

Biology

Department: Biology

Department Chair: B. O'Neal

Department Members: W. Cain, E. Galloway, K. Harris, M. Marasco, B. O'Neal, J. Winter

Major: Biology (Tracks: Biomedical Sciences, Ecology & Conservation, and Standard)

Minors: Biochemistry, Biology, Environmental Science

Related Major: Neuroscience

Related Minor: Neuroscience

Pre-Professional Programs: Pre-Dental, Pre-Forensic Science, Pre-Medical, Pre-Medical Laboratory Science, Pre-Optometry, Pre-Pharmacy, Pre-Physician's Assistant, Pre-Podiatry, and Pre-Veterinary

Cooperative Programs: Health-related Professions: Medical Laboratory Science, Dentistry, Nursing, Pharmacy, and Public Health

The biology program at Franklin College will provide experiences that help students better understand the nature of science and the role of scientists in society. To fulfill this mission, the program provides courses that stress the important areas of cellular, organismal, systemic, and environmental biology. Through laboratory, lecture, and discussion, science is presented not simply as a collection of facts but also as a process by which concepts may be generated. Upon completion of the major, students will have a well-rounded knowledge of biology as well as an understanding of the way to use scientific methodology to solve problems.

Biology Major

Completion of the Biology major will require students to complete **one** of the three following tracks or a Cooperative 3+ Program in Biology. Only one program or track will be recorded on the student's transcript. Two **tracks** share a common core (Standard and Ecology/Conservation), and each track has additional biology, chemistry, and related field requirements, plus a Professional Development Program/Senior Year Experience. Cooperative 3+ Programs in Biology have a common core (different from the core for biology tracks) and additional specific requirements for each cooperative program. All biology courses must be completed with a grade of C- or better.

Core Requirements (required for both Standard and Ecology & Conservation tracks)

BIO 134/BIO 134L Principles of Biology + Lab

BIO 140/BIO 140L Cell Biology + Lab

BIO 221 Botany

BIO 230 Zoology

BIO 350 Genetics

BIO 360 Animal Physiology **OR** **BIO 215** Human Anatomy and Physiology

BIO 470 Senior Seminar

BIO 499 Senior Comprehensive Exam

Related Field Requirements for Biology Major (required for all biology tracks)

A grade of D- or better satisfies the requirement for successful completion of the related field courses in math and chemistry.

CHE 121 General Chemistry I

CHE 122 General Chemistry II

CHE 123 General Chemistry I Lab

CHE 124 General Chemistry II Lab

Mathematics Related Field Requirement for Biology Major

One of the following math options (grade of D- or better required).

Option 1: **MAT 135** Calculus

Option 2: **LA 103** Quantitative Reasoning and **MAT 224** Basic Applied Statistics

Option 3: **CMP 130** Introduction to Computing and **MAT 224** Basic Applied Statistics

Option 4: **MAT 131** Introduction to Quantitative Analysis and **MAT 224** Basic Applied Statistics

Option 5: **MAT 224** Basic Applied Statistics (only if previously placed into MAT 135)

Biology Professional Development Program (PDP)/Senior Year Experience (SYE)

BIO/CHE 390 Professional Development Planning

INT XXX Internship ($\geq$ 3 hours of credit)

(INT XXX must be completed during the summer prior to or during the senior year. BIO 390 is a prerequisite for INT XXX.)

Biology Major - Standard Biology Track

In addition to the core and PDP/SYE requirements, students must take the following:

One of the following courses

- BIO 240** Ecology
- BIO 322** Ornithology
- BIO 335** Plant Communities

Plus: A minimum of 6 hours from Biology courses numbered BIO 210-392 (except BIO 390). Students may count one cross-listed course taught by another department toward their 6 hours (i.e., only one of the following: BIO 372/372L, BIO 387/387L, or BIO 355). Students may count either BIO 215 or BIO 360 as part of this 6-hour requirement, but not both.

