BIOLOGY

Dr. Troy Bray, Chair; Ms. Benjamin, Ms. Crane, Dr. Engman, Dr. Finley, Dr. Fuller, Ms. Hernandez-Smith, Mr. Leible, Dr. Serviss, Ms. Smith, Dr. Tumlison

The Department of Biology offers courses designated to meet the needs of students preparing for professional careers in industry, government, and education; and to provide a strong foundation for students preparing for graduate work. Courses that develop an understanding and appreciation of the living world as a part of a liberal education are provided for all students. Appropriate courses are also offered to meet requirements for pre-professional work in pre-medical, pre-dental, pre-pharmacy, pre-physical therapy, pre-veterinary, and other paramedical areas.

The ETS Major Field Test for Biology must be taken by graduating seniors with the score to appear on the student transcript.

Major Requirements for the Bachelor of Science Degree

Highly Recommended Courses:

BIO	**1013**	**Introduction to Biology**
CHM	**1034**	**General Chemistry for Non-Majors**
CHM	**1044**	**General Organic and Biochemistry**

Required Courses:

BIO	2104	General Botany
BIO	2114	General Zoology
BIO	3054	Genetics
BIO	3094	Microbiology
BIO	3524	General Ecology
BIO	4214	Cell Biology

Choose one of the following:

BIO	3304	Plant Physiology
BIO	3314	Animal Physiology

Choose one of the following:

BIO	3084	Comparative Anatomy and Evolution of Vertebrates
BIO	3244	Comparative Morphology and Evolution of Plants

A minimum of two additional upper-level courses in biology must be selected. These may be from the courses listed above or others listed in the Henderson catalog. Two semesters of Human Anatomy and Physiology will satisfy one of these requirements. BIO 4251, BIO 4373, and BIO 4823 may <u>not</u> be used for this requirement.

Total hours required for a major in biology:.....38-40

Additional requirements:

CHM	1014, 1024	University Chemistry
CHM	3063, 3073	Organic Chemistry I and II
CHM	3051, 3131	Organic Chemistry I and II Lab
MTH	1243, 1253	College Algebra and Plane Trigonometry, or equivalent/more advanced courses, with approval.
PHY	2034, 2044	General Physics I and II

Students must have a "C" grade or better in all courses in the major field and also in the courses listed as "additional requirements."

The biology department highly recommends that students achieve competence in the use of computers for word

processing, graph and spreadsheet construction, and PowerPoint presentations before enrolling in upper-level courses. Students should consider enrolling in Introduction to Computers (CSC 2003) if their background in computer use is weak.

Transfer Credits:

Transfer students must successfully complete three upper-level biology courses at Henderson before biology courses taken elsewhere will be considered for transfer to their degree program here. A science course taken elsewhere as freshman/sophomore class but offered at Henderson as junior/senior class may be applied to the degree, upon substitution of a junior/senior class agreed upon by the department and the student. Students already enrolled in the program should consult with the department prior to enrolling in science courses at other institutions.

Registration Policy:

Priority registration for major's courses will be reserved for students enrolling in those courses for the first time.Biology majors wishing to repeat a course in biology must wait until the end of priority registration to enroll in that class.This includes courses that were completed and courses in which the student withdrew or was dropped. Students with extenuating circumstances may petition the department for waiver of this requirement.

Standardized Examination:

In their final semester, students are required to take a standardized examination. The score will appear on the students final transcript.

Articulation agreement with Logan College of Chiropractic (3+3 Program)

Henderson State University and Logan College of Chiropractic (LCC) have established an articulation agreement that provides qualified students with the opportunity to earn a B.S. in Biology and a Doctorate of Chiropractic in six years, one year less than the normal time. Students will matriculate at HSU for a minimum of 96 semester hours, during which they will fulfill the Liberal Arts Core, 7 specified biology courses, and an additional 27 hours in specified chemistry, physics and math courses. No more than 20 credits of required courses, and *none* of the science credits may be earned via examination or transfer from another school. Logan has agreed to admit as first year doctorate of chiropractic students all Henderson students who complete this program with a cumulative GPA of 3.25 or higher. Students with a cumulative GPA of at least 2.5 but less than 3.25 will receive appropriate consideration in the admission process, but will not receive the assurance of admission. Upon completion of the first year of studies at LCC, credits may be transferred toward the completion of the B.S. in Biology degree at HSU. Students interested in this program are encouraged to consult with the chair of the biology department for a complete set of provisions.

