

DEPARTMENT OF BIOLOGY

COLLEGE OF ARTS AND SCIENCES

Faculty

Mark Bolyard (2006). Professor of Biology and Department Chair. B.A., Hanover College; Ph.D., University of North Carolina.

Jennifer Gruenke (2009). Associate Professor of Biology and Director of the Center for Scientific Studies. B.S., Bryan College; Ph.D., University of Virginia.

James A. Huggins (1987). University Professor of Biology. B.S.A. and M.S., Arkansas State University; Ph.D., University of Memphis; Additional study, University of Tennessee at Memphis, Mid-America Baptist Theological Seminary, and University of Memphis.

James Kerfoot, Jr. (2009). Assistant Professor of Biology. B.S. and M.S., Southern Illinois University Edwardsville; Ph.D., Florida Institute of Technology.

James Marcus Lockett (2004). Assistant Professor of Biology. B.S. and M.S., Murray State University; Ph.D., University of Tennessee.

Andy Madison (2002). Associate Professor of Biology. B.S., University of Tennessee; M.S., University of Kentucky; Ph.D., Kansas State University.

Michael L. McMahan (1980). University Professor of Biology. B.S. and M.S., University of Mississippi; Ph.D., Louisiana State University.

James Mahan (2010). Visiting Associate Professor of Biology. B.A., Vanderbilt University; M.S. and Ph.D., University of Memphis.

Tamara Popplewell (2008). Instructor of Biology. B.S. and M.A.Ed., Union University; additional study, Mississippi State University.

Elsie Y. Smith (1962). Associate Professor of Biology. B.S., Union University; M.S., University of Illinois; Additional study in Radiation Biology, University of Tennessee at Memphis.

Carol Weaver (1998). Professor of Biology. B.S., Union University; M.S., University of Missouri–St. Louis; Ph.D., St. Louis University.

Wayne Wofford (1987). Professor of Biology. B.S., Union University; M.S. and Ph.D., Texas A & M University.

Curriculum

The curriculum in biology is designed to acquaint students with living organisms as whole, functioning entities that, in their diversity, share many common features. In addition to providing the scientific background required of all educated citizens, the courses provide a foundation upon which the student may build a graduate program, undertake training in health-related professions, or prepare for

secondary-level science teaching. Students may participate in independent or group research as well as specific courses.

Because contemporary biology leans heavily on mathematics and physical sciences, students majoring in biology should include mathematics and chemistry in the freshman year. In BIO 112, students will build a foundation for study of biological processes. Students can proceed to the first 200-level biology course during the second semester of the freshman year. In the sophomore year, students will continue the survey of the kingdoms of life by taking additional 200-level biology courses. Students should strengthen their understanding of mathematics and obtain a background in organic chemistry during that year. Biology courses at the 300-400 level should be taken during the junior and senior years, with seminar reserved for the senior year. Students will examine in detail how organisms function and interact with their environment and each other.

Biology majors are required to complete a minor and are encouraged to minor in chemistry. Conservation Biology majors are exempt from the minor requirement.

Upper-level students may enroll in courses, including marine biology, by cooperative agreement with the Gulf Coast Research Laboratory and the Au Sable Institute of Environmental Studies. For information, see the Department Chair.

Conservation Biology Majors may meet the requirements to become a certified wildlife biologist by taking twelve hours of communication. The General Core requirement for COM 112 and electives of COM 121 and COM 235 may be used to fulfill 10 hours of this requirement. The remaining hours may be selected in consultation with your assigned faculty advisor.

I. Major in Biology—42-48 hours

- A. General Biology Concentration/Independent Research Option—42-44 hours
 1. BIO 112, 302, 425, 426, 437, and 498—8 hours
 2. BIO 211, 213, 214, 215, and 315—20 hours
 3. Four 300-level BIO courses; or BIO 221 & 222 and three 300 level BIO courses (excluding BIO 307 and 309)
- B. General Biology Concentration/Collaborative Research Option—45-47 hours
 1. BIO 112, 302, 415, and 498—7 hours
 2. BIO 211, 213, 214, 215, and 315—20 hours
 3. Five 300-level BIO courses; or BIO 221 & 222 and four 300 level BIO courses (excluding BIO 307 and 309)
- C. Zoology Concentration/Independent Research Option—43-44 hours
 1. BIO 112, 302, 425, 426, 437, and 498—8 hours
 2. BIO 213, 214; 200 or 211
 3. BIO 316, five -300 level BIO excluding 307, 309, 322 & 337
- D. Zoology Concentration/Collaborative Research Option —47-48 hours