Biology Major – Ecology & Conservation Track

In addition to the core and PDP/SYE requirements, students must take the following:

- BIO 240** Ecology
- BIO 320** Conservation Biology
- BIO 322** Ornithology
- BIO 335** Plant Communities
- BIO 365** Geographic Information Systems
- ENG 228** Advanced Composition
- ESC 118** Earth Science
- MAT 224** Basic Applied Statistics

One of the following domestic travel courses (See Self Service for course fee)

- BIO 342** Ecosystem Management
- BIO 380** Field Biology

One of the following courses

- POL 225** State and Local Government
- POL 336** Introduction to Public Policy

Recommended courses

- BIO 375** Undergraduate Research in Biology or Chemistry
- CMP 130** Introduction to Computing
- REL 210** Religion and the Environment

Biology Major – Biomedical Sciences Track

****Students in this track must maintain a GPA of 3.25 or better to remain in the track. Students who do not maintain this GPA must switch to the Standard Biology Track.**

Required courses

BIO 134/134L Principles of Biology + Lab
BIO 140/140L Cell Biology + Lab
BIO 215 Human Anatomy and Physiology II **OR** **BIO 360** Animal Physiology
BIO 221 Botany **OR** **BIO 230** Zoology
BIO 225 Bioethics
BIO 350 Genetics
BIO 373 Microbiology
BIO 470 Senior Seminar
BIO 499 Senior Comprehensive Exam

Related field courses

CHE 121/123 General Chemistry I + Lab
CHE 122/124 General Chemistry II + Lab
CHE 221/223 Organic Chemistry I + Lab
MAT 224 Basic Applied Statistics

Plus: A minimum of 19 hours from the following list of elective courses

BIO/KIN 121 Medical Terminology
BIO 310 Principles of Immunology
BIO 312 Viruses and Viral Disease
BIO 314 Techniques in Forensic Science
BIO 324 Science Communication & Public Outreach
BIO/CHE 334 Biochemistry
BIO 355/PHY 355 Ultrasonography
BIO/EXE 372/L Exercise Physiology **OR** **BIO/EXE 387/L** Biomechanics
BIO 375 Undergraduate Research*
BIO 392 Techniques in Biochemistry and Biotechnology
CHE 222/224 Organic Chemistry II + Lab
PHY/CHE 357 Radiation and Health
PHY/CHE 365 Biomedical Optics
PSY 117 General Psychology**
SOC 118 Introduction to Sociology
 *A maximum of 2 hours of BIO 375 can count toward required elective hours
 **All students considering careers in clinical medicine are advised to complete PSY 117

Biomedical Sciences Professional Development Program/Senior Year Experience

BIO 390 Professional Development Planning
INT 151 Medical Internship (minimum of 3 credits, must take place during or summer before senior year)

Neuroscience Major

Please see separate Neuroscience section in this course catalog.

Biology Minors

All courses must be completed with a grade of C- or better.

Standard Biology Minor**Core Requirements**

BIO 134/134L Principles of Biology + Lab

BIO 140/140L Cell Biology + Lab

Plus - An additional 14 credits from BIO 210-392

(BIO 225 cannot count towards both a Biology minor and the Reasoning and Values exploratory course).

These 14 hours may include either BIO 372 or BIO 387, but not both. Only 8 of the 14 hours can come from BIO 210, BIO 215, and BIO 360.

Biochemistry Minor

(Available to non-biology and non-chemistry majors only)

Required courses

BIO 134/BIO 134L Principles of Biology + Lab

BIO 140/140L Cell Biology + Lab

BIO/CHE 334 Biochemistry

BIO/CHE 392 Techniques in Biotechnology & Biochemistry

CHE 222 Organic Chemistry II

CHE 224 Organic Chemistry Lab II

One of the following courses

BIO 215 Human Anatomy and Physiology II or **BIO 360** Animal Physiology

BIO 373 Microbiology

Recommended Course

BIO 375 Undergraduate Research in Biology or Chemistry

Environmental Science Minor

(Available to non-biology majors only)

Core Requirements

BIO 134/134L Principles of Biology + Lab
BIO 240 Ecology
BIO 320 Conservation Biology
BIO 380 Field Biology
ESC 118 Earth Science
INT XXX Environmental Science Internship

One of the following courses

BIO 322 Ornithology
BIO 335 Plant Communities

One of the following courses

ECO 121 Principles of Microeconomics OR **ECO 123** Principles of Macroeconomics
POL 110 American National Government
SOC 118 Introduction to Sociology

Neuroscience Minor

Please see [separate Neuroscience section](#) in this course catalog.