Requirements for a Minor in Biology

Required Courses:

BIO	2104	General Botany
BIO	2114	General Zoology

In addition to the two courses above, students choose any three of the following courses to complete a minor in biology:

BIO	3054	Genetics
BIO	3544, 3554	Human Anatomy and Physiology I and II (Together count as <u>one</u> class)
BIO	3084	Comparative Anatomy and Evolution of Vertebrates
BIO	3244	Comparative Morphology and Evolution of Plants
BIO	3094	Microbiology
BIO	3524	General Ecology
BIO	4214	Cell Biology
		Total hours required for a minor in Biology 20

Courses in Biology

BIO 1013 (BIOL1004). Introduction to Biology. A general education course.A study of basic biological concepts and principles. Offered as separate non-majors and majors sections. The department recommends that non-science majors avoid taking this class during their freshman year.

BIO 1021 (BIOL1004). Introduction to Biology Laboratory. Experiments are performed to demonstrate the principles

covered in BIO 1013. Two hours per week. Prerequisite or corequisite: BIO 1013.

BIO 2104. (BIOL1034) General Botany. The study of biological principles and concepts applied to plants. Three hours of lecture and three hours of laboratory per week.

BIO 2114 (BIOL1054). General Zoology. The study of animal relationships, with emphasis on principles, anatomy and ecology. Three (3) hours lecture and three (3) hours laboratory per week.

BIO 2174.Human Anatomy and Physiology I, (non-majors). A study of the structures and functions of human body systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.

BIO 2184.Human Anatomy and Physiology II, (non-majors). A continuation of BIO 2174. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.2174 recommended.

BIO 2283. Environmental Science. A study of how ecosystems function in terms of nutrient cycles, energy flow, and population dynamics, with considerations of imbalances in various areas of human concern such as agriculture, resource utilization, waste disposal, energy sources, and the human population.

BIO 2324/3324. Tropical Marine Biology. Tropical Marine Biology. A field course emphasizing study of tropical marine animals and plants, with extensive study of the diverse organisms of reefs, mangroves, rocky shores and seagrass beds. Includes a field component in Belize. Prerequisites: Ability to swim and consent of instructor.

BIO 3054. (WI) Genetics. A study of transmission genetics followed by molecular genetics. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisite: BIO 2104 or 2114.

BIO 3084. Comparative Anatomy and Evolution of Vertebrates. Traces the evolutionary history of vertebrate animals through a comparative analysis of chordate anatomy with emphasis on the ten organ systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114.

BIO 3094. (WI) Microbiology. A comprehensive study of microorganisms with emphasis on conceptual and applied microbiology. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisites: 4 hours of biology and 4 hours of chemistry. Biology majors must complete either BIO 2104 or 2114 prior to enrolling in this course.

BIO 3244. (WI) Comparative Morphology and Evolution of Plants. Traces the evolutionary history of the plant kingdom through a comparative study of the structure and life cycles of representatives of the major groups of plants. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisite: BIO 2104.

BIO 3294. Plant Taxonomy. A study of basic principles and concepts of plant identification, classification and nomenclature. Laboratory and field emphasis on the description and identification of representatives of major families of vascular plants. Prerequisite: BIO 2104.

BIO 3304. (WI) Plant Physiology. A study of plant processes including photosynthesis, carbohydrate metabolism, translocation, mineral nutrition, plant growth hormones, water relationships, and growth and development. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: BIO 2104; CHM 1014 and 1024.

BIO 3314. Animal Physiology. A study of the functions of animal systems with emphasis on the human. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: BIO 2114 and BIO 3544 or BIO 3084; CHM 1014, 1024.

