

BIOLOGY



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Associate Professor of Biology

Dr. Henderson is a microbiologist who studies two intestinal pathogens, *Vibrio cholerae* and *Plesiomonas shigelloides*. His research concerns how these pathogens acquire iron from heme, the iron-containing component of hemoglobin. He is also working on the development of a temporary blood substitute, based on his work with heme iron transport in bacteria. His results have been published in the *Journal of Bacteriology*, *Infection and Immunity*, and *Molecular Microbiology*.

Administered by the Department of Biology within the College of Arts and Sciences.

Courses in Biology apply to the Bachelor of Science degree with a major in Biology and to a minor in Biology. Degree programs in Biology provide preparation for careers in elementary, secondary and college teaching; research in basic and applied biological sciences; medicine; veterinary medicine; dentistry; physical therapy; medical technology and other health fields. As a minor, Biology is a good supporting field for majors in

Chemistry, Geology, Psychology and Kinesiology. The introductory sequence, General Biology (BIOL 1306-1106, 1307-1107), is required for all Biology degree plans and is appropriate for meeting the University general education requirements for two science courses with laboratory (8 semester credit hours).

The Biology program features three basic degree plans: a Pre-professional Plan, a Teaching Certification Plan and General Studies. Students planning a major in Biology should consult with their faculty advisor to prepare a degree plan no later than the first semester of enrollment. No more than 45 semester credit hours of Biology may be applied toward the 120 semester credit hour minimum required for a degree. Students seeking to earn a B.S. with a major in Biology must pass all courses taken for the major, minor, general education, and the support and Science & Mathematics requirements on the Biology degree plans with a grade of C or better. Before enrolling in a course, any prerequisites to that course must be passed with a grade of C or better.

In addition to the University general education degree requirements, a major in Biology requires completion of certain supporting courses necessary and appropriate for a major in Biology. These courses are included in the respective degree requirements below.

Degree Requirements, Pre-professional Plan

The Pre-professional Plan is for students planning to enter graduate school or a professional school, including medicine, dentistry, veterinary medicine, medical technology and other health professions. This professional degree plan includes a minimum of 36 semester credit hours in the major with at least 28 credits of upper level 3000 and 4000 number courses.

The total semester credit hours required for a B.S. in Biology on this pre-professional track is **120**.

General Education Requirements

Students on the Pre-professional Plan should complete the requirements in the General Education Requirements section of this catalog on pages 63-64 including the following specific courses.

Calculus I and II, MATH 2413 and MATH 2414

General Chemistry I and II, CHEM 1311-1111 and CHEM 1312-1112

Computer Use

All pre-professional majors must demonstrate a basic use of computing through the completion of COSC 1335.

Supporting Requirements, Pre-professional Plan

Organic Chemistry I and II, CHEM 3411-3113 and CHEM 3412-3114

Physics I and II, calculus-based physics, PHYS 2325/2125 and PHYS 2326/2126 are strongly recommended, or PHYS 1301/1101 and 1302/1102

Literature: Survey course preferably at the upper (3000) level

Science Capstones: NTSC 4301 or other upper level elective, and NTSC 4311.

Major Requirements, Pre-professional Plan

Students majoring in Biology on the Pre-professional Plan must take a minimum of 36 semester credit hours in the major with a minimum of 28 hours of upper level courses, including:

BIOL 1306-1106	General Biology I
BIOL 1307-1107	General Biology II
BIOL 3300-3101	Microbiology or
BIOL 3324-3125	Cell Biology
BIOL 3310-3111	Invertebrate Zoology or
BIOL 3321-3113	Vertebrate Zoology
BIOL 4320	Cell Biochemistry
BIOL 4340-4141	Genetics with lab
BIOL 4342	Evolution with recitation
BIOL 4352-4153	Animal Physiology

TOTAL REQUIRED UPPER LEVEL HOURS: 22

Electives

Majors on the Pre-professional degree plan may take any upper level Biology courses beyond the required courses to achieve the minimum 28 upper level credits.

Degree Requirements, Teacher Certification, Grades 8-12

The Teacher Certification Plan for grades 8-12 is for students planning a career in secondary school teaching with Biology as the academic major and seeking provisional education certification. Students who choose Biology as their academic minor but who wish to receive certification in Biology should refer to the section on Biology Minor.