Pre-Health Professions Programs

Franklin College offers pre-health professions advising to students who are interested in applying to medical school or other health-related professional schools. For more information or questions, please contact the respective faculty member for each profession. Additional information regarding pre-professional program requirements are located on our website <https://franklincollege.edu/major/pre-professional/>

Pre-Med (allopathic and osteopathic) - Dr. Winter

Pre-Podiatry-Dr. Winter

Pre-Pharmacy - Dr. Thapaliya

Pre-Dentistry –Dr. Winter

Pre-Veterinary Medicine - Dr. O’Neal

Pre-Optometry- Dr. Thapaliya

Pre-Medical Laboratory Science - Dr. Thapaliya

Pre-Physician’s Assistant – Dr. Winter

Pre-Forensic Science—Dr. Florian

Pre-Nursing—Dr. Cain

Cooperative Programs in Biology

All cooperative programs for the biology major consist of a common core and specific courses required for each particular program. After completion of three years of college work in one of these programs and fulfilling Franklin College graduation requirements (except total graduation hours), students may receive a bachelor of arts degree from Franklin College upon completing one year at the cooperating institution, for a total of 120 semester hours. Successful completion of the first year in the cooperative program satisfies the internship or senior year experience requirement for the major ***unless otherwise noted***. Any student following these programs who is not accepted by the cooperating institution after the third year could return to Franklin College and receive a bachelor of arts in biology by completing: 1) all of the remaining requirements for the biology major standard program, and 2) 120 total semester hours required for graduation. *(Students with a declared enrollment in the aforementioned cooperative programs will be given priority during registration in subsequent semester(s)).*

Cooperative Programs in Health-related Professions

Core Requirements

BIO 134/134L Principles of Biology + Lab

BIO 140/140L Cell Biology + Lab

BIO 350 Genetics

BIO 390 Professional Development Planning

BIO 470 Biology Seminar

BIO 499 Senior Competency Practicum

CHE 121 & 123 General Chemistry I & Lab

CHE 122 & 124 General Chemistry II & Lab

Mathematics Requirement

One of the following math options

Option 1: **MAT 135** Calculus

Option 2: **LA 103** Quantitative Reasoning and **MAT 224** Basic Applied Statistics

Option 3: **CMP 130** Introduction to Computing and **MAT 224** Basic Applied Statistics

Option 4: **MAT 131** Introduction to Quantitative Analysis and **MAT 224** Basic Applied Statistics

Option 5: **MAT 224** Basic Applied Statistics (only if previously placed into MAT 135)

One of the following courses**BIO 221** Botany**BIO 230** Zoology**BIO 240** Ecology**Biology/Chemistry Professional Development Program/Senior Year Experience**

Successful completion of the first year in the cooperative program satisfies the internship or senior year experience requirement for the major **unless otherwise noted**.

