

Biology

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Taylor University has been a leader and at the forefront of Christian colleges in educating scientists in biology with strengths lying in preparation of students for graduate school, medical programs (medical & dental school and veterinary programs; physician assistant, physical therapy, public health and allied health programs) and science education. Our goal of developing biologists as leaders means that the department seeks to highly prepare its majors for the future by providing a strong foundation in biological science. The Department of Biology seeks to:

1. Provide students with a strong foundation in the essentials of biology with the opportunity to specialize in a particular field of biology. This is accomplished by:
 - Offering the breadth and quality of critically relevant course work necessary to prepare undergraduate biology majors for graduate and professional programs in the biological sciences.
 - Providing instruction by faculty with doctoral degrees.
 - Advising in specialty areas by advisors knowledgeable in those areas.
2. Thoroughly prepare students for future careers in the biological sciences by training them in the current knowledge, skills and processes of biological sciences. This is accomplished by:
 - Providing student opportunities within the biological sciences through practica and research experiences.
 - Continued faculty professional development as scholars, scientists, educators and role models by staying current in their profession and disciplines.
 - Examining the current program's approach, knowledge base, flexibility, equipment needs and integration of biology with other scientific disciplines; and implementing changes as needed.
3. Prepare Christian men and women for service to a world in need. This is accomplished by:
 - Presenting the essentials of modern, dynamic biology to students as part of the University general education curriculum.
 - Integrating faith and learning, including the continuing exploration of ethical implications in the application of modern biological science to the problems facing humankind today.

To fulfill the senior comprehensive examination requirement and be eligible for May graduation, majors are required to pass the biology subject test of the Graduate Record Exam (GRE) during the fall semester of their senior year.

Biology (BA)

The bachelor of arts degree with a major in biology requires two years of one foreign language and 51-53 hours in the major. (A minimum of 32 hours in the major must be from courses other than BIO 360, 393, 450, and 490.)

Major Requirements

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Select six hours in the summer field studies program from:

(A minimum of four hours must be from courses other than BIO 393 and 450.)

BIO 302	4	Limnology
BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 313	4	Insect Biology and Ecology
BIO 323	4	Aquatic Biology
BIO 342	4	Fish Biology and Ecology
BIO 370	1-4	Selected Topics
BIO 393	2-4	Practicum
BIO 450	1-4	Directed Research

Additional Major Requirements

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Electives

Select 15 hours from:

BIO 244	4	Human Anatomy and Physiology I
BIO 245	4	Human Anatomy and Physiology II
BIO 301	4	Taxonomy of Vascular Plants
BIO 307	4	Vertebrate Natural History
BIO 312	4	Cellular and Molecular Biology
BIO 322	3	Ornithology
BIO 331	4	Comparative Anatomy
BIO 360	1-4	Independent Study
BIO 370	1-4	Selected Topics
BIO 432	4	Developmental Biology
BIO 441	4	Environmental Physiology
BIO 450	1-4	Directed Research
BIO 452	4	Animal Physiology
BIO 462	4	Molecular Genetics
BIO 471	4	Microbiology and Immunology
BIO 472	4	Histology
BIO 490	1-2	Honors
CHE 411	3	Biochemistry I
ENS 231	4	Introduction to Environmental Science
ENS 475	4	Systems Ecology

In addition, the following courses are strongly recommended:

CHE 311/312, PHY 203/204 or PHY 211/212, and NAS 480

Biology/Systems (BS)

The bachelor of science degree with a major in biology/systems consists of the 51-53 hour bachelor of arts biology major and curriculum requirements in systems analysis. All systems curriculum courses must be completed with a grade of C- or better.

Systems Curriculum Requirements

COS 120	4	Introduction to Computer Science I
IAS 330	3	Human Relations in Organizations
MAT 151	4	Calculus I
MAT 382	3	Advanced Statistical Methods
SYS 101	3	Introduction to Systems
SYS 390	3	Information Systems Analysis
SYS 392	1	Systems Seminar
SYS 394	3	Information Systems Design
BIO 393	3-4	Practicum

Select one course from the following:

COS 121	4	Introduction to Computer Science II
COS 240	3	Business Application Programming

Select one course from the following:

MAT 210	4	Introductory Statistics
MAT 352	4	Mathematical Statistics

Select one course from the following:

*SYS 401	4	Operations Research
*SYS 402	4	Modeling and Simulation

Systems Electives

Select at least three hours of electives, in addition to those required in the major or systems.

