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 and 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.
    - 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 practicums 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 foundational core 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 graduation, majors are required to pass the biology Major Field Test 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 49 hours in the major. *All major courses must be completed with a grade of C- or better and are included in the major GPA.*

Major Requirements

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
BIO 203	4	Principles of Genetics
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Select 4 hours in the summer field studies program‡ from:

BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 370	1-4	Selected Topics *(approved by advisor)*
BIO 450	1-4	Directed Research *(approved by advisor)*

‡Additional courses from Au Sable Institute or other institutions may count with departmental approval. See www.ausable.org or Dr. Regier for details.

Additional Major Requirements

Select one of the following chemistry course combinations:

CHE 201	4	General, Organic, and Biochemistry I
CHE 202	4	General, Organic, and Biochemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Electives

Select 17 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 331	4	Comparative Anatomy
BIO 345	3	Evolution and the Nature of Science
BIO 351	4	Advanced Human Anatomy
BIO 360	1-4	Independent Study
BIO 370	1-4	Selected Topics *(approved by advisor)*
BIO 393	2	Practicum
BIO 410	3	Bioethics
BIO 432	4	Developmental Biology
BIO 441	4	Environmental Physiology
BIO 450	1-4	Directed Research
BIO 451	4	Advanced Human Physiology
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 375	4	Systems Ecology
SUS 231	4	Environmental Science, Society, and Sustainability

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 49-hour Biology (BA) major and curriculum requirements in systems analysis. *All major courses, including systems curriculum courses, must be completed with a grade of C- or better and are included in the major GPA.*

Systems Curriculum Requirements

MAT 151	4	Calculus I
SYS 101	3	Introduction to Systems
SYS 120	4	Introduction to Problem Solving
SYS 330	3	Human Relations in Organizations
SYS 390	3	Information Systems Analysis
SYS 392	1	Systems Seminar
SYS 394	3	Information Systems Design
SYS 403	3	Operations Management

Select one course from the following:

COS 121	4	Foundations of Computer Science
COS 143	3	Interactive Webpage Design

Select one course from the following:

MAT 210	4	Introductory Statistics
MAT 352	4	Mathematical Statistics

Select one course from the following:

SYS 401*	3	Operations Research
SYS 402*	3	Modeling and Simulation

Select one course from the following:

BIO 393	3-4	Practicum
SYS 393	3-4	Practicum

Systems Electives

Select at least 3 hours of electives, in addition to those required in the major or systems:

ENT 422	3	New Venture Planning
MAT 382	3	Advanced Statistical Methods
MGT 201	3	Introduction to Business
SYS 214	3	Principles of Human Computer Interaction
SYS 310	3	E-Commerce
SYS 401*	3	Operations Research
SYS 402*	3	Modeling and Simulation

**Courses in both areas may count only once.*

Biology (BS)

The Bachelor of Science degree with a major in Biology consists of 69-73 major hours. *All major courses must be completed with a grade of C- or better and are included in the major GPA.*

Major Requirements

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
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 4 hours in the summer field studies program‡ from:

BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 370	4	Selected Topics *(approved by advisor)*

‡Additional courses from Au Sable Institute or other institutions may count with departmental approval. See www.ausable.org or Dr. Regier for details.

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 351	4	Advanced Human Anatomy
BIO 432	4	Developmental Biology
BIO 441	4	Environmental Physiology
BIO 451	4	Advanced Human 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 375	4	Systems Ecology

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, Organic, and Biochemistry I
CHE 202	4	General, Organic, and Biochemistry 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

Pre-Medicine Pre-Professional Program

Biology majors wishing to pursue a career as a physician, dentist, or veterinarian should select this concentration. 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 BIO 201, 202, and 203, one year of chemistry, the math requirement, and have a cumulative GPA of 3.30.

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, scoring well on the MCAT (usually taken in the spring of the junior year), and obtaining relevant experiences in the medical field are common prerequisites for acceptance into medical school. Students may earn biology elective credit from their medical experiences by taking BIO 393 Practicum; see your department advisor for details.