Plus additional specific program requirements - choose one of the four following programs**A. Medical Laboratory Science at *IU Health Methodist Hospital*****BIO 215** Human Anatomy and Physiology II or **BIO 360** Animal Physiology**BIO 373** Microbiology**BIO/CHE 334** Biochemistry**CHE 221 & CHE 223** Organic Chemistry I and Lab**CHE 222 & CHE 224** Organic Chemistry II and Lab**Plus:** Completion of the clinical program IU Health Methodist Hospital.**B. Doctor of Pharmacy at *Purdue University*****BIO 215** Human Anatomy and Physiology II**BIO 310** Principles of Immunology**BIO 373** Microbiology**CHE 221 & CHE 223** Organic Chemistry I and Lab**CHE 222 & CHE 224** Organic Chemistry II and Lab**ECO 121** Principles of Microeconomics OR **ECO 123** Principles of Macroeconomics**MAT 140** Introduction to Mathematical Sciences**MAT 142** Calculus II**PHY 201 or 211 & 203** General Physics I and Lab**C. Dentistry at *most accredited dental schools*****BIO 215** Human Anatomy and Physiology II**BIO/CHE 334** Biochemistry**CHE 221 & CHE 223** Organic Chemistry I and Lab**PHY 201 or 211 & 203** General Physics I and Lab**PHY 202 or 212 & 204** General Physics II and Lab**PSY 117** General Psychology**Plus** completion of the DAT no later than the fall of the junior year.*IU Dental School strongly suggests***BIO 373** Microbiology**BIO/CHE 392** Techniques in Biotechnology and Biochemistry

D. Masters of Public Health at *IU-I Richard M. Fairbanks School of Public Health***BIO 215** Human Anatomy and Physiology II**BIO 230** Zoology**BIO 373** Microbiology**BIO electives** (6 hours)**CHE 221 & CHE 223** Organic Chemistry I and Lab**CMP 130** Introduction to Computing**MAT XXX** Math Elective**E. Bachelor of Science in Nursing at *University of Indianapolis*****BIO 215** Human Anatomy and Physiology II**BIO 373** Microbiology**PHL XXX** Philosophy course or **BIO 225** Bioethics**PSY 117** General Psychology**SOC 118** Introduction to Sociology**INT 151** Medical Internship***Pre-Physician Assistant (PA) Studies at Franklin College***

Franklin College offers all of the prerequisite courses required for application to most PA programs in Indiana and throughout the country.

Students should reference the appropriate section of this course catalog for the specific required and recommended courses, as well as additional admission guidelines for the Franklin College PA program.

Biology Course Descriptions

BIO 001 Laboratory Assistant		1 credit hour
Fall and Spring		Prereq: permission of the instructor

Students will assist a faculty member in setting up the labs, lab instruction, research, or maintaining biological facilities. While doing this, students will learn proper laboratory procedure techniques. The course is highly recommended for graduate school bound students or students interested in science teaching. Counts as an activity course credit.

BIO 114 General Biology		4 credit hours
Fall and Spring	Scientific Thinking exploratory	

Explores the functional and organizational principles of life from the cellular to the ecosystem level using evolutionary theory as the unifying framework. Topics in human and plant biology are used to illustrate basic biological concepts. Three hours lecture, two hours laboratory.

BIO 121 Medical Terminology and Documentation for Allied Health Professions		2 credit hours
Fall		

This course presents a basic study of medical terminology. Prefixes, suffixes, root words, combining forms, special endings, plural forms, abbreviations, and symbols are included in the content. This course is intended to assist those studying in medical and allied health-care fields by learning a system for defining, using, spelling, and pronouncing medical words. Basic principles of documentation and the various forms used by allied health-care professionals are also encompassed in this course. Same as KIN 121.

BIO 134 Principles of Biology		4 credit hours
Fall	Scientific Thinking exploratory	

This course is the first semester of a two semester sequence in biology for biology and chemistry majors. The purpose of this course is to provide science majors with a basic understanding of biology and aid in the development of critical thinking skills. Topics including Mendelian and population genetics, natural selection and evolution will be discussed. Four hours lecture and discussion, two hours laboratory.

BIO 134L Principles of Biology Lab		0 credit hours
Fall		

Lab portion of Principles of Biology. Must be taken concurrently with BIO 134.

BIO 140 Cell Biology		4 credit hours
Spring		Prereq: minimum grade of C- in BIO 134, or permission of the instructor Coreq: BIO 140L

A detailed understanding of cells will be developed in relationship to the following topics: ultra structure, biochemistry, metabolism, reproduction, molecular genetics, gene regulation, membrane transport, photosynthesis and respiration. Four hours lecture and discussion, two hours laboratory. Must be taken concurrently with BIO 140L.