COS 265	3	Data Structures and Algorithms
COS 382	3	Language Structures
MAT 230	4	Calculus II
MAT 240	4	Calculus III
MAT 245	4	Linear Algebra
MAT 251	4	Differential Equations
SYS 214	3	Principles of Human Computer Interaction
SYS 310	3	E-Commerce
*SYS 401	4	Operations Research
*SYS 402	4	Modeling and Simulation
SYS 403	3	Operations Management

*Courses in both areas may count only once.

Biology (BS)

The bachelor of science degree with a major in biology consists of 71 major hours.

Major Requirements

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Select one course from the following:

BIO 393	2-4	Practicum
BIO 450	2-4	Directed Research

Select one course from the following:

BIO 302	4	Limnology
BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 313	4	Insect Biology and Ecology
BIO 322	4	Ornithology
BIO 323	4	Aquatic Biology
BIO 342	4	Fish Biology and Ecology
BIO 370	4	Selected Topics in Field Biology (Pre-Approved)

Select one course from the following:

BIO 312	4	Cellular and Molecular Biology
BIO 462	4	Molecular Genetics
BIO 471	4	Microbiology and Immunology
BIO 472	4	Histology

Select one course from the following:

BIO 331	4	Comparative Anatomy
BIO 432	4	Developmental Biology
BIO 441	4	Environmental Physiology
BIO 452	4	Animal Physiology

Select one course from the following:

BIO 301	4	Taxonomy of Vascular Plants
BIO 307	4	Vertebrate Natural History
ENS 475	4	Systems Ecology

Select one additional 300-/400-level biology course or CHE 411.

Additional Major Requirements

CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Select one of the following physics course combinations:

PHY 203	4	General Physics I
PHY 204	4	General Physics II
or		
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one of the following mathematics options:

MAT 151	4	Calculus I
MAT 210	4	Introductory Statistics
MAT 230	4	Calculus II (or higher)
†MAT 145	3	Introduction to Functions and Calculus
and		
†MAT 146	3	Functions and Calculus
†MAT 145 and MAT 146 combination meets requirement		

A minimum of 33 hours in the major must be from courses other than BIO 360, 393, 450, 490, or CHE 411.

Pre-Medicine Pre-Professional Program

Students are required to make formal application to the pre-medicine program in the spring semester of their sophomore year or after completion of 45 hours of course work. Students must have completed four of the five biology core courses, one year of chemistry, the math requirement, and have a cumulative GPA of 3.30. Each student will receive a copy of the Biology Student Handbook from his or her academic advisor.

Students interested in the pre-medicine curriculum should check out during their sophomore year the medical school admissions requirements for the school(s) to which they plan to apply. The Medical School Admission Requirements guide published annually by AAMC is the best resource for this information. It is important to meet the specific entrance requirements of the medical school(s) chosen.

Maintaining at least a 3.60 GPA and scoring well on the MCAT test (usually taken in the spring of the junior year) are common prerequisites for acceptance to a medical school. Assistance is available in preparing for the MCAT examinations.

Biology/Pre-Medicine Concentration (BA)

The bachelor of arts degree with a major in biology and a pre-professional concentration in pre-medicine requires two years, sequential study in one foreign language and 70-77 hours in the major.

Major Requirements

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
BIO 393	2-4	Practicum
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Electives

Select four elective courses from:

BIO 312	4	Cellular and Molecular Biology
BIO 331	4	Comparative Anatomy
BIO 432	4	Developmental Biology
BIO 452	4	Animal Physiology
BIO 462	4	Molecular Genetics
BIO 471	4	Microbiology and Immunology
BIO 472	4	Histology
CHE 411	3	Biochemistry I

Select an additional 3-4 hours of upper-division biology electives.

Additional Major Requirements

CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Select one of the following physics course combinations:

PHY 203	4	General Physics I
PHY 204	4	General Physics II

or

PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one of the following mathematics options:

MAT 151	4	Calculus I
MAT 210	4	Introductory Statistics
MAT 230	4	Calculus II (or higher)
†MAT 145	3	Introduction to Functions and Calculus

and

†MAT 146	3	Functions and Calculus
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†MAT 145 and MAT 146 combination meets requirement

Biology/Pre-Medicine Concentration (BS)

The bachelor of science degree with a major in biology and a pre-professional concentration in pre-medicine consists of 71-77 major hours.