General Education Requirements, Teacher Certification Plan, grades 8-12

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Students majoring in Biology on the Teacher Certification Plan should complete the requirements in the General Education Requirements section on pages 63-64 of this catalog, including the following specific courses

General Chemistry I and II, CHEM 1311-1111 and CHEM 1312-1112

Additional Requirements, Teacher Certification Plan, grades 8-12

8 sch

Students majoring in Biology seeking provisional certification, grades 8-12 have the following additional requirements:

Organic Chemistry I, CHEM 3411-3113
Science Capstone NTSC 4311 or NTSC 4301

Two semesters of mathematics, specified as: Students seeking certification, grades 8-12, in Biology whose academic minor is in one of the other Science and Mathematics programs (Chemistry, Computer Science, Environmental Science, Geology/Earth Science, or Mathematics) are required to take Calculus I and II, MATH 2413 and 2414, to meet their math requirements. Students seeking certification, grades 8-12, in Biology whose minor is in a program outside of the Department of Science and Mathematics may opt to take MATH 1332 and MATH 1333 or MATH 2412.

Computer Use

Students seeking certification in grades 8-12 must demonstrate a basic use of computing through completion of COSC 1335.

Major Requirements, Teacher Certification Plan, grades 8-12

Students seeking standard certification, grades 8-12 with Biology as the academic major must take at least 30 semester credit hours in Biology, at least 22 of which must be at the upper level. This "reduced" major is an option only to students who complete their certification requirements as part of the Bachelor's degree; students who do not complete their certification requirements as part of the Bachelor's degree must complete a full Biology major according to the Pre-professional or General Studies plans. Required courses with elective options are:

BIOL 1306-1106	General Biology I with lab
BIOL 1307-1107	General Biology II with lab
BIOL 3300-3101	Microbiology with lab
or BIOL 3324-3125	Cell Biology with lab
BIOL 4340	Genetics (lab not required)
BIOL 4342	Evolution with recitation
BIOL 3372	Principles of Ecology

Choose among the following as electives to complete the required number of hours for the major: BIOL 3310-3111, Invertebrate Zoology with lab; BIOL 3312-3113 Vertebrate Zoology with lab; BIOL 3230-3231, Botany with lab; BIOL 3350-3151, Human Anatomy with lab; BIOL 3352-3153, Human Physiology with lab; or BIOL 4354, Animal Behavior.

Degree Requirements, Teacher Certification, Grades EC-4 and 4-8

The Teaching Certification Plans for Early Childhood – grade 4 and grades 4 - 8 are for students planning a career in elementary or middle school teaching with Biology as the academic major and seeking education certification. The description of degree requirements in this section apply to Biology majors seeking certification for either EC-4 or 4-8. Consult the School of Education advisor for information regarding education courses and certification procedures.

To meet Texas Higher Education Coordinating Board requirements, students seeking certification to teach grades EC-4 or 4-8 must take at least 9 hours of math (may include statistics) at or above college-level algebra and at least 12 hours of science. They should plan accordingly when meeting general education and elective course requirements. Students seeking certification as a 4-8 Generalist must take at least 12 hours of math and 14-16 hours of science. (Students certifying to teach 4-8 Math or Science will have additional hours in their respective disciplines.)

General Education Requirements

Students majoring in Biology seeking certification for either EC-4 or 4-8 should complete the requirements in the General Education Requirements section on pages 63-64 of this catalog, with particular specifications as outlined in the supporting requirements below.

Additional Requirements, Teacher Certification Plans for EC-4 or 4-8

Students seeking certification in EC-4 or 4-8 with Biology as their major have the following supporting requirements:

MATH 1314, MATH 1350, and MATH 2350	College Algebra, Foundations of Elementary Mathematics I and II (EC-4 can substitute Statistics for MATH 2350)
CHEM 1311-1111 and CHEM 1312-1112	General Chemistry I and II
NTSC 4311 or NTSC 4301	Science Capstone

Computer Use

Students seeking certification in EC-4 or 4-8 must demonstrate a basic use of computing through completion of COSC 1335.

Major Requirements, Teacher Certification Plan, EC-4 and 4-8

Students seeking certification in EC-4 or 4-8 with Biology as the major must take at least 26 hours in Biology with at least 18 hours at the upper level. This "reduced" major is an option only to students who complete their certification requirements as part of the Bachelor's degree; students who do not complete their certification requirements as part of the Bachelor's degree must complete a full Biology major according to the Pre-professional or General Studies plans.

Required courses with elective options are:

BIOL 1306-1106	General Biology I with lab
BIOL 1307-1107	General Biology II with lab
BIOL 4340	Genetics (lab not required)
BIOL 4342	Evolution with recitation
BIOL 3372	Principles of Ecology

Choose among the following as electives: BIOL 3310-3111, Invertebrate Zoology with lab; BIOL 3312-3113 Vertebrate Zoology ; BIOL 3230-3231, Botany with lab; BIOL 3350-3151, Human Anatomy with lab; BIOL 3352-3153, Human Physiology with lab; or BIOL 4354, Animal Behavior.

