction to the field of ecotoxicology, classes of contaminants, mechanisms of action, biomarkers, and effects at the individual, population, and community level. Also included will be historical background of the field and the history of environmental legislation in the United States. (Fall as enrollment requires)
Prerequisites: Any 3-4000 level BIOL courses (excludes BIOL 3900, BIOL 4800, BIOL 4960).

BIOL 4800. Service Learning in Biology. 0-0-2 Units.
Independent internship with a field of biology or lecture assistantship or laboratory assistantship within a biology course at Dalton State. Repeatable for a maximum of 4 credit hours. (F,S,M) Students with a laboratory assistantship must have successfully completed the course with a B or better.
Prerequisites: 12 hours of Biology and approval of a faculty supervisor and Chair of Department of Life Science required before registration.

BIOL 4850K. Human Dissection. 0-4-3 Units.
This is a laboratory course that requires prosection of a human cadaver which will be used as an instructional aid in other courses at Dalton State. Students will review the history of cadaver use, demonstrate various dissection techniques and knowledge of medical human anatomy. (S) Prerequisites are 3 upper level BIOL courses and permission of the instructor.

BIOL 4900. Special Topics in Biology. 3-0-3 Units.
Advanced concepts in biology will be presented, the detailed content varying from year to year. Course may be repeated for credit when topic differs. (Offered as Needed)
Prerequisites: BIOL 3400K and 3 additional upper level Biology courses.

BIOL 4960. Research in Biology. 0-0-1-3 Unit.
Research project conducted by a student under guidance of a faculty member. Repeatable for a maximum of 4 hours. (F,S,M) Justification: These were rewritten by the URC to facilitate getting TAs/Research students in lower level classes. We still require both instructor and chair approval, as before.
Prerequisites: 16 hours Biology courses and approval of a faculty supervisor and Chair of Department of Life Science required before registration.