Major Requirements

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Select one course from the following:

BIO 393	2-4	Practicum
BIO 450	2-4	Directed Research

Select one course from the following:

BIO 312	4	Cellular and Molecular Biology
BIO 462	4	Molecular Genetics
BIO 471	4	Microbiology and Immunology

Select one course from the following:

BIO 331	4	Comparative Anatomy
BIO 432	4	Developmental Biology

Select one course from the following:

BIO 302	4	Limnology
BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of Rocky Mountains
BIO 313	4	Insect Biology and Ecology
BIO 322	4	Ornithology
BIO 323	4	Aquatic Biology
BIO 342	4	Fish Biology and Ecology
BIO 370	4	Selected Topics in Field Biology (Pre-Approved)

Select one course from the following:

BIO 441	4	Environmental Physiology
BIO 452	4	Animal Physiology

Select one additional 3-4 credit hour 300-400-level biology course or CHE 411.

Additional Major Requirements

CHE 311	4	Organic Chemistry I
CHE 312	4	Organic Chemistry II

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II

or

CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Select one of the following physics course combinations:

PHY 203	4	General Physics I
PHY 204	4	General Physics II

or

PHY 211	4	University Physics I
PHY 212	5	University Physics II

Select one of the following mathematics options:

†MAT 145	3	Introduction to Functions and Calculus
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and

†MAT 146	3	Functions and Calculus
MAT 151	4	Calculus I
MAT 210	4	Introductory Statistics
MAT 230	4	Calculus II (or higher)

†MAT 145 and MAT 146 combination meets requirement

Biology Science Education (BS)

The bachelor of science degree in biology science education requires 89-96 hours of professional education, required science, biology core, and elective courses. *Secondary Education majors must complete specific general education requirements as outlined by the Education Department.*

Professional Education

EDU 150	3	Education in America
EDU 210	3	Writing for Teachers
EDU 260	3	Educational Psychology
EDU 309	1	Teaching in Secondary, Junior High/Middle Schools— Special Methods
EDU 310	2	Discipline and Classroom Management
*EDU 332	3	The Junior High/Middle School
EDU 415	1	Student Teaching Seminar
EDU 431	15	Supervised Internship in Secondary Schools
NAS 309	2	Science Education Methods
SED 320	3	Exceptional Children

*EDU 332 is required only for those seeking licensure in junior high/middle school.

Biology Core Courses

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Science Core Courses

Select one of the following chemistry course combinations:

CHE 201	4	General Chemistry I
CHE 202	4	General Chemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Select one course from the following:

PHY 203	4	General Physics I
PHY 211	4	University Physics I

Select one course from the following:

ENS 241	4	Physical Geology
ENS 242	4	Geology of Indiana
GEO 240	3	Introduction to Geology
PHY 204	4	General Physics II
PHY 212	5	University Physics II

Biology Electives

Select one field course from the following:

BIO 302	4	Limnology
BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 313	4	Insect Biology and Ecology
BIO 322	4	Ornithology
BIO 323	4	Aquatic Biology
BIO 342	4	Fish Biology and Ecology

Select one cell and molecular course from the following:

BIO 312	4	Cellular and Molecular Biology
BIO 432	4	Developmental Biology
BIO 462	4	Molecular Genetics
BIO 471	4	Microbiology and Immunology

Select one organismal biology course from the following:

BIO 244	4	Human Anatomy and Physiology I
BIO 245	4	Human Anatomy and Physiology II
BIO 331	4	Comparative Anatomy
BIO 441	4	Environmental Physiology
BIO 452	4	Animal Physiology

Select one ecological and population biology course from the following:

BIO 301	4	Taxonomy of Vascular Plants
BIO 307	4	Vertebrate Natural History
ENS 475	4	Systems Ecology

Select one biology experience course from the following:

BIO 393	2-4	Practicum
BIO 450	2-4	Directed Research

Select any course not taken from a previous area above or four hours from an additional 300- or 400-level biology course.

Biology Minor

A minor in biology requires 26-28 hours.

