DEPARTMENT OF BIOLOGY

Web Site: http://www.twu.edu/biology

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Undergraduate Degrees Offered

All bachelor’s degrees in Biology require a minimum of 120 semester credit hours and a minor of at least 18 semester credit hours of which a minimum of 6 semester credit hours must be upper division. Consult the minor department for any additional requirements.

- B.S. in Biology with Teacher Certification for 4-8 Science (http://catalog.twu.edu/archives/2018-2019/undergraduate/arts-sciences/biology/biology-bs-teacher-certification-4-8-science)
- B.S. in Biology with Teacher Certification for 7-12 Composite Science (http://catalog.twu.edu/archives/2018-2019/undergraduate/arts-sciences/biology/biology-bs-teacher-certification-7-12-composite-science)
- B.S. in Biology with Certification for 7-12 Life Science (http://catalog.twu.edu/archives/2018-2019/undergraduate/arts-sciences/biology/biology-bs-certification-7-12-life-science)
- B.S. in Medical Technology (http://catalog.twu.edu/archives/2018-2019/undergraduate/arts-sciences/biology/medical-technology-bs)

For more information about the department, please visit the Department of Biology (http://www.twu.edu/biology) webpage. For information about the teacher education program, please visit the Teacher Education (https://twu.edu/teacher-education) webpage.

The Department of Biology is diversified so that students may select a curriculum that fits their choice of professions. These include a major in Biology, which provides preparation for Medical, Dental or Veterinary School; a major in Biology with Research Emphasis; or a major in Biology with preparation for a career in education. Students with an emphasis in any of these areas are advised by a special advisor and should follow the specific recommendations outlined in the respective study plan. There is also the option to major in Biology in preparation for the Medical Technology Degree, which begins with courses in Biology for three years before entering a Medical Technology School. Please see the next section on the Medical Technology program.

The Department of Biology also offers a minor in Biology, a Master of Science in Biology Research/Thesis or Professional Paper options, a Ph. D. in Molecular Biology and a minor in General Science in cooperation with the Department of Chemistry and Biochemistry. For graduate offerings, please refer to the graduate catalog.

Biology Major with Research Emphasis (120 semester credit hours)

This option is open to undergraduate students who wish to gain knowledge and experience in performing biology laboratory research and plan to pursue a career in scientific research and/or biotechnology. They also may plan to pursue a masters-level or doctoral-level program in the sciences or attend a professional school. The advantage of this program is the requirement for at least three semesters of undergraduate research experience. Admission to this program is by application only. Students should have applied for admission to the program by the beginning of their Sophomore year. Application forms may be obtained from the departmental secretary.

During the first three years of the program, students complete their core requirements for the B.S. degree in Biology and their core requirements in Chemistry. Before the Junior year, students should have initiated a research project with a Biology faculty member. Students must complete three (3) semesters of undergraduate research and must be enrolled in BIOL 4983 each semester while involved in the research project. This project culminates in the Senior year with the preparation of a publishable Senior Thesis. Additional required elective courses in Biology and Chemistry are selected through consultation with their Biology Department advisor.

Graduate Courses

Refer to the Graduate Catalog (http://catalog.twu.edu/archives/2018-2019/graduate) for information regarding graduate courses.

Admissions

Please see Admission (http://catalog.twu.edu/archives/2018-2019/undergraduate/admission-information) section of this catalog. The same standards for admission to the University apply to the Department of Biology.

Minors

Biology Minor

A minor in biology requires 18 semester credit hours, six of which must be advanced.

General Science Minor

The minor in General Science requires 18 hours, six of which must be advanced. These must be divided among three of the following: chemistry, biology, physics, and science courses. If the major is biology or chemistry the hours must be divided between two of the remaining three.

Courses

Bacteriology Courses


BACT 4413. Virology Laboratory. Preparation and evaluation of immunizing agents; clearance by the reticuloendothelial system; antigen-antibody reactions as evaluated by agglutination, precipitation, complement-fixation, and ELISA assays; immunochemistry techniques and immunopathology reactions. Prerequisites: BACT 3111, BACT 3113, and CHEM 2213. Co-requisite: BACT 4113. Three lecture hours a week. Credit: Three hours.


