Biotechnology

Biotechnology—creating technology or products from cellular and biomolecular processes, often DNA technology—is one of the fastest growing and innovative scientific sectors.

Biotechnology fast-tracks you for careers in life science while meeting the standard entry requirements for medical school and other professional schools. You will learn about the use of biotechnology in areas such as health care, veterinary medicine, agriculture, and the environment.

Our students study the science behind breakthrough discoveries that revolutionized gene editing, stem cell research, green energy, and big data in personalized medicine. Our students learn in the classroom and lab, as well as in a chosen field alongside biotechnology experts. Our students gain the knowledge, expertise, ethical framework, and contacts necessary to achieve a successful career in the life sciences. Our Biotechnology degree not only fast-tracks you for careers in life science, it also meets standard entry requirements for medical school and other professional schools.

On campus, students have access to our new biology and analytical chemistry research laboratories, our confocal microscopy suite, and our on-campus Ecosystem Study Area to put classroom techniques to practice. Our students gain marketable skills and networks through co-op placements and practicums.

ID	COURSE	CREDITS
BIOT 100	**BIOT 100 - Biotechnology Practicum I | 2022-2023** This hands-on course is part of an intern program in the Biology Department at TWU designed to provide instruction in general laboratory procedures and laboratory safety beyond that required during regular undergraduate laboratories. Performed tasks are evaluated and occur in the areas of animal husbandry, general laboratory maintenance, cell culture, histochemistry, light microscopy, and protein chemistry (i.e. western blotting, SDS-PAGE). Students will also acquire general instruction in Good Laboratory Practice (GLP) and Good Animal Practice (GAP).	1
BIOT 200	**BIOT 200 - Biotechnology Practica II | 2022-2023** Biotechnology Practica II-IV provide general and advanced intern experiences in industrial settings. BIOT 200 (2 sem. hrs.) is a requirement for entry to co-op placements and graduation. BIOT 300 and 400 (3 sem. hrs. each) are additional intern experiences providing exposure to advanced techniques and applications in biotechnology. The skills taught in each practicum vary depending on the industrial setting, but should include some of the following techniques: mammalian tissue culture; monoclonal antibody production including cell fusion; hybridoma screening by ELISA and immunoblotting; fermentation microbiology and the operation of large-scale fermentation systems; insect cell culture and use of Baculovirus expression vectors to produce recombinant proteins; downstream processing and the recovery and purification of proteins, carbohydrates, lipids; freezing, freeze-drying and preservation of microorganisms,	2, 3

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	animal viruses, cell lines and hybridomas; high throughput screening strategies, diagnostic testing; methods in bioinformatics; and quality control procedures.	
BIOT 290	**BIOT 290 - Introduction to Biotechnology | 2022-2023** This course reviews the role of modern biotechnology in plant, animal, and marine biology, microbiology, agriculture, the pharmaceutical industry and medicine. The course focuses on underlying technologies in biotechnology, how these technologies are implemented, together with public concerns and government guidelines and legislation.	3
BIOT 300	**BIOT 300 - Biotechnology Practica III | 2022-2023** Biotechnology Practica II-IV provide general and advanced intern experiences in industrial settings. BIOT 200 (2 sem. hrs.) is a requirement for entry to co-op placements and graduation. BIOT 300 and 400 (3 sem. hrs. each) are additional intern experiences providing exposure to advanced techniques and applications in biotechnology. The skills taught in each practicum vary depending on the industrial setting, but should include some of the following techniques: mammalian tissue culture; monoclonal antibody production including cell fusion; hybridoma screening by ELISA and immunoblotting; fermentation microbiology and the operation of large-scale fermentation systems; insect cell culture and use of Baculovirus expression vectors to produce recombinant proteins; downstream processing and the recovery and purification of proteins, carbohydrates, lipids; freezing, freeze-drying and preservation of microorganisms, animal viruses, cell lines and hybridomas; high throughput screening strategies, diagnostic testing; methods in bioinformatics; and quality control procedures.	2, 3
BIOT 390	**BIOT 390 - Biotechnology & Christian Theology | 2022-2023** This course is designed to untangle some of the actual or perceived dissonance between issues of biological science and Christian theology. Six major topics are addressed: (1) models, analogies and metaphors in science and Christian theology; (2) scientific and religious investigations of the biosphere; (3) defining human nature; (4) defining non-human nature; (5) caring for the earth; and (6) the biomedical revolution. The common threads among these topics are the tension between Christian faith and the findings of basic and applied biology (biotechnology), and the call to action required in a faith-based view of creation. As well as speaking from their own disciplines and background, the course instructors take part in panel discussions at the end of each of the six units to foster discussion and dialogue on the issues. Student participation is further encouraged by group projects in which the group must develop and dissonance between scientific and religious worldview perspectives.	3
BIOT 400	**BIOT 400 - Biotechnology Practica IV | 2022-2023** Biotechnology Practica II-IV provide general and advanced intern experiences in industrial settings. BIOT 200 (2 sem. hrs.) is a requirement for entry to co-op placements and graduation. BIOT 300 and 400 (3 sem. hrs. each) are additional intern experiences providing exposure to advanced techniques and applications in biotechnology. The skills taught in each practicum vary depending on the industrial setting, but should include some of the following techniques:	2, 3

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	mammalian tissue culture; monoclonal antibody production including cell fusion; hybridoma screening by ELISA and immunoblotting; fermentation microbiology and the operation of large-scale fermentation systems; insect cell culture and use of Baculovirus expression vectors to produce recombinant proteins; downstream processing and the recovery and purification of proteins, carbohydrates, lipids; freezing, freeze-drying and preservation of microorganisms, animal viruses, cell lines and hybridomas; high throughput screening strategies, diagnostic testing; methods in bioinformatics; and quality control procedures.	
BIOT 409	**BIOT 409 - Thesis Preparation | 2022-2023** Students will be required to choose a topic for their senior thesis (BIOL 409-410/GENV 409- 410) in consultation with an instructor. Selected readings and references pertinent to the topic will be assigned. A final written report will be presented consisting of a detailed thesis proposal and a review of the literature.	1
BIOT 410	**BIOT 410 - Senior Thesis | 2022-2023** Research in a chosen area of biology or environmental studies with a final written report. Presentation of research findings will also be made by the student in a poster session.	2
BIOT 470	**BIOT 470 - Introduction to Bioinformatics | 2022-2023** An overview of the interdisciplinary science of genomics, proteomics, and bioinformatics which applies the tools of information technology (computer hardware and software) to analyze biological data such as gene or protein sequences. This course examines the theory of bioinformatics as well as its practical application to biological problems using approaches such as BLAST searches, phylogenetics, and protein structure function analysis.	3
BIOT 490	**BIOT 490 - Advanced Biotechnology | 2022-2023** This capstone course in biotechnology considers the theoretical and practical aspects of implementing biotechnology, paying particular attention to current issues including: (1) technology transfer and commercialization; (2) patent protection in biotechnology; (3) Good Laboratory Practices (GLP); (4) Good Manufacturing Practices (Food and Drug Regulations, 2002 edition); (5) Good Clinical Practices (GCP); (6) Research Ethics Board guidelines; (7) validation studies; (8) downstream processing and the recovery of purified products; (9) novel developments in methodology. The course includes a seminar series by industry and regulatory experts and site visits to local biotechnology companies to assess how they have implemented and overcome obstacles to production and quality control.	3