Minor Requirements

Select three courses from the following:

BIO 101	4	Principles of Cell Biology
BIO 103	3	Introductory Plant Biology
BIO 104	3	Introductory Animal Biology
BIO 203	4	Principles of Genetics
ENS 204	4	Principles of Ecology

Additional Minor Requirements

MAT 210	4	Introductory Statistics
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Select one course from the following:

CHE 201	4	General Chemistry I
CHE 211	4	College Chemistry I

Select an additional eight hours of upper-division (300-/400-level) biology courses.

AuSable Institute of Environmental Studies

Taylor University is affiliated with the AuSable Institute of Environmental Studies (AIES) in Mancelona, Michigan. Taylor students may take summer courses for credit at AIES. *Detailed information is available from the AIES representative of the Department of Biology.*

Biology Courses

- BIO 100** 4 hours
General Biology
Concepts and principles are studied to provide basic knowledge that assists students to meet the obligations of an informed citizen. The spring semester of General Biology is intended for elementary education majors as a content course that emphasizes instructional methodologies in science education. Three hours of lecture and two hours of laboratory per week. *Meets general education life science requirement; not available to biology majors.*
- BIO 101** 4 hours
Principles of Cell Biology
A majors core course: Study of generalized sub-cellular structures and metabolism emphasizing dependence of function on structure, principles of organization, and capture and utilization of energy. Three hours of lecture and two hours of laboratory per week. Meets general education life science requirement.
- BIO 103** 3 hours
Introductory Plant Biology
A majors core course: Introduction to plants taxonomy, physiology, and ecology; Archaea, algae, and fungi are introduced as well. The structure, growth, and development of the flowering plant body are emphasized. Two hours of lecture and two hours of laboratory per week. *Meets general education life science requirement.*
- BIO 104** 3 hours
Introductory Animal Biology
A majors core course: A taxonomic survey of the major phyla in the animal kingdom. Classification, characteristics, representative forms, and relations to man are considered. Invertebrates are emphasized. Two hours of lecture and three hours of laboratory per week. *Meets general education life science requirement.*
- BIO 170** 1-4 hours
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering. May count toward the departmental major and general education requirements.
- BIO 200** 4 hours
Human Nutrition
A study of human nutrition dealing with human consumption and utilization of food. An understanding of the basic roles of nutrients in the body creates an appreciation of the continuity of the life cycle with its changing nutritional needs. Three hours of lecture and two hours of laboratory per week. *Prerequisite: CHE 100 or permission of instructor. Meets general education life science requirement; not available to biology majors.*
- BIO 203** 4 hours
Principles of Genetics
A majors core course: Fundamental principles of Mendelian inheritance, introduction to molecular genetics, along with quantitative and evolutionary genetics will be examined. Three hours of lecture and two hours of laboratory per week. Does not normally satisfy general education science requirement.
- BIO 205** 4 hours
Human Biology
An introduction to the structure and function of the human body. This course focuses on the anatomy and physiology of human cells, tissues, organs, all organ systems, as well as the whole organism. Practical health applications will also be explored. *Meets general education life science requirement.*
- BIO 243** 5 hours
Human Anatomy and Physiology
A survey of the structure and function of the human organism. Biochemical composition, cellular structure, and tissue levels of organization and all the major systems are covered. Four hours of lecture and two hours of lab. *Meets general education life science requirement. Offered summer semester only.*
- BIO 244** 4 hours
Human Anatomy and Physiology I
The first of a two-course survey covering the structure and function of the human body. Biochemical composition, cellular structure, and tissue levels of organization, along with the integument, skeletal, muscular, and nervous systems are covered. Three hours of lecture and two hours of lab per week. *Meets general education life science requirement. Offered fall semester.*
- BIO 245** 4 hours
Human Anatomy and Physiology II