General Studies

Students not in either the Pre-professional or Teacher Certification Plan may opt to complete a more flexible degree plan in General Studies. This plan is suitable for students interested in positions in business, industry, or government where a B.S. in Biology may be required or recommended. The General Studies plan must include 36 hours in Biology with a minimum of 24 upper-level credits. Required Biology courses must include:

BIOL 1306-1106	General Biology I with lab
BIOL 1307-1107	General Biology II with lab
BIOL 4340	Genetics (lab not required)
BIOL 4342	Evolution with recitation
BIOL 3350-3151 or 3312-3113	Human Anatomy or Vertebrate Zoology (with lab)
BIOL 3352-3152 or 4352-4153	Human Physiology or Animal Physiology (with lab)

Two semesters of mathematics (MATH 2413 and 2414) and physics (PHYS 130/1101 and 1302/1102 are sufficient), and four semesters of chemistry (CHEM 1311-1111, 1312-1112; 3411-3113, 3412-3114) are required.

Biology Minor

Biology serves as an appropriate minor area for students to complement majors in other natural sciences, such as Chemistry, Environmental Science, or Geology, in the behavioral sciences, such as Kinesiology, Psychology and Sociology, and in many other majors.

The total credits required for a minor in Biology is **20**.

Students earning a minor in Biology must take a minimum of 20 semester credit hours with a minimum of 12 at the upper level as follows.

BIOL 1306-1106	General Biology I with lab
BIOL 1307-1107	General Biology II with lab
BIOL 4340	Genetics (lab not required)
BIOL 4342	Evolution with recitation

Choose two of the following as electives:

BIOL 3300-3101	Microbiology with lab or
BIOL 3324-3125	Cell Biology with lab
BIOL 3310-3111	Invertebrate Zoology with lab or
BIOL 3230-3231	Botany with lab or
BIOL 3312-3113	Vertebrate Zoology with lab
BIOL 3350-3151	Human Anatomy with lab
BIOL 3352-3153	Human Physiology with lab
BIOL 3372	Principles of Ecology

Biology minors who intend to certify in Biology as a second teaching field must complete at least 24 semester credit hours rather than the 20 semester credit hours of an ordinary Biology minor, with a minimum of 12 semester credit hours at the upper level. In addition, they must complete the following additional requirements: CHEM 1311-1111 and CHEM 1312-1112, General Chemistry I and II.

Students transferring credits to U. T. Permian Basin in clinical courses such as nursing, medical technology and other allied health areas should consult with the Chair of the Health Professions Advisory Committee to determine the number of incoming credits that may apply toward a degree. The biology faculty will help students design programs of study to satisfy specific career objectives. A minimum of 120 hours, 54 of which must be upper-level, are required for the Bachelor's degree.

TEExES Requirements

Candidates for TEExES tests in 8-12 Life Sciences must have completed the courses listed for each area below (or equivalent courses).

8-12 Life Sciences: BIOL 1306/1106, 1307/1107, 3300/3101 or 3324/3125, 3372 or 4372, 4340, 4342; CHEM 1311-1111, 1312-1112, and 3411/3113; NTSC 4311; and 3 or 4 hours biology electives.

Candidates for TEExES tests in 8-12 Science must have completed the courses listed for each area below (or equivalent courses).

8-12 Science: BIOL 1306/1106, 1307/1107, 4340; 4342; BIOL 3372 or 3230/3231; BIOL 3300/3101 or 3324/3125; CHEM 1311/1111, 1312/1112, 3411/3113; GEOL 1301/1101, 1302/1102; PHYS 1301/1101 and 1302/1102 or PHYS 2325/2125 and 2326/2126; NTSC 4311; and 3-4 hours of science electives.

Candidates for TEExES tests in 4-8 Science must have completed the courses listed for each area below (or equivalent courses).

4-8 Science: BIOL 1306/1106, 1307/1107, 4340, BIOL 3372 or 3230/3231; CHEM 1311/1111, 1312/1112; GEOL 1301/1101, 1302/1102; PHYS 1301/1101; NTSC 4311; and 9-12 hours of science electives.

Candidates for TEExES tests in 4-8 Math/Science Composite must have completed the courses listed for each area below (or equivalent courses).

4-8 Math/Science Composite: MATH 2350 or 2412, 2413, 2414, 3301, 3305, 3308, 3350; BIOL 1306/1106, 1307/1107; BIOL 3372 or 3230/3231; CHEM 1311/1111; GEOL 1301/1101; PHYS 1301/1101 or GEOL 1302/1102; NTSC 4311; and 6 hours of science electives.

Course Listing

All upper-level courses in Biology require BIOL 1306-1106 and 1307-1107 as a prerequisite. Additional prerequisites are listed for individual courses.

