BIOLOGY, SECONDARY CERTIFICATION OPTION

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 will also study with faculty in the school of education to prepare them for certification to teach science at secondary level at middle or high school.

Area A: Essential Skills
Grades of C or better required.

| ENGL 1101 | English Composition I | 3 |
| ENGL 1102 | English Composition II | 3 |
| MATH 1113 | Precalculus Mathematics | 3 |

Area B: Institutional Options

| COMM 1110 | Fundamentals of Speech *** | 3 |

Choose one of the following electives: 1

| COMM 1120 | Argumentation and Advocacy |
| ENGL 1105 | Intro to Greek Mythology |
| ENGL 1110 | Creative Writing |
| GEO 1000 | Natural Hazards |
| HIST 1050 | Appalachian Hist-Special Topic |
| HIST 1051 | Sports Hist & Amer Character |
| HLTH 1030 | Health and Wellness Concepts |
| HUMN 1000 | Mystery Fiction in Pop Culture |
| HUMN 1100 | Political and Social Rhetoric |
| HUMN 1300 | Christian Fiction/Pop Culture |
| SOCI 1000 | Race and Ethnicity in America |
| PRSP Elective (See advisor) |

Area C: Humanities/Fine Arts

Choose one or two ENGL course(s): 3-6

| ENGL 2000 | Topics in Literature & Culture |
| ENGL 2111 | World Literature I |
| ENGL 2112 | World Literature II |
| ENGL 2120 | British Literature I |
| ENGL 2121 | British Literature II |
| ENGL 2130 | American Literature I |
| ENGL 2131 | American Literature II |
| ENGL 2201 | Intro to Film as Literature |

If only one ENGL course chosen, add one of the following: 0-3

| ARTS 1100 | Art Appreciation |
| HUMN 1201 | Expressions of Culture I |
| HUMN 1202 | Expressions of Culture II |

MUSC 1100 | Music Appreciation |
MUSC 1110 | World Music |
MUSC 1120 | American Music |
THEA 1100 | Theatre Appreciation |

Area D: Science/Mathematics/Technology

| CHEM 1211K | Principles of Chemistry I | 4 |
| CHEM 1212K | Principles of Chemistry II | 4 |
| MATH 2253 | Calculus and Analytic Geom I | 4 |

Area E: Social Sciences

| HIST 2111 | United States History to 1877 | 3 |
| or HIST 2112 | United States Hist since 1877 |
| POLS 1101 | American Government | 3 |

Two of the following electives: 6

| ANTH 1103 | Intro to Cultural Anthropology |
| ECON 2105 | Principles of Macroeconomics |
| ECON 2106 | Principles of Microeconomics |
| GEOG 1100 | Introduction to Geography |
| GEOG 1101 | Intro to Human Geography |
| GEOG 1111 | Intro to Physical Geography |
| HIST 1111 | World Civilization to 1500 CE |
| HIST 1112 | World Civilization since 1500 |
| HIST 2111 | United States History to 1877 |
| HIST 2112 | United States Hist since 1877 |
| PHIL 1103 | Intro to World Religions |
| PHIL 2010 | Intro to Philosophical Issues |
| PHIL 2020 | Logic and Critical Thinking |
| POLS 2101 | Intro to Political Science |
| 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 |
| EDUC 2110 | Investig Critical/Contem Issue ** | 3 |
| EDUC 2120 | Expl Socio-Cultural Perspec ** | 3 |
| EDUC 2130 | Exploring Learning/Teaching ** | 3 |

Required Biology Courses

| BIOL 3000 | Research Methods in Biology | 3 |
| BIOL 3200K | Cellular Biology | 4 |
| BIOL 3400K | Genetics | 4 |
| BIOL 3500K | Ecology | 4 |
| BIOL 3510K | Plant Biology | 4 |
| BIOL 4000 | Senior Seminar | 2 |
| BIOL 4250 | Evolution | 3 |
| CHEM 3211K | Organic Chemistry I | 4 |
| CHEM 3212K | Organic Chemistry II | 4 |
MATH 1401  Elementary Statistics  3

**Upper Level Biology Electives**  4

One four credit hour 3000-4000 level BIOL with lab elective or two three credit hour 3000-4000 level BIOL electives.

- BIOL 3300K  Developmental Biology
- BIOL 3340K  General Microbiology
- BIOL 3520K  Invertebrate Zoology
- BIOL 3550  Conservation Biology
- BIOL 3600K  Ornithology
- BIOL 3700  Field Biology Techniques
- BIOL 3900  Readings in Biology
- BIOL 4100  Immunology
- BIOL 4275  Bioremediation/Phytoremediatio
- BIOL 4360K  Comparative Vertebrate A & P
- BIOL 4410K  Molecular Biology
- BIOL 4500K  Biotechnology
- BIOL 4600  Ecotoxicology
- BIOL 4800  Service Learning in Biology
- BIOL 4900  Special Topics in Biology
- BIOL 4960  Research in Biology

**Education Courses**

**Professional Education Semester 1 (Block I) - Fall Semester**

Prior to enrollment in PES I courses, students must be accepted to the Teacher Education Program and have completed 8 credit hours of Biology with grades of C or better.

- EDUC 3902  Curric/Asses Secondary Teacher  3
- EDUC 3272  Class Mgmt Sec Ed Field Exp I  2

**Professional Education Semester 2 (Block II) - Spring Semester**

Prior to enrollment in PES II courses, students must have completed EDUC 3902 and EDUC 3272 with grades of C or better.

- EDUC 3273  Class Mgmt Sec Ed Field Exp II  2
- EDUC 4901  Methods/Strat Teach Sec Stu  3

**Professional Education Semester 3 (Block III) - Fall Semester**

Prior to enrollment in PES III, students must have completed EDUC 3273 and EDUC 4901 with grades of C or better.

- EDUC 3120  Teaching Diverse Learners(Sec)  3
- EDUC 3274  Class Mgmt Sec Ed Field Exp III  2

**Professional Education Semester 4 (Block IV) - Spring Semester**

Prior to enrollment in PES IV, students must have completed EDUC 3120, EDUC 3274, and all upper division coursework in the major with grades of C or better.

- READ 3456  Reading across Curric Sec Educ  3
- EDUC 4952  Internship in Sec School Biol  8
- EDUC 4953  Teaching Internship Seminar  1

**Physical Education**

- PHED Activity Elective  1

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Math 2253 may be taken in Area A if the student meets the prerequisites, with MATH 2254 then taken in Area D. The additional hour of credit will be applied to the upper level curriculum.

**Prior to enrollment in EDUC 2110, EDUC 2120, and EDUC 2130, students must have taken PSYC 1101, COMM 1110, and Area A courses with grades of C or better. Approved Background check, proof of professional Liability Insurance, completion of the mandated reporter training course, and a passing score on an Ethics assessment are also required. EDUC 2110, EDUC 2120, EDUC 2130 must be completed with grades of C or better prior to acceptance into PES I.**

*** COMM 1110 and PSYC 1101 are prerequisites for EDUC 2110, EDUC 2120, and EDUC 2130. Grade of C or better required.

**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.**

Prerequisites: ENGL 0999 unless exempt.

**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.
Prerequisites: ENGL 0999 unless exempt.
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 MLM 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,M)
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. 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.