The second of a two-course survey covering the structure and function of the human body. The endocrine, cardiovascular, respiratory, digestive, urinary, and reproductive systems are covered. Three hours of lecture and two hours of lab per week. *Prerequisite: BIO 244. Offered spring semester.*
- BIO 270** 1-4 hours
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering. May count toward the departmental major and general education requirements.
- BIO 301** 4 hours
Taxonomy of Vascular Plants
Identification, classification, and systematics of vascular plants are studied. Topics include basic population genetics, the process of speciation, phylogeny reconstruction, and molecular patterns of diversification. Laboratory emphasis is on local flora, plant family characteristics, and modern systematic techniques. Two hours of lecture and four hours of laboratory per week. *Prerequisite: BIO 103; BIO 203 is recommended. Offered fall semester.*
- BIO 302** 4 hours
Limnology
Field Course: Field study of lakes and other freshwater systems with applications to planning and management. Includes an introduction to limnology and investigation of representative lakes, streams and wetlands of the region and compares the North American Great Lakes with other great lakes of the world and their stewardship. *Prerequisites: BIO 103, 104 and CHE 201 or 211. Offered summers at AIES.*
- BIO 304** 4 hours
Field Natural History of the Black Hills
Field Course: Introduction to basic field and lab methods used in field natural history. Includes basic nomenclature of spring flora and fauna in terrestrial as well as aquatic systems. Examines the principles of geology/paleontology, ecosystems, communities, and wildlife as exhibited in the Black Hills region of South Dakota, including Mt. Rushmore, Badlands National Park, Custer State Park, Devils Tower National Monument, the Black Hills National Forest, and Yellowstone and Grand Teton National Parks. *Prerequisites: BIO 103, 104, ENS 204, or permission of instructor. Offered summers at the Wheaton College Science Station, Black Hills South Dakota.*
- BIO 305** 4 hours
Natural History of the Rocky Mountains
Field Course: Natural History of the Rocky Mountains is a field study course of the ecology and natural history of the Rocky Mountains. Students study the varied life zones, geology, climatic, and soil interactions of the Sonoran Desert, Grand Canyon, Great Basin Desert, Great Salt Lake, Yellowstone, Grand Teton National Park, Pawnee Prairie, and Rocky Mountain National Park. Students will gain appreciation of God's creation. *Prerequisites: Completion of the biology core courses before enrolling or permission of the professor. Offered summer semester.*
- BIO 307** 4 hours
Vertebrate Natural History
This course looks at the adaptive anatomy, feeding relationships, behavior, life history, and geographical distribution of vertebrates from fishes to mammals. Labs focus on methods currently employed for study and observation of vertebrates in the field and involve several outdoor sessions. Three hours of lecture and three hours of lab per week. *Prerequisite: BIO 104 or permission of the instructor; ENS 204 is recommended. Offered spring semester.*
- BIO 312** 4 hours
Cellular and Molecular Biology
Analysis of the eukaryotic cell with regard to its physiological and biochemical characteristics, including bioenergetics, protein kinesin, cell communication, cell-division cycle, cell junctions and histology, cancer, and the adaptive immune system. Three hours lecture, one three-hour laboratory per week. *Prerequisites: BIO 101, CHE 201 or 211 and 202 or 212, and minimum junior status; or permission from the instructor.*
- BIO 313** 4 hours
Insect Biology and Ecology
Field Course: A study of insect taxonomy, ecology, life histories, and economic importance. Special attention is given to environmental stewardship issues, including use of insecticides, biological control, integrated pest management, and impact of cultivation on formation of pest faunas. Field methods are stressed. *Prerequisites: BIO 101, 104. Offered summers at AIES.*
- BIO 322** 4 hours
Ornithology
Field Course: Biology, behavior, ecology, and identification of birds. Work is primarily conducted in the field and covers the major habitats of northern lower Michigan, including wetlands, lakes, rivers, forests, dunes, and open field communities. Emphasis is placed on identification of the spring bird fauna of northern lower Michigan by sight and by call. *Prerequisites: One course in introductory biology and animal biology. Offered summers at AIES.*