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Biology Courses

BIOL 1013. Human Biology. (TCCN BIOL 1309) Structure and function of the human body and its relationship to health and disease; interrelationships between individuals, groups, and environments; development of skills in problem solving and critical thinking; and discussion of recent human-related events impacting physiological functions. Two lecture hours and three laboratory hours a week. Credit: Three hours.

BIOL 1023. Environmental Biology. (TCCN BIOL 2406) Diversity of life; interrelationships between organisms and their environment; environmental interaction problems. Course for non-science majors. Two lecture and three laboratory hours a week. Credit: Three hours.

BIOL 1111. Principles of Biology I Laboratory. (TCCN BIOL 1106) Experiences with basic fundamentals of biology, including structure and function from cell to organism. Emphasis on plants as organisms. For science majors and minors. Co-requisite: BIOL 1113. Three laboratory hours a week. Credit: One hour.


BIOL 1121. Principles of Biology II Laboratory. (TCCN BIOL 1107) Experience with basic fundamentals of organismal biology of plants and animals. For science majors and minors. Prerequisite: BIOL 1111. Co-requisite: BIOL 1123. Three laboratory hours a week. Credit: One hour.


BIOL 3014. Bioinformatics and Computational Biology. Investigation of the structure and function of genes and proteins through the application of computational data storage and retrieval, pattern recognition, and chemical modeling techniques; includes study of sequence analysis, structural prediction, genomics, phylogenetics, systems biology, and databases. Prerequisites: BIOL 1123 and CHEM 1123. Three lecture and two laboratory hours a week. Credit: Four hours.

BIOL 4221. Ecology Laboratory. Laboratory and field experiments designed to illustrate the basic concepts of ecology. Co-requisite: BIOL 4223. Three laboratory hours a week. Credit: One hour.


BIOL 4293. Scientific Communication. Written and verbal communication skills involved in gathering, analyzing, and distributing scientific and technical information efficiently and accurately for specific scientific audiences. Prerequisite: Eight hours of biology courses. Three lecture hours a week. Credit: Three hours.

BIOL 4344. Pathophysiology. Basic study of physiological systems in health and disease. Prerequisites: ZOOL 1301 and ZOOL 2023. Four laboratory hours a week. Credit: Four hours.

BIOL 4583. Science in the Elementary Classroom. Strategies for teaching elementary school science using science inquiry and active learning techniques. Topics will include notebooking, portfolio building, 5E lesson plan design, classroom management, cooperative learning, assessment, and technology applications. Three lecture hours a week. Credit: Three hours.

BIOL 4593. Science in the Secondary Classroom. Strategies for teaching high school and middle school science using science inquiry and active learning techniques. Notebooking, portfolio building, 5E lesson plan design, classroom management, cooperative learning, assessment, and technology applications. Three lecture hours a week. Credit: Three hours.

BIOL 4681. Biology Seminar. Student presentations based on library or laboratory research projects. May be repeated for additional credit. One lecture hour a week. Credit: One hour.


BIOL 4813. Molecular and Cellular Biology: Gene Expression Laboratory. Three laboratory hours a week. Credit: Three hours.

BIOL 4821. Molecular and Cellular Biology: Genetics and Inheritance Laboratory. Laboratory studies in genetics and inheritance. Experience in basic laboratory techniques and their application in answering experimental questions. Prerequisites: BIOL 1123, BIOL 4811, and CHEM 3223. Co-requisite: BIOL 4823. Three laboratory hours a week. Credit: One hour.

BIOL 4903. Special Topics. Advanced studies in biology. Prerequisite: Permission of instructor. May be repeated for additional credit when topic varies. Three hours a week. Credit: Three hours.

BIOL 4911. Independent Study. Topics in advanced biology. Prerequisite: Permission of instructor. May be repeated. Credit: One hour.