BIO 140L Cell Biology Lab		No credit
Spring		Prereq: minimum grade of C- in BIO 134, or permission of the instructor Coreq: BIO 140

Lab portion of Cell Biology. Must be taken concurrently with BIO 140.

BIO 205 Environmental Issues		3 credit hours
On demand	Civic Learning exploratory	Prereq: LA 101

In this interdisciplinary course, students will examine various environmental issues of the 21st century. Governmental agencies, nonprofit organizations, and grassroots efforts will be examined as students learn how to actively address global issues. This course is intended for non-biology majors, and may not be taken if credit for BIO 320 has been earned.

BIO 210 Human Anatomy and Physiology I		4 credit hours
Fall		Prereq: BIO 140

This is the first of a two-semester sequence in which human anatomy and physiology are studied using a body systems approach, with emphasis on the interrelationships between form and function at the gross and microscopic levels of organization. The first semester covers an introduction to scientific principles, principles of cell biology, histology, the integumentary, skeletal, muscular, and nervous systems. The laboratory includes examinations of anatomical models and physiological investigations.. Three hours lecture, two hours laboratory.

BIO 215 Human Anatomy and Physiology II		4 credit hours
Spring		Prereq: BIO 210

This is the second of a two-semester sequence in which human anatomy and physiology are studied using a body systems approach with emphasis on the interrelationships between form and function at the gross and microscopic levels of organization. The second semester covers the cardiovascular, lymphatic, digestive, urinary, reproductive systems, and endocrine. The laboratory includes examinations of anatomical models and physiological investigations.. Three hours lecture, two hours laboratory.

BIO 221 Botany		4 credit hours
Spring		Prereq: BIO 140

Principles of form, function, growth, reproduction, physiology, classification and evolution in algae, fungi and plants. Flowering plants will be keyed, to help train students in key elements of plant identification. Three hours lecture, three hours laboratory.

BIO 225 Bioethics		3 credit hours
Fall	Reasoning and Values exploratory	Prereq: BIO 114 or BIO 134

In this course students will explore ethical issues relating to medicine and scientific research. Each topic will be examined using a values-based analysis, and awareness of leadership principles. Emphasis will be on biological principles, decision-making, and conflict management. Specific topics will include: use of humans in research, genetics and fertility, end of life issues, and topics concerning embryos, cloning, and genetic engineering.

BIO 230 Zoology		4 credit hours
Fall		Prereq: BIO 140

A survey of animals with an emphasis on evolution, structure, function, and life cycles of representative taxa. Three hours lecture and three hours lab.

BIO 240 Ecology		4 credit hours
Fall		Prereq: BIO 140 or consent of instructor

This course examines the relationships of plants and animals to their biological and physical environment. Lecture, lab, and field learning will include a focus on understanding and manipulating wildlife habitats and population dynamics, in the context of human objectives and influences. The relationship between theoretical ecology and applied management will be emphasized by examining the specific ways in which the biology of plants and wildlife informs effective management. Three hours lecture, three hours laboratory.

BIO 300 Topics in Biology		3 credit hours
On demand		

A topic of current interest in biology will be taught. Topics will vary depending on faculty interest. Course will be offered upon the request of a faculty member and with approval of the Vice President of Academic Affairs.

BIO 310 Principles of Immunology		3 credit hours
Spring, even academic years		Prereq: BIO 140

A foundational course in immunology, which explores how human health depends on the function of the immune system. Areas of focus include the role of the immune system in detecting and destroying invading pathogens, tumor immunology, allergies, autoimmune diseases, and vaccination. Mechanisms of innate and adaptive immunity will be emphasized. The course is targeted towards students interested in pursuing careers in biotechnology, medicine, and health-related research.