BIOL 1306 General Biology I (3)[†]

Overview of the biological sciences, with emphasis on the structure, function and physiology of the cell; genetics and bioenergetics. Corequisite: BIOL 1106. FS

BIOL 1106 General Biology I Laboratory (1)[†]

Laboratory methods in the biological sciences, directed toward the structure and function of the cell. Corequisite: BIOL 1306. FS

BIOL 1307 General Biology II (4)[†]

Overview of the biological sciences, with emphasis on the biology of organisms, their evolution and the environment. Prerequisite: BIOL 1306-1106. Corequisite: BIOL 1107. FS

BIOL 1107 General Biology II Laboratory (1)[†]

Laboratory methods for the study of the structure, function, and the environment of organisms. Corequisite: BIOL 1307. FS

BIOL 3300 Microbiology (3)

Growth, morphology, metabolism and ecology of microorganisms. Prerequisites: BIOL 1306-1106, 1307-1107; CHEM 1311-1111, 1312-1112. Corequisite: BIOL 3101. S

BIOL 3101 Microbiology Laboratory (1)

Techniques for the study of microorganisms. Corequisite: BIOL 3300. S

BIOL 3196 Supervised Laboratory Teaching (1)

Upper-level undergraduates provide teaching assistance in General Biology or other designated Biology lab sections. The lab instructor supervises the student, establishes curricular duties (grading, etc.), and remains in charge of the lab as instructor of record. Good experience for students seeking teaching certification. Prerequisites: A grade of at least B in the lab course oneself, plus permission of supervising lab instructor. F,S

BIOL 3197 Pre-professional Seminar (1)

Course provides a mechanism to disseminate information to students interested in doctoral-level professional programs, including opportunities for interactions, small group discussions, and visits by representatives of health science centers. F

BIOL 3198 Seminar (1)

Interaction and small group discussions of varied topics in biology. Prerequisites: BIOL 1306-1106; BIOL 1307-1107. S

BIOL 3303 Principles of Nutrition (3)

Nutritional roles of carbohydrates, proteins, lipids, minerals, vitamins and water in animals (including humans) and plants; emphasis on digestion, absorption, metabolism and excretion of the nutrients and their metabolites. Prerequisite: BIOL 1306-1106, 1307-1107. Prerequisite or Corequisite: CHEM 3411. F

BIOL 3310 Invertebrate Zoology (3)

A survey of the morphology, physiology, phylogeny and natural history of major invertebrate phyla. Prerequisites: BIOL 1306-1106, BIOL 1307-1107. Corequisite: BIOL 3111. Offered alternate years. F

BIOL 3111 Invertebrate Zoology Laboratory (1)

Laboratory studies of the morphology and physiology of representative invertebrates. Corequisites: BIOL 3310. Offered alternate years. F

BIOL 3312 Vertebrate Zoology (3)

A survey of the vertebrates, including classification, life history, ecology, evolution, morphology, and physiology. Prerequisites: BIOL 1306-1106, BIOL 1307-1107. S

BIOL 3113 Vertebrate Zoology Laboratory (1)

Laboratory and field studies of vertebrates including identification, classification, life history, and morphology. Corequisites: BIOL 3312. S

BIOL 3324 Cell Biology (3)

Structure and function of prokaryote and eukaryote cells. Topics include cell anatomy, physiology, energetics and transport. Prerequisites: BIOL 1306-1106, 1307-1107; CHEM 1311-1111, 1312-1112; MATH 2412. Corequisite: BIOL 3125. S

BIOL 3125 Cell Biology Laboratory (1)

Laboratory investigation of cellular structure and function. Corequisites: BIOL 3324. S

BIOL 3230 Botany (2)

Structure, development, taxonomy and physiology of the major plant groups. Prerequisite: BIOL 1306-1106, 1307-1107. Corequisite: BIOL 3231. S

BIOL 3231 Botany Laboratory (2)

Morphology and taxonomy of the major plant groups. Corequisite: BIOL 3230. S

BIOL 3350 Human Anatomy (3)

The development, structures and function of major human anatomical systems. Primarily for kinesiology majors and Biology majors seeking teacher certification. Prerequisite: BIOL 1306-1106, 1307-1107. Corequisite: BIOL 3151. F

BIOL 3151 Human Anatomy Laboratory (1)

Anatomy of tissues and organ systems of the human and cat. Corequisite: BIOL 3350. F

BIOL 3352 Human Physiology (3)

The physiology of human cells, tissues and systems. Primarily for kinesiology majors and Biology majors seeking teacher certification. Prerequisites: BIOL 1306-1106, 1307-1107; CHEM 1311-1111, CHEM 1312-1112 recommended. Corequisite: 3153. S

BIOL 3153 Human Physiology Laboratory (1)

Physiological studies illustrating properties and functions of human cells, tissues and systems. Co requisites: BIOL 3352. S

BIOL 3372 Principles of Ecology (3)

An introduction to behavioral, population, community and ecosystems ecology including the impact of humans on ecosystem function. For non-majors and Biology majors seeking teaching certification.