BIOL 4913. Independent Study. Topics in advanced biology. Prerequisite: Permission of instructor. May be repeated. Credit: Three hours.

BIOL 4951. Cooperative Education. Credit: One hour.

BIOL 4953. Cooperative Education. Credit: Three hours.

BIOL 4983. Undergraduate Research. Original research at the undergraduate level. Formal, written report required. May be taken for honors credit and repeated for additional credit. No more than six semester credit hours will count towards the biology degree. Prerequisite: Permission of the department chair. Nine laboratory hours a week. Credit: Three hours.

**Botany Courses**

BOT 2111. Plant Biology Laboratory. (TCCN BIOL 1111) Laboratory studies of plant morphogenesis, anatomy, physiology, and classification. Prerequisites: BIOL 1111 and BIOL 1113, or permission of instructor. Co-requisite: BOT 2113. Three laboratory hours a week. Credit: One hour.

BOT 2113. Plant Biology. (TCCN BIOL 1311) Plant morphogenesis, anatomy, physiology, and classification. Prerequisites: BIOL 1113, BIOL 1111, BIOL 1123, and BIOL 1121, or permission of instructor. Co-requisite: BOT 2111. Three lecture hours a week. Credit: Three hours.

**Science Courses**

SCI 1114. Sustainable Physical Science. (TCCN PHYS 1415) Theory and practice of sustainability in the context of the physical sciences. Cycle of matter and energy in the environment, formation and consumption of resources, laws of motion and thermodynamics, properties of waves, and nature of electric charge. Three lecture and two laboratory hours a week. Credit: Four hours.

SCI 1123. General Life Science. (TCCN 1408) Life processes as they are based on physical chemical principles. Manifestation of different life forms in various organisms in adaptation to diverse environments. Three lecture hours a week. Credit: Three hours.

SCI 2103. Introduction to Environmental Chemistry: Global Perspectives. (TCCN ENV 1401) Chemical principles in the context of significant environmental issues. Topics include energy, biogeochemical cycles; issues such as the ozone layer, global warming and acid rain, and assessment of environmental risk. Two lecture and three laboratory hours a week. Credit: Three hours.

SCI 2113. Earth Science I. (TCCN GEOL 1401) Nature of science and scientific inquiry as revealed through an integrated investigation of physical and chemical development of the Earth through space and time. An examination of how the lithosphere, hydrosphere, and atmosphere are connected through the model of Plate Tectonics, and decoding the science based issues of the 21st century. Two lecture and two laboratory hours a week. Credit: Three hours.

SCI 3013. Community Conversation in Sustainability. Sustainability issues from scientific, sociological, and business perspectives. Topics include the impacts of energy production, food production, industry, and our modern lifestyle on our local and global community with an emphasis on systems and possible solutions. Three lecture hours a week. Credit: Three hours.

SCI 3033. Water in a Changing Environment. Sustainability issues of water from an American Southwestern to global perspective; combines the science, sociology, and economics of water quality and availability of transboundary water systems in a changing environment. Two lecture and two laboratory hours a week. Credit: Three hours.

SCI 3133. Climate Change: A Human Perspective. Study of climate change with a synthesis of meterology, geology, oceanography, astronomy, and anthropology. Examines past, present, and future climate change in the context of natural and anthropogenic forcing with special focus on man's impact on the climate and climate's impact on man. Two lecture and two laboratory hours a week. Credit: Three hours.

SCI 3153. History of Modern Science. An exploration of the development of the sciences in their social and political context; science from the Newtonian revolution to present. Two lecture and two laboratory hours a week. Credit: Three hours.


SCI 4923. Building Sustainable Communities. Capstone course for certificate in Science, Society, and Sustainability. Integration of concepts from science, sociology, and economics to synthesize sustainable solutions to community issues. Requires completion of a civic engagement project with a public presentation of sustainable solutions for a selected complex civic issue. Prerequisite: Completion of 12 hours towards Science, Society, and Sustainability certificate. Three seminar hours a week. Credit: Three hours.