BIO 312 Viruses and Viral Disease		3 credit hours
Spring, even academic years	Civic Learning exploratory	Prereq: "D-" or higher in BIO 140

This course will provide an introduction to the diverse and prolific viruses that inhabit our planet, with a special focus on disease-causing viruses. The course will include molecular virology, viral pathogenesis, antiviral immunity and vaccination, and viral epidemiology. An emphasis will be placed on reading understanding primary scientific literature. Special attention will be paid to applying the concepts learned in class to viral pandemics and epidemics, drawing connections between contemporary and historical viral pandemics and epidemics. To that end, we will work to critically engage with information and misinformation shared publicly about viruses, viral disease, and vaccines by public officials, non-governmental organizations, educational institutions, medical professionals, and peers.

BIO 314 Techniques in Forensic Science		3 credit hours
Spring, odd academic years		Prereq: CHE 122 and BIO 140, or instructor permission

The laboratory techniques used in Forensic Science are frequently portrayed in film and television. However, rarely are these practices accurately portrayed. This course will focus on the chemistry and biology laboratory techniques, instrumentation, practices, and applications commonly used in the field of forensic science. The course will consist of a 2 credit hour lecture period and a 1 credit hour lab period to touch on both the theory and practical application of the topics discussed. Same as CHE 314.

BIO 320 Conservation Biology		3 credit hours
Fall, odd academic years	Civic Learning exploratory	Prereq: BIO 140; Prereq or Coreq: BIO 240

In this course, students will be immersed into the principles of conservation biology. Important topics include species diversity, habitat preservation, habitat management, invasive species, endangered species, ecological economics, global climate change, and various legislation that impacts conservation biology. Students will explore how these concepts are used by managers to make science and evidence-based decisions. As a Civic Learning course, we will also examine government authorities associated with conservation biology and learn how to effectively communicate/advocate to stakeholders and decision-makers. Students who are enrolled in or have earned credit for BIO 205 must petition the Biology Department to enroll in BIO 320.

BIO 322 Ornithology		3 credit hours
Spring, even academic years		

A comprehensive study of birds with an emphasis on morphology, taxonomy, identification, evolution, ecology, and conservation. Two hours lecture, three hours laboratory.

BIO 324 Science Communication and Public Outreach		3 credit hours
Spring, odd academic years		Prereq: Junior status (58+ hours completed)

This course provides training in best practices in communicating scientific concepts for both scientific and non-scientific audiences and in facilitating high-quality public engagement with science. The class is largely practice-based, with students having many opportunities to hone their science communication skills. Students plan and execute a science outreach event, produce written work in multiple forms for lay and technical audiences, and create audio and video content that communicates scientific concepts. Students also learn to design and produce high-quality data visualizations that are clear and concise. Though this course is rooted in the biological sciences, students from all disciplines are welcomed, including students from the physical and social sciences and students from journalism or theater backgrounds.

BIO 334 Biochemistry		3 credit hours
Spring		Prereq: BIO 140, CHE 221 and CHE 223

An introduction to the chemistry of biomolecules, metabolism, and biosynthesis. Three hours lecture. Note: This course may count toward either a Biology major or a Chemistry major, but not both. Same as CHE 334.

BIO 335 Plant Communities		4 credit hours
Fall, even academic years		Prereq: BIO 114 or BIO 134

An introduction to the plant communities in Indiana with emphasis on plant identification, plant associations, and exotic species. Three hours lecture, three hours laboratory.

BIO 342 Ecosystem Management		2 credit hours
Spring, even academic years		

An immersive, field-based study of the natural resources and socioeconomic realities of complex ecosystems such as the Mississippi Delta and associated coastal marshes of Louisiana. Students will gain firsthand knowledge of the methods used by contemporary biologists to study and conserve plants and wildlife. Student learning focuses on understanding and manipulating wildlife habitats and population dynamics, in the context of human objectives and influences. This course includes a week-long field trip over spring break with significant amounts of travel, hiking, wading, boating, kayaking, angling, and time outdoors.

BIO 350 Genetics		4 credit hours
Spring		Prereq: BIO 140, junior status or consent of instructor

A study of the principles of heredity, including Mendelian, molecular, and population genetics. Three hours lecture, two hours laboratory.