BIO 323 4 hours
Aquatic Biology
Field Course: Collection, identification and ecological position of fresh-water organisms. Taxonomic skills are developed. *Prerequisites: BIO 103, 104, and ENS 204. Offered summers at AIES.*

BIO 331 4 hours
Comparative Anatomy
Classification, characteristics, and comparison of typical chordate animals with emphasis on the vertebrates. Lab contains detailed dissection of representative vertebrates. Three hours of lecture and three hours laboratory per week. *Prerequisite: BIO 104 or permission of instructor. Offered fall semester.*

BIO 342 4 hours
Fish Biology and Ecology
Field Course: Identification, ecology, exploitation and stewardship of fishes and their habitats. Field studies include noncommercial and commercial fisheries in the Great Lakes region, ecological dynamics of fisheries, exploitation and population ecology, fishing techniques, and fishing rights and regulations. *Prerequisites: BIO 101, 104, and ENS 204. Offered summers at AIES.*

BIO 360 1-4 hours
Independent Study
An individualized, directed study involving a specified topic.

BIO 370 1-4 hours
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering. May count toward the departmental major and general education requirements.

BIO 393 1-4 hours
Practicum
Supervised learning involving a first-hand field experience or a project. Generally, one hour of credit is awarded for a minimum of 40 hours of practicum experience. *Offered primarily during summer.*

BIO 410 3 hours
Bioethics
An introduction to bioethics, comprising an overview of ethical theory, uniquely Christian contributions to ethical theory, and a consideration of specific bioethical problems. The interaction of bioethics in the worlds of ideologies, politics, and economics, and the unique contribution a Christian bioethical perspective brings to the public square, will also be foci of the course. Designed for upper level biology students, but open to any upper division student willing and able to acquire the necessary biological competence to knowledgeably deal with the biology of the course material.

BIO 432 4 hours
Developmental Biology
A study of development at the molecular, cellular, and organismal levels. The lecture sessions focus on current concepts in developmental biology, and the lab is classical vertebrate embryology (frog, chick, pig). Three hours of lecture and three hours of laboratory per week. *Prerequisites: BIO 101 and 104; BIO 312 or 462 recommended. Offered fall semester.*

BIO 441 4 hours
Environmental Physiology
An introduction to the physiology of cells and tissues with emphasis on responses to environmental challenges. Topics include cell structure, protein synthesis and enzymes, water balance, transport, mineral nutrition, metabolism including photosynthesis, and responses to environmental cues stresses. Three hours of lecture and three hours of laboratory per week. *Prerequisites: BIO 103, CHE 201 and 202 or CHE 211 and 212. Offered spring semester.*

BIO 450 1-4 hours
Directed Research
Investigative learning involving closely directed research and the use of such facilities as the library or laboratory.

BIO 452 4 hours
Animal Physiology
A study of the physiological nature of living organisms with special consideration of the functions of vertebrate organ systems. Practical experience is given in working with live animals and the instrumentation used to examine the functional processes of various systems. Three hours of lecture and three hours of laboratory per week. *Prerequisites: BIO 331, CHE 201 and 202 or CHE 211 and 212. Offered spring semester.*

BIO 462 4 hours
Molecular Genetics
The current understanding of what a gene is, how it functions, and how it is regulated, particularly from a molecular perspective, is the essence of this course. Viral, prokaryotic, and eukaryotic systems are studied. Current scientific literature as well as a published textbook serve as sources. Three hours lecture and one four-hour laboratory per week. *Prerequisites: BIO 101 and 203; two courses in chemistry. BIO 471 is recommended. Offered fall semester.*

BIO 471 4 hours
Microbiology and Immunology
An introduction to general microbiology and to the human immune response. Included are microbial growth and control, diversity and taxonomy, the ecological role of microorganisms, and medical microbiology. The laboratory provides basic bacterial culture techniques, including the identification of unknowns. Three hours of lecture and three hours of laboratory per week. *Prerequisites: BIO 101, BIO 203, and two courses in chemistry are recommended. Offered spring semester.*

BIO 472 4 hours
Histology
The study of minute structure, composition, and function of tissue. Lectures and laboratories help expose students to both the normal tissue formation found in animal tissues (chiefly mammalian) and many of the abnormal tissue developments associated with pathological dysfunctions. *Prerequisites: Completion of the biology core courses before enrolling or permission of the instructor. Offered spring semester.*

BIO 480 1-4 hours
Seminar
A limited-enrollment course designed especially for upper-class majors with emphasis on directed readings and discussion.

BIO 490 1-2 hours
Honors
Individualized study or research of an advanced topic within a student's major. Open to students with at least a 3.00 GPA in the major field.

BIO 493 4 hours
Biology Senior Capstone
An integrative, senior-level course in which major themes from within the biology major and from the Taylor general education program are intentionally revisited at a depth appropriate to college seniors. Such themes include the nature of biology as a natural science, the historical and philosophical foundations of the natural sciences, and the interaction and integration of biology with the Christian faith. Students will also actively engage in the process of doing current biological science, as well as consider several ethical issues that arise from current biology. *Prerequisite: Senior standing as a biology major. Offered January interterm.*

Notes