1. BIO 112, 302, 415, and 498—7 hours
2. BIO 213, 214; 200 or 211
3. BIO 316, six-300 level BIO excluding 307,309, 322 & 337

- E. Cell Biology Concentration/ Independent Research Option —44 hours + CHE minor
1. BIO 112, 302, 425, 426, 437, and 498—8 hours
 2. BIO 211; 214 or 215
 3. BIO 315, 317, 320, 323, 325
 4. Two of BIO: 307, 309, 316, 321.
 5. Must minor in Chemistry to include CHE 319 & 329
- F. Cell Biology Concentration/Collaborative Research Option—46-47 hours + CHE minor
1. BIO 112, 302, 415, and 498—7 hours
 2. BIO 211; 214 or 215
 3. BIO 315, 317, 320, 323, 325
 4. Two of BIO: 307, 309, 316, 321.
 5. One 300-level BIO—3 or 4 hours
 6. Must minor in Chemistry to include CHE 319 & 329

II. Major in Conservation Biology—49-50 hours

Prerequisites or Corequisites: CHE 111, 112; PHY 213, MAT 116, 211, 208

- A. BIO 112, 200, 213, 214, 215, 235—23 hours
- B. BIO 302, 315, 318, 335, 336, 337—19 hours
- C. BIO 425, 426, 437, 498—4 hours
- D. BIO Elective—3 or 4 hours
- E. No minor is required.

III. Teacher Licensure in Biology (Grades 7-12)

- A. Major requirements as shown above with General Biology Concentration (I.A.&B) to include 221, 222, and 318.
- B. Additional requirements: PHY 112; PHY 213 & 214 (or 231 & 232)

- C. Professional Education: EDU 150, 250, 326, 418, 433; PSY 213, 318; SE 225
- D. Completion of applicable portions of the Praxis II.
- E. For additional information, see the Assistant Dean for Teacher Education and Accreditation.

IV. Minor in Biology—23 hours

- A. BIO 112
- B. Two 200-level BIO courses
- C. Three 300-level BIO courses

Assessment of Majors

Biology majors are required to take two terminal courses as a requirement for graduation: BIO 415, Collaborative Research Experience or BIO 437 Research Experience; and BIO 498, Seminar. The Department administers the Major Field Examination to senior biology majors in BIO 498.

Student Organizations

Biologists In Observation of the Master's Earth, BIOME, serves students interested in exploring the world of biology beyond the classroom. BIOME is designed primarily for biology majors and minors but is open to anyone with an interest in biology.

Student Awards

The Biology Research Award is given by the faculty of the Department of Biology to the student in BIO 437 who presents the best research paper of the year, based on an original piece of work.

Whiteaker Freshman Biology Award. The Department selects a freshman major or minor based on outstanding scholastic achievement, financial need, Christian service, and school spirit.

Course Offerings in Biology (BIO)

() Hours Credit; F–Fall, W–Winter; S–Spring; Su–Summer

100. Survey of Biological Concepts (4) F, W, S

A course for non-science majors focused on the basic ideas to enable students to appreciate the living world and their relationship to it. Topics : the cell, genetic basis of life, biodiversity, survey of the 5 kingdoms of life, ecology, and the environment. Three hours of lecture and 2 hours of laboratory/week. No credit toward BIO majors/minors.

112. Principles of Biology (4) F, S

A study of the basic characteristics of organisms, dealing with structure, function, reproduction, and ecology. Three hours of lecture and 2 hours of laboratory/week.

121. Human Biology (4) S

Survey of structure and function of the human body with emphasis on the normal operations of organ systems and the role of homeostasis. Three hours lecture and 2 hours lab/week. Credit cannot be earned after earning either BIO 221 or 222. No credit toward BIO major/minor.

200. Wildlife Biology (4) F

Prerequisites: BIO 100 or 112.

Biological concepts involved in fisheries and wildlife biology, their application in practice, and exploration of contemporary issues facing the organisms, habitats, and human consumers. Three hours of lecture and 3 hours of laboratory/week.

201. Survey of Microbiology (4) F, S

Pre- or Corequisite: BIO 221 and BIO 222.

Emphasis on observation, growth, identification and control of microbes with focus on selected microbial diseases. Four hours of lecture per week to include lab demonstrations and simulations. No credit toward BIO major/minor.

211. Microbiology (4) F, S

Prerequisite: BIO 112 and CHE 111.