BIO 355 Ultrasonography		3 credit hours
Spring, odd academic years, rotating with PHY 365		Prereq: BIO 210 & 215 or ANAT 210 & 220 or BIO 360 or consent of instructor

Ultrasound is integrated in the health professions and medical education curriculum extensively because of its non-invasive nature and diagnostic utility. The course is divided into four sections: introductory ultrasonography, musculoskeletal, cardiovascular, and abdominal ultrasonography. The course provides hands-on training for proper utilization and appropriate operation of ultrasound equipment to assess various regions of the body, as well as a review of Focused Assessment with Sonography in Trauma (FAST) assessment. Same as PHY 355.

BIO 360 Animal Physiology		4 credit hours
Fall, odd academic years		Prereq: BIO 140; CHE 121 and 122

Explores the chemistry and physics of the living animal. Topics include cellular physiology, metabolism, organ systems, and mechanisms of control. Emphasis is placed on specific adaptive mechanisms of the animal to its environment. The course stresses interpretation of experimental results both in the lecture and lab. Three hours lecture, three hours laboratory.

BIO 365 Geographic Information Systems		3 credit hours
Spring, odd academic years		

An experiential study of spatial analysis and cartography using geographic information systems (GIS). Students will engage in project-based learning to develop the digital, quantitative, and analytical skills needed to leverage the industry's leading software tool, ArcGIS. As learners and technical consultants, we will collect data, conduct spatial analyses, interpret results, and create various map products to assist local non-profit organizations in their conservation objectives.

BIO 372 Exercise Physiology		3 credit hours
Fall and spring		Prereq: ANAT 220, EXE 119, EXE 208, EXE 234 Coreq: BIO 372L

Exercise physiology is the study of acute and chronic adaptations of the body's physiological systems to movement and physical conditioning. Physiological foundations and the development of physiological fitness components will be discussed. A laboratory component is integrated into class sessions. Same as EXE 372.

BIO 372L Exercise Physiology Lab		No credit
Fall and spring		Co-req: BIO 372

Lab component to BIO 372 Exercise Physiology. Same as EXE 372L.

BIO 373 Microbiology		4 credit hours
Fall		Prereq: BIO 140 and consent of instructor

This lecture- and lab- based course provides a thorough understanding of the biology of microorganisms. Topics include microbial taxonomy, cell structure and function, metabolism, genetics, host-microbe interactions, treatment of microbial diseases, and the relevance of public health to microbiology. A basic introduction to human immune function is included, and students will develop a detailed understanding of microbial pathogenesis as well as the role of commensal microbes in human health and disease and the role of microbes in a variety of ecosystems. The role of bioinformatics in modern microbiology will be addressed, and students will receive hands-on bioinformatics experience. The lab will require students to obtain proficiency in safely handling and culturing bacteria, preparing microscopy slides, and operating microscopes. Students will also utilize molecular biology, biochemical, and bioinformatics techniques to identify bacteria and will complete laboratory projects requiring these skills. 3 hours lecture, 3 hours laboratory.

BIO 374 Advanced Cell and Molecular Biology		3 credit hours
On demand		Prereq: BIO 140 is required, BIO 350 is preferred but not required.

This course is an in-depth, advanced look at cellular and molecular processes applicable to both research and medicine. Mechanisms of DNA repair, transcription and translation regulation, cell communication and cellular transport will be discussed. Much of this course will rely on the analysis of primary literature and interpretation of experimental data to understand cell biology in the context of cancer and other cellular dysfunctions. The course is 3 hours of lecture with no laboratory component.

BIO 375 Undergraduate Research in Biology or Chemistry	2 credit hours
	Prereq: consent of instructor

To receive academic credit for an undergraduate research experience students must complete a project proposal endorsed by a sponsoring science faculty member. The application will contain an overview of the project, specific project goals, deadlines for the completion of the project, and specific project outcomes that will be evaluated and used to determine the final grade. All projects must meet the following criteria: a) spending an average of 6 hours/week during the semester (for 2 credits) working on the project; b) writing a scientific paper summarizing the results of the study; c) preparing an electronic poster of the project results; d) maintaining a lab notebook, and e) presenting the results of the project to an audience. The project must be approved by the Chair (or designee) of the sponsoring department.