**Zoology Courses**


ZOOL 2031. Human Anatomy and Physiology Laboratory. Study of the structures and functions of the human body. Co-requisite: ZOOL 2033. Three laboratory hours a week. Credit: One hour.

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ZOOL 3121. Neuroanatomy and Neurophysiology Laboratory. Laboratory exposure to the gross and microanatomy of the human brain and spinal cord. Discussion of case studies based on analyses of lesions associated with neurological dysfunction. Co-requisite: ZOOL 3123. Three laboratory hours a week. Credit: One hour.


ZOO 3313. Biology of Aging. Physiological, anatomical, and immunological changes occurring with the aging process. Three lecture hours a week. Credit: Three hours.

ZOO 4033. Animal Behavior. Basic examination of animal behavior principles, instinct, learning, communication, and social organization. Presentations compare various animal groups and students practice observational methods. Field trip. Prerequisite: Introductory course in general biology or zoology. Three lecture hours a week. Credit: Three hours.

ZOO 4241. Mammalian Physiology Laboratory. Laboratory experiments in mammalian and human physiology. Co-requisite: ZOOL 4243. Three laboratory hours a week. Credit: One hour.

ZOO 4243. Mammalian Physiology. Basic processes and functions of organs and organ systems in the mammalian body; consideration of human and other physiological functions. Prerequisites: BIOL 1123 and CHEM 1123. Co-requisite: ZOOL 4241. Three lecture hours a week. Credit: Three hours.

Faculty

Professors

HYNDS, DIANNA L., Professor of Biology. B.S., Hillsdale College; Ph.D., Ohio State University, Columbus.

MAIER, CAMELIA G., Professor of Biology. B.S., University of Bucharest; M.S., University of North Texas; Ph.D., University of North Texas.

MILLS, NATHANIEL C., Professor of Biology. B.S., Western Kentucky University; Ph.D., Vanderbilt University.

Associate Professors

BERGEL, MICHAEL, Associate Professor of Biology. B.Sc., The Hebrew University of Jerusalem; M.Sc., The Hebrew University of Jerusalem; Ph.D., The Hebrew University of Jerusalem.

CONRAD-WEBB, HEATHER M., Associate Professor of Biology. B.S., Baylor University; Ph.D., Ohio State University, Columbus.

HANSON, LAURA K., Associate Professor of Biology. B.S., University of Washington; Ph.D., Cornell University.

WESTMORELAND, SANDRA, Associate Professor of Biology. B.S., University of Houston; M.S., University of Texas at Arlington; Ph.D., University of Texas at Arlington.

Assistant Professors

AVERITT, DAYNA L., Assistant Professor of Biology. B.A., University of Texas at Austin; M.S., Georgia State University; Ph.D., Georgia State University.

BROWER, CHRISTOPHER, Assistant Professor of Biology. B.S., Northeastern Oklahoma State University; M.S., University of Oklahoma Health Sciences Center; Ph.D., University of Oklahoma Health Sciences Center.

GUMIENNY, TINA, Assistant Professor of Biology. B.S., Texas A&M University; Ph.D., State University of New York-Stony Brook.

PISLARIU, CATALINA, Assistant Professor of Biology. B.S., University of Bucharest, Romania; M.S., Ghent University, Belgium; Ph.D., University of North Texas.

Lecturers

DAVIS, ANN M., Lecturer of Biology. B.A., Rice University; Ph.D., Southwestern Medical Center.

ELROD, DIANA, Lecturer II of Biology. B.S., University of Arkansas for Medical Sciences; M.S., University of Memphis; Ph.D., University of North Texas.

Associate Clinical Professor

AHMED, SHAZIA A., Associate Clinical Professor of Biology. B.S., University of Karachi; M.S., University of Karachi; Ph.D., Texas Woman’s University.

Assistant Clinical Professors

HAMMETT, AMY JO, Assistant Clinical Professor of Biology. B.S., Texas Woman’s University; Ph.D., Texas A&M University.

TANNER, SHAUMARIE, Assistant Clinical Professor of Biology. B.S., Texas Woman’s University; M.S., Texas Woman’s University.