BIO 3403. (WI) Herpetology. A comprehensive study of reptiles and amphibians with emphasis on specimens collected and studied in the field. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 3493. Biogeography. An in-depth study and evaluation of the factors affecting the geographic distribution of life on earth. Primary emphasis will be placed on climatic, geologic, and human influence. Dispersal mechanisms, speciation, biodiversity, and evolutionary history will also be investigated. Prerequisite: BIO 2104 and BIO 2114.

BIO 3524. (WI) General Ecology. A study of principles of ecosytem structure and dynamics including energy flow, biogeochemical cycling, community composition and succession, and the distribution and abundance of populations. Includes laboratory and field experiences with ecological problems. Two Saturday field trips required. Prerequisites: BIO

2104 and 2114.

BIO 3544.Human Anatomy and Physiology I (Majors). A study of the structures and functions of human body systems. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.

BIO 3554.Human Anatomy and Physiology II (Majors). A continuation of BIO 3544. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisite: BIO 2114 or BIO 1013 and BIO 1021.3544 recommended.

BIO 4044. (WI) Neotropical Ecology. This course introduces students to the history, ecology, and evolution of ecosystems of the New World tropics, with emphasis on the Isthmus of Panama.Includes a strenuous and challenging three-weekcomponent in Panama, with fieldwork in the Caribbean Sea, the Pacific Ocean, rainforest sites near the Panama Canal and a cloud forest site in the Darien Province.Prerequisites:BIO 2104 and BIO 2114, ability to swim, ride horses, and consent of the instructor.This course satisfies the liberal arts core physical education activity requirement and the non-western culture requirement.

BIO 4073. Dendrology. A study of woody plants of the local flora with emphasis on field identification, classification, and economic importance. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisite: BIO 2104.

BIO 4163. (WI) Entomology. A study of morphology, taxonomy, and metamorphosis of insects and related arthropods. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4194. Animal Histology. The study of the microscopic anatomy and function of animal tissues with emphasis on the human. Three (3) hours lecture and (3) three hours laboratory per week. Prerequisites: BIO 2114, CHM 1014, 1024, and either BIO 3544, 3084, or 3314.

BIO 4203. (WI) Aquatic Ecology. A study of the structure and function of freshwater ecosystems, with emphasis on the dynamics of their physical, chemical and biological components. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisites: BIO 2114, CHM 1014 and 1024.

BIO 4214. (WI) Cell Biology. The molecular biology of the cell with emphasis on structure-function relationships. Three (3) hours lecture and three (3) hours laboratory per week. Prerequisites: eight hours of biology and CHM 1014, 1024, or consent of the instructor.

BIO 4223. (WI) Ichthyology. A comprehensive study of freshwater fishes and their food with emphasis on taxonomy, ecology and management. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4251. Biological Laboratory Techniques. For majors only. Experience is given in planning and assisting in laboratory courses. Prerequisite: Consent of department. May be repeated once.

BIO 4331-3. Independent Study. Study under the direct supervision of a faculty member. May be repeated. Requires chair's approval.

BIO 4343. Phycology. A study of the taxonomy, morphology, ecology, and economic importance of freshwater algae. Two (2) hours lecture and two (2) hours laboratory or field per week. Prerequisite: BIO 2104.

BIO 4353. (WI) Mammalogy. A study of the classification, ecology, natural history, economic importance, techniques and methods of collection, identification, and preservation of mammals. Two (2) hours lecture and two (2) hours field or laboratory per week. Prerequisite: BIO 2114.

BIO 4371-3. Independent Research. Study of a contemporary biological problem under the direct supervision of a faculty member. A written scientific paper is required. Prerequisites: Twenty hours of biology and consent of the instructor. May not substitute for any core requirement. May be repeated once.

BIO 4503.Behavioral Ecology.A study of how interactions with other organisms and the environment drive the evolution of adaptive behaviors.Behaviors that are manifest in the biology of animals such as life history, reproduction, resource acquisition, sociality, and survival will be examined. Prerequisite:BIO 3524.