BIO 380 Field Biology	2 credit hours
Spring, odd academic years	Prereq: BIO 134 and consent of instructor

This course meets once a week for the entire semester and has a one week field trip during Spring Break to a distinctive ecosystem (e.g., Smoky Mountains). Natural history and ecological analysis of animal and plant communities are emphasized. Students conduct a research project that is presented to the class and public in addition to keeping a detailed journal that includes both scientific information and reflections of the experience. Hiking and other outdoor skills are required.

BIO 382 Comparative Animal Behavior	3 credit hours
On demand	Prereq: BIO 140

A study of how and why animals do what they do (i.e., the proximate and ultimate cause of animal behavior). Students investigate the genetic and sensory/motor mechanisms of behavior, the possible evolutionary histories of behavior, the effects of behavior on fitness, and the role of behavioral ecology in conservation.

BIO 387 Biomechanics	3 credit hours
Fall and spring	Prereq: ANAT 220, EXE 119, EXE 208, EXE 234 Co-req: BIO 387L

The course will provide the student with a mechanical examination of the motion of the human body. Application of anatomical, physiological and mechanical data will be used to explain and predict movements of the body to improve technique or prevent injury. A laboratory experience is integrated into class sessions. Must be taken concurrently with BIO 387L. Same as EXE 387.

BIO 387L Biomechanics Lab	No credit
Fall and spring	Co-req: BIO 387

Lab component to BIO 387 Biomechanics. Same as EXE 387L.

BIO 390 Professional Development Planning	1 credit hour
Fall and Spring	

The primary objective of this course is to prepare students for the Professional Development Experience and chosen careers. Students will participate in professional development workshops.

BIO 392 Techniques in Biotechnology and Biochemistry		3 credit hours
Spring, odd years		Prereq: BIO 140, CHE 121, & CHE 122

Students in this course will investigate the myriad of technology available to study DNA, RNA and proteins covering both the theories and applications in research, medical, and industrial settings. Techniques covered will include use of prokaryotic and eukaryotic organisms in recombinant DNA technologies, gene expression microarrays, protein analysis by Western blot, and protein interaction analysis in yeast and higher eukaryotes. Lab work involves using techniques which are the foundation for research in molecular biology. Four hours laboratory. Note: This course may count toward either a Biology major or a Chemistry major, but not both. Same as CHE 392.

BIO 470 Biology Seminar		2 credit hours
Fall and spring		Prereq: At least junior class standing and 16 or more completed BIO course credits Coreq: BIO 499

Students explore and summarize the scientific literature related to an individual topic and present their findings in a formal review paper and a public presentation.

BIO 482 Biology Practicum		1-2 credit hours
		Prereq: instructor permission

A supervised, pre-approved experience which allows a student to pursue specific learning goals and/or be involved in a field experience during the regular academic semester.

BIO 490 Independent Study		1-2 credit hours
		Prereq: Departmental consent is required

Course is designed to encourage student initiative and to provide a degree of flexibility in the departmental program. Normally the subject is not sufficiently or appropriately covered in regular departmental course offerings.

BIO 499 Senior Competency Practicum		No credit
Fall and Spring		Prereq or Coreq: BIO 350 Coreq: BIO 470

An examination (i.e., Major Field Test) covering basic biological principles. Grade of D- or better required.

PDP 301 Health Professions Career Preparation		1 credit hour
Fall		

This course will help students to prepare for careers in the health professions and for the application process involved in graduate health program admissions. Topics covered will include, but are not limited to: 1) understanding and navigating the application/admissions process 2) developing competencies as a pre-health student 3) assessing professional programs and finding your fit 4) preparing for entrance exams 5) writing personal statements 6) preparing for interviews 7) balancing work-school-life & preventing burnout 8) funding your education. The course may also include guest speakers and/or field trips and will provide a space for discussing special topics of student interest. Pass/Fail.