Prerequisites: BIOL 1306-1106; BIOL 1307-1107. S

BIOL 3389 Multicourse Listing (3)

Undergraduate course which will be offered infrequently or which is being developed before the regular course is listed in the catalog.

BIOL 4272 Field Biology (2)

An introduction to ecological methodology. Prerequisites or corequisites: BIOL 4372 or BIOL 3372. S

BIOL 4301 Virology (3)

Structure, composition, replication and host interactions of animal, plant and bacterial viruses. Prerequisite: BIOL 3300-3101 or 4320 and 4340; CHEM 3411-3113. Offered alternate years.

BIOL 4320 Cell Biochemistry (3)

A survey of the biochemical basis of life processes, structure and function of cell components and biologically important molecules, enzyme kinetics, bioenergetics, respiration and reductive biosynthesis. Prerequisite: BIOL 1306-1106, BIOL 1307-1107; CHEM 3411-3113; MATH 2413, BIOL 3300-3101 or BIOL 3324-3125 recommended. F

BIOL 4323 Immunology (3)

Structure and function of the mammalian immune system. Prerequisite: BIOL 3300-3101, BIOL 4320 and BIOL 4340. Offered alternate years.

BIOL 4340 Genetics (3)

Structures and functions of hereditary material, emphasizing recent developments. BIOL 1306-1106, BIOL 1307-1107.

Corequisite: BIOL 4141 for Biology majors on Preprofessional Plan. F S

BIOL 4141 Genetics Laboratory (1)

Laboratory experiences in manipulation of genetic systems and interpretation of data. Required for Biology majors on Preprofessional Plan. Corequisite: BIOL 4340. F S

BIOL 4342 Evolution (3)

Population variation and mechanisms of evolution and speciation. Students will spend three hours per week in lecture and one hour per week in a small group recitation. Prerequisite: BIOL 4340 passed with a grade of C or better. F S

BIOL 4352 Animal Physiology (3)

Development, function and mechanism of action of the major physiological systems in animals. Prerequisite: BIOL 4320.

Corequisite: BIOL 4153. S

BIOL 4153 Animal Physiology Lab (1)

Experiments and demonstrations of physiological phenomena. Corequisite: BIOL 4352. S

BIOL 4354 Animal Behavior (3)

Overview of the ecological, evolutionary and genetic aspects of animal behavior. Prerequisites: BIOL 1306-1106, 1307-1107; BIOL 4340 Offered in alternate years. F

BIOL 4372 Ecology (3)

Overview of the principles of behavioral, population, community and ecosystem ecology. Prerequisites: BIOL 1306-1106, BIOL 1307-1107; MATH 2413. Offered alternate years. F

BIOL 4395 Bioresearch (3)

Individual undergraduate research directed by a faculty member of Biology. Recommended prerequisites: BIOL 4320, 4340 and/or 4352. Consent of directing faculty is required. FS

† Course fulfills general education requirements.

2007-2009 DEGREE PLAN: BS IN BIOLOGY

Pre-Professional Plan

		SCH	Upper Level	<u>Semester</u>	<u>Grade</u>
GENERAL EDUCATION CORE					
Composition I	ENGL 1301	3		_____	_____
Composition II	ENGL 1302	3		_____	_____
US History I	HIST 1301	3		_____	_____
US History II	HIST 1302	3		_____	_____
Govt., Amer. & State I	PLSC 2305	3		_____	_____
Govt., Amer. & State II	PLSC 2306	3		_____	_____
Literature (2000 level)	ENGL 23__	3		_____	_____
Social or Behavioral Science	_____	3		_____	_____
Communication	COMM 1315	3		_____	_____
Visual or Performing Arts	_____	3		_____	_____
MAJOR: BIOLOGY, ≥ 36 hrs. total, ≥ 28 hrs. upper level					
General Biology I	BIOL 1306/1106	4		_____	_____
General Biology II	BIOL 1307/1107	4		_____	_____
Micro- or Cell Biology	BIOL 3300/1 or 3324/5	4	4	_____	_____
Invert Zoo or Vert Zoology	BIOL 3310/1 or 3312/3	4	4	_____	_____
Biochemistry	BIOL 4320	3	3	_____	_____
Genetics	BIOL 4340/4141	4	4	_____	_____
Evolution w/recitation	BIOL 4342	3	3	_____	_____
Animal Physiology	BIOL 4352/4153	4	4	_____	_____
BIOL electives:	_____, _____	≥ 6	≥ 6	_____	_____
SUPPORT REQUIREMENTS FOR BIOLOGY MAJOR					
Calculus I	MATH 2413	4		_____	_____
Calculus II	MATH 2414	4		_____	_____
General Chemistry I	CHEM 1311/1111	4		_____	_____
General Chemistry II	CHEM 1312/1112	4		_____	_____
Organic Chemistry I	CHEM 3411/3113	5	5	_____	_____
Organic Chemistry II	CHEM 3412/3114	5	5	_____	_____
Physics I	PHYS 2325/2125	4		_____	_____
Physics II	PHYS 2326/2126	4		_____	_____
SCIENCE & MATHEMATICS DEPARTMENTAL REQUIREMENTS					
Computer Programming	COSC 1335	3		_____	_____
Literature (Upper Level)	ENGL 33__	3	3	_____	_____
Capstone: NTSC 4301 or u.l. elective		3	3	_____	_____
Capstone: Hist. & Phil. Sci.	NTSC 4311	3	3	_____	_____
MINOR: _____, ≥ 18 hrs. total, ≥ 12 hrs. upper level					
(refer to Discipline specifications)					
Lower Level:	_____, _____	≥ 6			
Upper Level:	_____, _____	≥ 12	≥ 12		
	_____, _____				
TOTAL HOURS		≥ 120	≥ 54		