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 of sequential study in one foreign language and 69-73 hours in the major. *All major courses, including those in the concentration, must be completed with a grade of C- or better and are included in the major GPA.*

Major Requirements

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
BIO 203	4	Principles of Genetics
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 351	4	Advanced Human Anatomy
BIO 432	4	Developmental Biology
BIO 451	4	Advanced Human Physiology
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 6-8 credit hours of 300-/400-level biology courses 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, Organic, and Biochemistry I
CHE 202	4	General, Organic, and Biochemistry 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)*

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 69-73 major hours. *All major courses, including those in the concentration, must be completed with a grade of C- or better and are included in the major GPA.*

Major Requirements

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
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 351	4	Advanced Human Anatomy
BIO 432	4	Developmental Biology

Select 4 hours in the summer field studies program‡ from:

BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 370	4	Selected Topics *(approved by advisor)*

‡Additional courses from Au Sable Institute or other institutions may count with departmental approval. See www.ausable.org or Dr. Regier for details.

Select one course from the following:

BIO 441	4	Environmental Physiology
BIO 451	4	Advanced Human 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, Organic, and Biochemistry I
CHE 202	4	General, Organic, and Biochemistry 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)*

Biology Science Education (BS)

The Bachelor of Science degree in Biology Science Education requires 56-60 hours plus education courses. *All major courses, including education curriculum courses, must be completed with a grade of C- or better and are included in the major GPA.*

Professional Education

EDU 150	3	Education in America
EDU 222	2	Reading in the Content Area for Secondary Teachers
EDU 260	3	Educational Psychology
EDU 307	2	Discipline and Classroom Management for Secondary Teachers
EDU 309	1	Teaching in Secondary, Junior High/Middle Schools—Special Methods
EDU 328	2	Assessment for Student Learning
EDU 332	2	The Junior High/Middle School
EDU 344	1	Educational Technology in Secondary Education
EDU 384	1	Perspectives on Diversity
EDU 431	15	Supervised Internship in Secondary Schools
NAS 309	2	Science Education Methods
SED 220	3	Exceptional Children

Additional Education Requirements

CAS 110	3	Public Speaking
PSY 340	3	Adolescent Psychology

Biology Core Courses

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
BIO 203	4	Principles of Genetics
BIO 345	3	Evolution and the Nature of Science
BIO 493	4	Biology Senior Capstone
ENS 204	4	Principles of Ecology

Science Core Courses

Select <u>one</u> of the following chemistry course combinations:

CHE 201	4	General, Organic, and Biochemistry I
CHE 202	4	General, Organic, and Biochemistry II
or		
CHE 211	4	College Chemistry I
CHE 212	4	College Chemistry II

Select <u>one</u> course from the following:

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

Select <u>one</u> 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 <u>4</u> hours in the summer field studies program‡ from:

BIO 304	4	Field Natural History of the Black Hills
BIO 305	4	Natural History of the Rocky Mountains
BIO 370	4	Selected Topics *(approved by advisor)*

‡Additional courses from Au Sable Institute or other institutions may count with departmental approval. See www.ausable.org or Dr. Regier for details.

Select <u>one</u> 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 <u>one</u> 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 <u>one</u> biology experience course from the following:

BIO 370	2-4	Selected Topics (*approved by* advisor)
BIO 450	2-4	Directed Research

Select <u>one</u> additional course not taken from a previous area or an additional <u>4</u> credits from a 300/400-level biology course**

**BIO 370, 393, and 450 may not meet this requirement.*

Biology Minor

A minor in Biology requires 28 hours. *All minor courses must be completed with a grade of C- or better and are included in the minor GPA.*

Minor Requirements

Select <u>three</u> courses from the following:

BIO 201	4	Biology I: Foundations of Cell Biology and Genetics
BIO 202	4	Biology II: Organisms and Diversity
BIO 203	4	Principles of Genetics
ENS 204	4	Principles of Ecology

Additional Minor Requirements

MAT 210	4	Introductory Statistics

Select <u>one</u> course from the following:

CHE 201	4	General, Organic, and Biochemistry I
CHE 211	4	College Chemistry I

Select additional upper-division (300-/400-level) biology courses to reach <u>28</u> credit hours.

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 foundational core life science requirement; not available to biology majors.*

BIO 102 **4 hours**
Biology for Educators
Introductory principles of biology taught with materials appropriate for future teachers. Topics include cell biology, inheritance, diversity, evolution, and ecology. *Three hours of lecture and two hours of laboratory per week. Meets foundational core life science requirement; not available to biology majors.*

BIO 104 **3 hours**
Animal Biology
A foundational core course designed to provide a broad look at life science through the study of the Kingdom Animalia. Includes a consideration of tissues, anatomy, ecology, natural history, and human interaction with representative vertebrates and invertebrates. *Two hours lecture and two hours laboratory per week. Meets foundational core life science requirement. Offered fall semester of even years..*

BIO 106 **4 hours**
Human Biology
This course is designed as a one semester anatomy and physiology course covering all body organ systems and the interrelatedness of human health and lifestyle, environment, etc. *Three hours lecture and two hours of laboratory per week. Meets foundational core life science requirements. Offered fall semester. Preference given to Social Work majors.*

BIO 170 **1-4 hours**
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering.