Classification, morphology, physiology, and ecology of bacteria and viruses, with special emphasis on bacteria. Three hours of lecture and 3 hours of laboratory/week.

213. Invertebrate Zoology (4) F

Prerequisite: BIO 112.

Classification, morphology, physiology, and ecology of the invertebrate animals. Three hours of lecture and 3 hours of laboratory/week.

214. Vertebrate Zoology (4) S

Prerequisite: BIO 112.

Classification, morphology, physiology, and ecology of the vertebrate animals. Three hours of lecture and 3 hours of laboratory/week.

215. Botany (4) F

Prerequisite: BIO 112 and CHE 111.

Classification, morphology, physiology, and ecology of the algae, fungi, bryophytes, and vascular plants. Three hours of lecture and 3 hours of laboratory/week.

221. Human Anatomy and Physiology (4) F, Su

The first semester of a 2-semester course for nursing, physical education, and allied health. Body systems studied include the integumentary, cardiovascular, lymphatic, skeletal, and muscular. Three hours of lecture and 2 hours of laboratory/week. No credit toward BIO minor.

222. Human Anatomy and Physiology (4) S, Su

A continuation of BIO 221. Systems studied include: urinary, nervous, endocrine, digestive, and respiratory. No credit toward a BIO minor. Three hours of lecture and 2 hours of laboratory/week.

235. Natural Resources Policy (3) W

Examines current laws and policies governing public and private lands and the conservation of wildlife in the United States.

300. Pathophysiology (3) F, S, W

Prerequisite: BIO 221 and 222.

Various states of altered health. Topics: stress, shock, altered acid-base balance, altered fluid and electrolyte balance, neoplasia, hypertension, immunodeficiency, genetic disorders, altered cardiac rhythms, renal failure and uremia. No credit toward BIO major/minor.

302. Seminar Attendance (0) F, S

Prerequisites: 12 BIO hours, graded on a Pass/Fail basis. Students are required to attend all seminar presentations made by students enrolled in BIO 498 during the semester. Must be taken before enrolling in BIO 498.

307. Advanced Human Anatomy and Physiology I (4)

F

Prerequisite: BIO 112, 214 and an additional 4 hours of BIO hours applicable to the BIO major.

The 1st of a 2-semester sequence designed primarily for science majors seeking to establish a knowledge base of human anatomy and physiology. Body systems studied include the integumentary, skeletal, muscular, and nervous systems. Three hrs lecture and 3 hrs lab per/week.

309. Advanced Human Anatomy and Physiology II (4)

S

Prerequisite: BIO 307.

A continuation of BIO 307 studying body systems: endocrine, cardiovascular, respiratory, urinary, digestive, and lymphatic. 3 hrs lecture and 3 hours lab/week.

310. Histology (4) W–As Needed

Prerequisite: BIO 112 and 8 hours of BIO applicable to the Biology Major.

The branch of anatomy that deals with structure, composition, design and function of body tissues as it relates to the principles of physiology, biochemistry, molecular biology and medicine. Three hours lecture and 3 hours lab per week.

312. Comparative Vertebrate Anatomy (4) W–Odd Years

Prerequisite: BIO 112 and 214, plus 4 additional hours of BIO, excluding BIO 221-2.

Study of the similarities of anatomy and early development of vertebrates, complemented by dissection of representative adults. Three hours of lecture and 3 hours of laboratory/week.

315. Genetics (4) S

Prerequisite: 12 hours of biology, excluding BIO 221-2.

A study of the principles of heredity including both classical and molecular genetics. Three hours of lecture and 3 hours of laboratory/week.

316. Physiology (4) S

Prerequisite: 12 hours, excluding 221-2; CHE 106 or 314. Zoology is recommended.

A study of the principles of physiology, emphasizing metabolic processes common to many organisms. Three hours of lecture and 3 hours of laboratory/week.

317. Developmental Biology (4) F

Prerequisite: 12 BIO hours, excluding 221-2. Zoology is recommended.

A study of development in organisms, including both classical, descriptive embryology and contemporary investigations of processes involved in morphogenesis and differentiation.

318. Ecology (4) S–Even Years

Prerequisite: 12 BIO hours, excluding 221-2.

A study of the interactions between organisms and their biological and physical environments. Three hours of lecture and 3 hours of laboratory/week.

320. Immunology (4) F

Prerequisite: BIO 211, CHE 314, and 8 additional BIO hours, excluding BIO 221-2.