2007-2009 DEGREE PLAN: BS IN BIOLOGY

General Studies Plan

		SCH	Upper Level	Semester	Grade
GENERAL EDUCATION CORE					
Composition I	ENGL 1301	3		_____	_____
Composition II	ENGL 1302	3		_____	_____
US History I	HIST 1301	3		_____	_____
US History II	HIST 1302	3		_____	_____
Govt., Amer. & State I	PLSC 2305	3		_____	_____
Govt., Amer. & State II	PLSC 2306	3		_____	_____
Literature (2000 level)	ENGL 23__	3		_____	_____
Social or Behavioral Science	_____	3		_____	_____
Communication	COMM 1315	3		_____	_____
Visual or Performing Arts	_____	3		_____	_____
SUPPORT REQUIREMENTS FOR BIOLOGY MAJOR					
Calculus I	MATH 2413	4		_____	_____
Calculus II	MATH 2414	4		_____	_____
General Chemistry I	CHEM 1311/1111	4		_____	_____
General Chemistry II	CHEM 1312/1112	4		_____	_____
Organic Chemistry I	CHEM 3411/3113	5	5	_____	_____
Organic Chemistry II	CHEM 3412/3114	5	5	_____	_____
Physics I	PHYS 2325/2125 or 1301/1101	4		_____	_____
Physics II	PHYS 2326/2126 or 1302/1102	4		_____	_____
SCIENCE & MATHEMATICS DEPARTMENTAL REQUIREMENTS					
Computer Programming	COSC 1335	3		_____	_____
Literature (Upper Level)	ENGL 33__	3	3	_____	_____
Capstone: NTSC 4301 or u.l. elective		3	3	_____	_____
Capstone: Hist. & Phil. Sci.	NTSC 4311	3	3	_____	_____
MAJOR: BIOLOGY, ≥ 36 hrs. total, ≥ 24 hrs. upper level					
General Biology I	BIOL 1306/1106	4		_____	_____
General Biology II	BIOL 1307/1107	4		_____	_____
Micro- or Cell Biology	BIOL 3300/1 or 3324/5	4	4	_____	_____
Human Anatomy	BIOL 3350/1	4	4	_____	_____
Human or Animal Physiology	BIOL 3352/1 or 4352/4153	4	4	_____	_____
Organisms survey course	BIOL 3310/1 or 3312/3113 or 3230/3231	4	4	_____	_____
Genetics	BIOL 4340	3	3	_____	_____
Evolution with recitation	BIOL 4342	3	3	_____	_____
BIOL electives:	_____, _____	≥2	≥2	_____	_____
MINOR: _____, ≥ 18 hrs. total, ≥ 12 hrs. upper level					
(refer to Discipline specifications)					
Lower Level:	_____, _____		≥6		
Upper Level:	_____, _____		≥12	≥12	
	_____, _____				
TOTAL HOURS		≥120	≥54		

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EC-Grade 4 Generalist Certification

		SCH	Upper Level	Semester	Grade
GENERAL EDUCATION CORE					
Composition I	ENGL 1301	3		_____	_____
Composition II	ENGL 1302	3		_____	_____
US History I	HIST 1301	3		_____	_____
US History II	HIST 1302	3		_____	_____
Govt., Amer. & State I	PLSC 2305	3		_____	_____
Govt., Amer. & State II	PLSC 2306	3		_____	_____
Literature (2000 level)	ENGL 23__	3		_____	_____
Social or Behavioral Science	_____	3		_____	_____
Communication	COMM 1315	3		_____	_____
Visual or Performing Arts	_____	3		_____	_____

MAJOR: BIOLOGY, EC-4 Generalist Certification, > 26 hrs. total, ≥ 18 hrs. upper level

General Biology I	BIOL 1306/1106	4		_____	_____
General Biology II	BIOL 1307/1107	4		_____	_____
Genetics	BIOL 4340	3	3	_____	_____
Evolution w/recitation	BIOL 4342	3	3	_____	_____
Principles of Ecology	BIOL 3372	3	3	_____	_____