BIO 4563. Biology of Cancer. A study of current concepts and characteristics of cancer, including cancer research and cancer treatment. This course will explore the cellular and molecular mechanisms underlying cancer development with

the aim of understanding how changes in the normal growth and division processes lead to the formation of tumors. Topics include the natural history of cancer, oncogenes, tumor suppressors, cancer-causing viruses, epidemiology, health care policy and current therapeutic approaches to cancer treatment and prevention. Prerequisite: BIO3054.

Two-year plan for the rotation of offerings of classes in the biology department. Note: Core courses should be offered exactly per this schedule, except when faculty are on sabbatical , but need may determine the offering schedule of some elective courses.

EVEN YEARS

Fall

Core

BIO1013 Introduction to Biology
BIO2114 General Zoology
BIO2104 General Botany
BIO3094 Microbiology
BIO3084 Comparative Anatomy & Evolution of Vertebrates
BIO3314 Animal Physiology
BIO4214 Cell Biology

Elective

BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)
BIO4073 Dendrology
BIO4163 Entomology
BIO4353 Mammalogy
BIO4251 Biology Lab Techniques
BIO4333 Directed Study
BIO4373 Independent Research

Spring

Core

BIO1013 Introduction to Biology
BIO2114 General Zoology
BIO2104 General Botany
BIO3054 Genetics
BIO3094 Microbiology
BIO3244 Comparative Morphology and Evolution of Plants
BIO3524 General Ecology

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3554 Human Anatomy and Physiology II (Majors)
BIO3403 Herpetology
BIO3493 Biogeography
BIO4503 Behavioral Ecology
BIO4251 Biology Lab Techniques
BIO4331 Independent Study
BIO4373 Independent Research

Summer 1 (Odd)

Core

BIO1013 Introduction to Biology
BIO2104 General Botany
BIO3094 Microbiology

Elective

BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)
BIO4251 Biology Lab Techniques

Summer 2 (Odd)

Core

BIO1013 Introduction to Biology
BIO3054 Genetics

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3554 Human Anatomy and Physiology II (Majors)
BIO4044 Neotropical Ecology
BIO4331 Independent Study
BIO4373 Independent Research
BIO5324 Tropical Marine Biology (depending on need)

D YEARS

Fall

Core

BIO1013 Introduction to Biology
BIO2114 General Zoology
BIO2104 General Botany
BIO3094 Microbiology
BIO3084 Comparative Anatomy & Evolution of Vertebrates
BIO3304 Plant Physiology
BIO3314 Animal Physiology
BIO4214 Cell Biology

Elective

BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)
BIO4133 Animal Histology
BIO4203 Aquatic Ecology
BIO4343 Phycology
BIO4251 Biology Lab Techniques
BIO4331 Independent Study
BIO4373 Independent Research

Spring

Core

BIO1013 Introduction to Biology
BIO2114 General Zoology
BIO2104 General Botany
BIO3054 Genetics
BIO3094 Microbiology
BIO3524 General Ecology

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3554 Human Anatomy and Physiology II (Majors)
BIO 3294 Plant Taxonomy
BIO4223 Ichthyology
BIO4033 Ornithology
BIO4563 Biology of Cancer
BIO4251 Biology Lab Techniques
BIO4331 Independent Study
BIO4373 Independent Research

Summer 1 (Even)

Core

BIO1013 Introduction to Biology
BIO2104 General Botany
BIO3094 Microbiology

Elective

BIO4251 Biology Lab Techniques
BIO2174 Human Anatomy and Physiology I (Non-majors)
BIO3544 Human Anatomy and Physiology I (Majors)

Summer 2 (Even)

Core

BIO1013 Introduction to Biology
BIO3054 Genetics

Elective

BIO2184 Human Anatomy and Physiology II (Non-majors)
BIO3554 Human Anatomy and Physiology II (Majors)
BIO4044 Neotropical Ecology
BIO4373 Independent Research
BIO5324 Tropical Marine Biology (depending on need)