A fundamental course dealing with principles of immunity and the mechanism of the immune response. Laboratory emphasis is on serology and transplantation immunology. Three hours of lecture and 3 hours of laboratory/week.

321. Ecotoxicology (4) S–Even Years

Prerequisites: 12 BIO hours, excluding 221-2, and CHE 111-2.

A comprehensive overview of the ecological consequences of environmental pollution, the effects of toxic substances on the ecosystem as a whole and on individuals with that ecosystem, and the methodology of assessing pollutant damage. Three hours of lecture and 3 hours of laboratory/week.

322. Human Gross Anatomy (3) Su

Prerequisite: BIO 221 & 222 or 214 or 312.

Cadaver anatomy and dissection for nursing, preprofessional, and physical education students to enhance understanding of anatomy and prepare for work on living humans.

323. Cell Biology (4) S

Prerequisites: 12 BIO hours excluding BIO 221-2.

A study of biological systems at the cellular and subcellular levels emphasizing functional aspects such as protein procession and sorting, membrane systems, energy generation in mitochondria and chloroplasts, and cell signaling.

325. Molecular Biology (4) F

Prerequisites: BIO 211; CHE 314 and 324.

Basic principles of molecular biology focusing on recombinant DNA methods as applied to a variety of biological questions. Students will learn basic research laboratory skills through a wide range of methods from gel electrophoresis to subcloning. Three hours of lecture and three hours laboratory/week.

335. Conservation Biology (3) W

Prerequisite: BIO 200, MAT 211

A study of the principles of conservation and wildlife management. Examines the ecology of species of interest and the habitat manipulation techniques used in the conservation of such organisms.

336. Ecology and Conservation of the Vertebrates (4) S—Odd Years

Prerequisite: BIO 214

Study of the natural history and ecology of North American vertebrates, including fish, amphibians, reptiles, birds and mammals. Conservation concerns of particular vertebrates will be examined. Three hours lecture and 3 hours laboratory/week.

337. Taxonomy of the Vascular Plants (4) S—Odd Years

Prerequisite: BIO 215

A study of the vascular plants of the eastern United States, focusing on the common herbaceous plants, vines, shrubs, and trees and their identification in the field. Field trips required. Two hours lecture and 6 hours lab.

415. Collaborative Research Experience (2) F,S

Prerequisite: Junior Standing, 20 hours toward BIO major, minimum BIO GPA 2.0.

An introduction to the skills necessary to conduct scientific research in a group setting. Each group will develop a research question and submit research addressing that question. Students will attend all presentations in BIO 437. Course is not available for Audit.

425. Introduction to Research (1) F, S

Prerequisites: Junior standing, 20 hours toward BIO major, minimum BIO GPA of 2.0.

An introduction to the skills necessary to conduct scientific research, prepare a manuscript and make a presentation at a scientific meeting. Each student will develop and submit a research proposal for approval and attend all presentations in BIO 437.

426. Research Experience I (1) F, S, Su, W

Prerequisite: BIO 425 or 415, minimum BIO GPA of 2.0.

Students may only take this course during Winter or Summer if the student is also registered for Experience II (428) for a Fall or Spring Semester.

Individual research in accordance with the proposal developed and approved in 425. Students will attend all student presentations in BIO 437. Course is not available for Audit.

428. Research Experience II (1) F,S

Prerequisite: BIO 425 and minimum BIO GPA of 2.0; Corequisite: BIO 437.

Continuation of individual research initiated during BIO 426. Course is graded Pass/Fail and is not available for Audit.

437. Research Presentation (1) F, S

Prerequisite: BIO 426, minimum BIO GPA of 2.0.

Presentation of results of 426 as a publishable manuscript and oral presentation.

498. Biology Seminar (1) F, S

Prerequisite: 28 hours toward BIO major, a minimum BIO GPA of 2.0, senior standing.

Written and oral presentation of a library research paper and weekly discussions of current biological research. May be modified at the discretion of the department.

179-279-379-479. External Domestic Study Programs (1-3) As Needed

All courses and their applications must be defined and approved prior to registering.

180-280-380-480. Study Abroad Programs (1-4)

All courses and their application must be defined and approved prior to travel.

195-6-7. Special Studies (1-4)**295-6-7. Special Studies (1-4)**

Lower-level group studies that do not appear in the regular departmental offerings.

395-6-7. Special Studies (1-4)

Upper-level group studies that do not appear in the regular departmental offerings.

495-6-7. Independent Study (1-4)

Individual research under the guidance of a faculty member(s).