

# DEPARTMENT OF BIOLOGY

**Web Site:** <http://www.twu.edu/biology/>

**Chair:** Interim, Ron Hovis

**Location:** GRB 201

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**Graduate Academic Advisor:** Heather Conrad-Webb, Ph.D.

**Location:** GRB 225

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## Graduate Degrees Offered

- M.S. in Biology (<http://catalog.twu.edu/graduate/arts-sciences/biology/biology-ms>)
- M.A.T. (Interdisciplinary - emphasis in Science) (<http://catalog.twu.edu/graduate/professional-education/mat-graduate-interdisciplinary-degree>)
- Ph.D. in Molecular Biology (<http://catalog.twu.edu/graduate/arts-sciences/biology/molecular-biology-phd>)

The doctoral degree is offered through the Federation of North Texas Area Universities.

Students in the Department of Biology can obtain a graduate degree with an emphasis in molecular biology, microbiology, neurobiology, general biology, botany, bioinformatics, virology or science education. The primary objectives of the department are to provide education and training to prepare students to enter a career in research, industry or teaching. Within the department, there are opportunities for both teaching and research assistantships. For teaching assistantships, students should request an application from the department.

## Admissions

Please see the admissions section (<http://catalog.twu.edu/graduate/graduate-school/admission-graduate-school>) in this catalog. In addition to these general requirements, the Department of Biology requires the following for admission to its graduate degree programs:

1. A bachelor's degree in Biology or its equivalent. In addition admission to the Ph.D. program requires undergraduate courses in organic chemistry/biochemistry (2 semesters); calculus (1 semester); and physics (2 semesters). Students without an undergraduate Biology major will be considered if the departmental admissions committee believes that the student shows academic promise. These students may be granted provisional admission while they complete the requisite background coursework.
2. Submission of GRE (<http://www.ets.org/gre>) scores. Those accepted into a master's program typically exceed 148 verbal and 140 quantitative on the Revised GRE. Those accepted into the Ph.D. program commonly have GRE scores above 153 verbal and 144 quantitative on the Revised GRE.
3. A statement of purpose (1-3 pages) that includes reasons for pursuing graduate work, background experience and professional goals. Please include all contact information and submit the statement of purpose directly to the Biology Graduate Advisor.

4. Three letters of recommendation from persons familiar with the applicant's academic capabilities. The referees should submit their letters of recommendations on letterhead stationary directly to the Biology Graduate Advisor by email.

International students should follow the application procedures outlined by the International Education Office (<http://www.twu.edu/international-education>). In addition, applicants should also send the statement of purpose and letters of recommendation directly to the Biology Graduate Advisor. Those students wishing to apply for teaching assistantships must demonstrate English speaking proficiency by one of the following:

- score of 26 or higher on the TOEFL (<http://www.ets.org/toefl>) iBT speaking section
- score of 50 or higher on the Test of Spoken English
- a Pearson Test of English (<https://pearsonpte.com>) (PTE) Academic score of 53 or above;
- score of 7.5 or higher on the IELTS (<http://www.ielts.org>) Speaking test
- score of 4 or higher on the MELAB (<http://www.cambridgemichigan.org/melab>) Speaking test

Applicants who satisfy the Graduate School's admission standards are forwarded for review to the departmental admissions committee. This committee is responsible for recommending acceptance into Biology graduate programs.

## Minors

Master's level: 6 graduate hours of biology.

Doctoral level: 12 graduate hours of biology.

## Courses

### Bacteriology Courses

**BACT 6534. Plasmids as Vectors for Recombinant DNA.** Molecular structure and replication of plasmids. Utilization of plasmids for isolation, characterization, and expression of prokaryotic and eukaryotic genes. Two lecture and six laboratory hours a week. Credit: Four hours.

**BACT 6544. Viruses as Vectors for Recombinant DNA.** Replicative cycle of viruses utilized in recombinant DNA technology. Viruses used to isolate genetic material from other sources and characterization of the recombinant DNA by size, restriction endonuclease mapping, and nucleic acid sequencing. Two lecture and six laboratory hours a week. Credit: Four hours.

### Biology Courses

**BIOL 5014. Advanced Bioinformatics and Computational Biology.** Theory and methods for computational research of biomacromolecular and cellular structure and function, including the application of computational data storage and retrieval, pattern recognition, and chemical modeling techniques; research utilizing sequence analysis, structural prediction, genomics, phylogenetics, or systems biology. Prerequisites: Courses in molecular biology and biochemistry. Three lecture and two laboratory hours a week. Credit: Four hours.

**BIOL 5033. Advanced Science in the Secondary Classroom.** Advanced 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 5111. Teaching Methods for Biology Laboratory Instructors.**

Examination of teaching methods in the biology laboratory. Development of attitudes and behaviors which typify the excellent teacher. One lecture hour a week. Credit: One hour.

**BIOL 5123. Biostatistics.** Advanced studies in biometric systems, experimental design, and data analysis. Prerequisite: Twelve hours of biology and permission of instructor. Three lecture hours a week. Credit: Three hours.