BIO 201 **4 hours**
Biology I: Foundations of Cell Biology and Genetics
Study of cellular structures and metabolism emphasizing form and function on structure; the cellular pathways of energy and matter transformation; the information flow, exchange and storage and the molecular, mitotic and meiotic mechanism of inheritance. Three hours of lecture and two hours of laboratory per week. *Meets foundational core life science requirement. Majors/Minors only.*

BIO 202 **4 hours**
Biology II: Organisms and Diversity
This course is the second of the two-course sequence for freshman biology majors. In this course we will examine the diversity of organisms, including algae, protozoa, fungi, plants, and animals, as they appear through the fossil record from the Paleozoic Era to the present time. *Majors/Minors only. Prerequisite: BIO 201.*

BIO 203 **4 hours**
Principles of Genetics
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 foundational core science requirement.*

BIO 210 **3 hours**
Medical Terminology
This course is designed to assist students in learning medical terminology, as well as to provide instruction in word-building skills so that words can be identified by their parts. It provides a solid vocabulary foundation for those individuals who anticipate taking the MCAT or plan to enter an area of allied health studies.

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 foundational core 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.

BIO 280 **3 hours**
Research Methods
A lecture- and seminar-based introduction to how biology research is designed, interpreted, and communicated. Topics include hypothesis formulation, literature review and analysis, experimental design, experimental error and the role of statistics, data interpretation, research communication (visual, oral, and written), and scientific integrity. *Biology majors only or with instructor approval.*

BIO 300 **4 hours**
Medical Physiology
Medical Physiology is taught in Cuenca Ecuador by the Medical School of the Universidad del Azuay. The course is part of the Global Engagement Centre program for the department of biology. The course covers human physiology in a clinical setting. Class is approached in a pathology problems based curriculum with laboratories in the university hospital. *Permission is required by the Director of the Cuenca Centre.*

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 202; BIO 203 is recommended. Offered fall semester of odd years.*

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 202, 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 202 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 molecular and biochemical characteristics, including bioenergetics, protein kinesis, cell signaling, cell-division cycle, cell junctions and extracellular matrix, cancer, stem cells and tissue renewal, and the adaptive immune system. Three hours lecture and three hours of lab per week. *Prerequisites: BIO 201; 203; CHE 201 or CHE 211; CHE 202 or CHE 212; and minimum junior status or permission of the instructor.*

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 202 or permission of instructor. Offered fall semester of odd years and summers at discretion of faculty.*

BIO 345 **3 hours**
Evolution and the Nature of Science
This course introduces the conceptual and theoretical foundations of evolution and the nature of science. Students will be introduced to the longer-term processes of change. Evaluation of theories of species dynamics will be understood within the framework of the nature of science. *Prerequisite: Junior standing as a biology major or instructor permission.*

BIO 351 **4 hours**
Advanced Human Anatomy
Upper division course providing students with an advanced study of human anatomy. Includes detailed laboratory dissections of the dogfish shark and domestic cat, serving as models for human anatomy and, as importantly, detailed practice in the skills used in dissection. *Three hours lecture and three hours of laboratory per week. Prerequisites: BIO 201; and CHE 201 or 211. Offered fall semester.*

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.

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 knowledgably 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 class sessions focus on current concepts in developmental biology. The lab utilizes living model organisms (e.g. urchin, fly, chick) to conduct inquiry-based projects. *Three hours of lecture and three hours of laboratory per week. Prerequisites: BIO 201 and 203; 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 202, CHE 201 or 211, and CHE 202 or 212. Offered spring semester of odd years.*

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 451 **4 hours**
Advanced Human Physiology
Upper division course providing students with an advanced study of human physiology. Includes detailed laboratory experiences, including human demonstrations, the use of animals as models for humans, and practical experience with instrumentation used to examine the functional processes of organ systems. *Three hours lecture and three hours of laboratory per week. Prerequisites: BIO 201; BIO 331 or 351; and CHE 201 or 211. Offered spring semester.*

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 or 211; and CHE 202 or 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 201, 203, and 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 lecture and three hours of laboratory per week. *Prerequisites: BIO 201 and BIO 203. 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.*

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 foundational core 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