CHOOSE AMONG THE FOLLOWING AS ELECTIVES TO COMPLETE THE MAJOR:

Invertebrate Zoology	BIOL 3310/3111	4	4	_____	_____
Vertebrate Zoology	BIOL 3312/3113	4	4	_____	_____
Botany	BIOL 3230/3231	4	4	_____	_____
Human Anatomy	BIOL 3350/3151	4	4	_____	_____
Human Physiology	BIOL 3352/3153	4	4	_____	_____
Animal Behavior	BIOL 4354	3	3	_____	_____

SUPPORT COURSES FOR BIOLOGY MAJOR, EC-4 Generalist Certification

College Algebra	MATH 1314	3		_____	_____
Elementary Math I	MATH 1350	3		_____	_____
Elementary Math II	MATH 2350	3		_____	_____
General Chemistry I	CHEM 1311/1111	4		_____	_____
General Chemistry II	CHEM 1312/1112	4		_____	_____

SCIENCE & MATHEMATICS DEPARTMENTAL REQUIREMENTS

Computer Programming	COSC 1335	3		_____	_____
Natural Science Capstone	NTSC 4301 or 4311	3	3	_____	_____

MINOR: _____, ≥ 18 hrs. total, ≥ 12 hrs. upper level

(refer to Discipline specifications)

Lower Level: _____, _____

≥6

Upper Level: _____, _____

≥12

≥12

EDUCATION COURSES, Early Childhood – Grade 4 Generalist

Note: Consult certification advisor for further information

Education Core (12 sch)

Child Psychology	PSYC 3341	3	3	_____	_____
The Exceptional Child	EDUC 3352	3	3	_____	_____
Bilingual/Multicultural Ed	EDUC 3362	3	3	_____	_____
Foundations of Education	EDUC 4313	3	3	_____	_____
Language Develop Young Children	EDUC 4314	3	3	_____	_____
Second Language Acquisition Prin	EDUC 4317	3	3	_____	_____
ECE Practices	EDUC 4312	3	3	_____	_____
Reading/Literacy: EC- 4	EDUC 4324	3	3	_____	_____

Content Area Methods (6 sch)

Math/Science: EC-4	EDUC 4372	3	3	_____	_____
Lang Arts/Soc St: EC-4	EDUC 4373	3	3	_____	_____

Student Teaching (6 sch)

Seminar: Student Teaching	EDUC 4099	0	0	_____	_____
Student Teach: EC-4	EDUC 4680	6	6	_____	_____

TOTAL HOURS	≥120	≥54		
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2007-2009 DEGREE PLAN: BS IN BIOLOGY

Certification Grade 4-8 Generalist

		SCH	Upper Level	<u>Semester</u>	<u>Grade</u>
GENERAL EDUCATION CORE					
Composition I	ENGL 1301	3		_____	_____
Composition II	ENGL 1302	3		_____	_____
US History I	HIST 1301	3		_____	_____
US History II	HIST 1302	3		_____	_____
Govt., Amer. & State I	PLSC 2305	3		_____	_____
Govt., Amer. & State II	PLSC 2306	3		_____	_____
Literature (2000 level)	ENGL 23__	3		_____	_____
Social or Behavioral Science	_____	3		_____	_____
Communication	COMM 1315	3		_____	_____
Visual or Performing Arts	_____	3		_____	_____
MAJOR: BIOLOGY, 4-8 Generalist Certification, > 26 hrs. total, ≥ 18 hrs. upper level					
General Biology I	BIOL 1306/1106	4		_____	_____
General Biology II	BIOL 1307/1107	4		_____	_____
Genetics	BIOL 4340	3	3	_____	_____
Evolution w/recitation	BIOL 4342	3	3	_____	_____
Principles of Ecology	BIOL 3372	3	3	_____	_____
CHOOSE AMONG THE FOLLOWING AS ELECTIVES TO COMPLETE THE MAJOR:					
Invertebrate Zoology	BIOL 3310/3111	4	4	_____	_____
Vertebrate Zoology	BIOL 3312/3113	4	4	_____	_____
Botany	BIOL 3230/3231	4	4	_____	_____
Human Anatomy	BIOL 3350/3151	4	4	_____	_____
Human Physiology	BIOL 3352/3153	4	4	_____	_____
Animal Behavior	BIOL 4354	3	3	_____	_____
SUPPORT COURSES FOR BIOLOGY MAJOR, 4-8 Generalist Certification					
College Algebra	MATH 1314	3		_____	_____
Elementary Math I	MATH 1350	3		_____	_____
Elementary Math II	MATH 2350	3		_____	_____
Precalculus	MATH 2312	4		_____	_____
General Chemistry I	CHEM 1311/1111	4		_____	_____
General Chemistry II	CHEM 1312/1112	4		_____	_____
SCIENCE & MATHEMATICS DEPARTMENTAL REQUIREMENTS					
Computer Programming	COSC 1335	3		_____	_____
Natural Science Capstone	NTSC 4301 or 4311	3	3	_____	_____
MINOR: _____, ≥ 18 hrs. total, ≥ 12 hrs. upper level					
(refer to Discipline specifications)					
Lower Level:	_____, _____		≥6		
Upper Level:	_____, _____		≥12	≥12	
	_____, _____				