**BIOL 5293. Advanced Scientific Communication.** Advanced writing and verbal communication skills involved in gathering, analyzing, and distributing scientific and technical information for specific scientific audiences; advanced research project design and implementation, data collection, and the design and application of appropriate statistical analysis. Three lecture hours a week. Credit: Three hours.

**BIOL 5333. Advanced Pathophysiology.** Principles of pathophysiology; including normal physiology, effects of abnormalities of function, instrumentation and measurement of physiological function. Three lecture hours a week. Credit: Three hours.

**BIOL 5503. Research Methods.** Studies in bibliographical procedures, the selection of methods applicable to specific problems, and writing and organization of review articles. May be repeated for additional credit. Credit: Three hours.

**BIOL 5611. Readings in Biology.** Library research in selected subjects in biology. Credit: One hour.

**BIOL 5613. Readings in Biology.** Library research in selected subjects in biology. Credit: Three hours.

**BIOL 5681. Seminar.** Presentation of research projects, data, and research by graduate students; discussions of presentations and related literature or laboratory techniques. May be repeated for additional credit. One seminar hour a week. Credit: One hour.

**BIOL 5801. Biological Research.** Nature of biological investigations; methods and tools of research; survey of scientific literature. Credit: One hour.

**BIOL 5803. Biological Research.** Nature of biological investigations; methods and tools of research; survey of scientific literature. Credit: Three hours.

**BIOL 5881. Biological Research.** Continuation of BIOL 5801. Credit: One hour.

**BIOL 5883. Biological Research.** Continuation of BIOL 5803. Credit: Three hours.

**BIOL 5903. Special Topics.** Offerings in biology, botany, microbiology, and zoology. May be repeated for additional credit. Prerequisite: Permission of instructor. Credit: Three hours.

**BIOL 5911. Independent Study.** Independent or tutorial work in selected areas in biology. May be repeated for additional credit. Credit: One hour.

**BIOL 5913. Independent Study.** Independent or tutorial work in selected areas in biology. May be repeated for additional credit. Credit: Three hours.

**BIOL 5973. Professional Paper.** Written presentation of literature and possible laboratory research in a selected area. Credit: Three hours.

**BIOL 5981. The Professional Portfolio.** Development of a professional portfolio by students in the Master of Arts in Teaching program demonstrating the student's growth in the Learner-Centered Competencies. Pass-fail grade only. Credit: One hour.

**BIOL 5983. Thesis.** Credit: Three hours.

**BIOL 5993. Thesis.** Prerequisite: BIOL 5983. Credit: Three hours.

**BIOL 6334. Advanced Cell Biology.** Survey of current understanding of biogenesis, architecture and function of cellular organelles. The cell cycle and regulation of cell growth. Prerequisite: Permission of the instructor. Four lecture hours a week. Credit: Four hours.

**BIOL 6513. Molecular Biology.** Survey of current understanding of DNA structure, organization, chromosome replication, gene transcription, ribosome assembly, and translation. Emphasis is on molecular processes and their regulation in both prokaryotes and eukaryotes. Prerequisites: CHEM 5613 and CHEM 5623, or permission of instructor. Three lecture hours a week. Credit: Three hours.

**BIOL 6734. Advanced Genetics.** A literature-based course covering theory, experimental methods, and data analysis in genetics. Prerequisites: BIOL 6513 and BIOL 6334. Four lecture hours a week. Credit: Four hours.

**BIOL 6821. Research in Molecular Biology.** Application of molecular studies to biological problems. May be repeated for additional credit. Credit: One hour.

**BIOL 6823. Research in Molecular Biology.** Application of molecular studies to biological problems. May be repeated for additional credit. Credit: Three hours.

**BIOL 6831. Research in Molecular Biology.** Continuation of BIOL 6821. May be repeated for additional credit. Credit: One hour.

**BIOL 6833. Research in Molecular Biology.** Continuation of 6823. May be repeated for additional credit. Credit: Three hours.

**BIOL 6843. Health Care Genetics.** Human genetics and gene abnormalities with emphasis on application of new genomic technology in medicine; includes gene expression, inheritance, consequences of mutation, recombinant DNA technology, genetic testing, gene therapy, and genomics; incorporation of sequence-based health with evidence-based practice. Fulfills requirement in the Doctor of Nursing Practice program. Three lecture hours a week. Credit: Three hours.

**BIOL 6903. Special Topics.** Selected studies in advanced biology. Prerequisite: Permission of instructor. May be repeated for additional credit. Credit: Three hours.

**BIOL 6911. Independent Study.** Independent work in selected areas of molecular biology. May be repeated for additional credit. Credit: One hour.

**BIOL 6913. Independent Study.** Independent work in selected areas of molecular biology. May be repeated for additional credit. Credit: Three hours.

**BIOL 6983. Dissertation.** Credit: Three hours.

**BIOL 6993. Dissertation.** Prerequisite: BIOL 6983. Credit: Three hours.

## Zoology Courses

**ZOOL 5423. Endocrinology.** Advanced studies of biology and biochemistry of the glands of internal secretion. Prerequisite: ZOOL 4243. 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.

### **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.