EDUCATION COURSES, Grade 4-8 Generalist

Note: Consult certification advisor for further information

Education Core (12 sch)

Child Psychology	PSYC 3341	3	3	_____	_____
The Exceptional Child	EDUC 3352	3	3	_____	_____
Bilingual/Multicultural Ed	EDUC 3362	3	3	_____	_____
Foundations of Education	EDUC 3370	3	3	_____	_____

Literacy and Pedagogy (12 sch)

Dev Reading Strategies Class Lit	EDUC 3322	3	3	_____	_____
Classroom Instruct/Mgmt	EDUC 4321	3	3	_____	_____
Reading/Literacy	EDUC 4325	3	3	_____	_____
Reading/Literacy EC-Grade or Reading/Lit Content Area	EDUC 4324 or 4326	3	3	_____	_____

Content Area Methods (6 sch)

Math/Science: 4-8	EDUC 4374	3	3	_____	_____
Lang Arts/Soc St: 4-8	EDUC 4375	3	3	_____	_____

Student Teaching (6 sch)

Seminar: Student Teaching	EDUC 4099	0	0	_____	_____
Student Teach: 4-8	EDUC 4682	6	6	_____	_____

TOTAL HOURS	≥120	≥54		
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2007-2009 DEGREE PLAN: BS IN BIOLOGY

Certification Grade 8-12 Specialist

		SCH	Upper Level	Semester	Grade
GENERAL EDUCATION CORE					
Composition I	ENGL 1301	3		_____	_____
Composition II	ENGL 1302	3		_____	_____
US History I	HIST 1301	3		_____	_____
US History II	HIST 1302	3		_____	_____
Govt., Amer. & State I	PLSC 2305	3		_____	_____
Govt., Amer. & State II	PLSC 2306	3		_____	_____
Literature (2000 level)	ENGL 23__	3		_____	_____
Social or Behavioral Science	_____	3		_____	_____
Communication	COMM 1315	3		_____	_____
Visual or Performing Arts	_____	3		_____	_____

MAJOR: BIOLOGY, Certification Grade 8-12, ≥ 30 hrs. total, ≥ 22 hrs. upper level

General Biology I	BIOL 1306/1106	4		_____	_____
General Biology II	BIOL 1307/1107	4		_____	_____
Micro- or Cell Biology	BIOL 3300/1 or 3324/5	4	4	_____	_____
Genetics	BIOL 4340	3	3	_____	_____
Evolution w/recitation	BIOL 4342	3	3	_____	_____
Principles of Ecology	BIOL 3372	3	3	_____	_____

CHOOSE AMONG THE FOLLOWING AS ELECTIVES TO COMPLETE THE MAJOR:

Invertebrate Zoology	BIOL 3310/3111	4	4	_____	_____
Vertebrate Zoology	BIOL 3312/3113	4	4	_____	_____
Botany	BIOL 3230/3231	4	4	_____	_____
Human Anatomy	BIOL 3350/3151	4	4	_____	_____
Human Physiology	BIOL 3352/3153	4	4	_____	_____
Animal Behavior	BIOL 4354	3	3	_____	_____

SUPPORT REQUIREMENTS FOR BIOLOGY, Certification Grade 8-12 Specialist

Computer Programming	COSC 1335	3		_____	_____
Mathematics					
If minor or 2nd teach field in Science & Math:					
Calculus I	MATH 2413	4		_____	_____
Calculus II	MATH 2414	4		_____	_____
If minor or 2nd teach field not in Science & Math:					
College Algebra	MATH 1314	3		_____	_____
Introductory Statistics or Precalculus	PSYC 3301 or MATH 2412	3-4	3	_____	_____
General Chemistry I	CHEM 1311/1111	4		_____	_____
General Chemistry II	CHEM 1312/1112	4		_____	_____
Organic Chemistry I	CHEM 3411/3113	5	5	_____	_____
Natural Science Capstone	NTSC 4301 or 4311	3	3	_____	_____

MINOR: _____, ≥ 18 hrs. total, ≥ 12 hrs. upper level

(refer to Discipline specifications)

Lower Level: _____, _____ ≥6
Upper Level: _____, _____ ≥12 ≥12
 _____, _____