Biotechnology

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The biotechnology program bridges the gap between biology, biochemistry and clinical laboratory sciences, preparing graduates for the ever-evolving life-sciences field.

The Bachelor of Applied Science in Biotechnology is offered through the College of Liberal Arts and Sciences at the KU Edwards Campus. In this program, students acquire a unique combination of science and workforce skills. Extensive hands-on laboratory experience provides a solid foundation in biotechnology, while courses in management and communications help students build a professional skill set.

Undergraduate Admission

Admission to KU
All students applying for admission must send high school and college transcripts to the Office of Admissions. Unless they are college transfer students with at least 24 hours of credit, prospective students must send ACT or SAT scores to the Office of Admissions. Prospective first-year students should be aware that KU has qualified admission requirements that all new first-year students must meet to be admitted. Consult the Office of Admissions (http://admissions.ku.edu) for application deadlines and specific admission requirements.

Visit the International Support Services (http://www.iss.ku.edu) for information about international admissions.

Students considering transferring to KU may see how their college-level course work will transfer on the Office of Admissions (http://credittransfer.ku.edu) website.

Admission to the College of Liberal Arts and Sciences

Admission to the College is a different process from admission to a major field. Some CLAS departments have admission requirements. See individual department/program sections for departmental admission requirements.

Biotechnology Program

Grounded in biological sciences, chemistry and advanced technology, biotechnology employs biological systems to solve scientific challenges that impact society. Through this program, you will be equipped for diverse career options in fields such as:

- Medical education or professions
- Food science
- Environmental and agricultural sciences
- Animal health
- Pharmaceuticals

In this unique program, you will not be assessed based on your ability to memorize an array of facts but by your ability to reference facts, formulate an approach and integrate data to solve problems.

Courses

BTEC 300. Research Methods in Biotechnology. 3 Hours N.
An integrated lecture and laboratory course exploring the science and basic laboratory skills used in food science, agricultural science, pharmaceutical science, clinical medicine, animal health, and environmental science. Survey of career opportunities in biotechnology. Guest lectures from field-experts in biotechnology. Prerequisite: BIOL 152; concurrent or prior enrollment in CHEM 330; or consent of instructor. LEC.

BTEC 305. Molecular and Microbiological Techniques. 4 Hours N.
An integrated lecture and laboratory course exploring the science and tools used in microbiology-based fields. A strong focus is placed on developing functional scientific skills required to run an RD or Production Lab. Students will survey the diversity of microbial life while becoming proficient in the tools that are used extensively in the laboratory. We emphasize hands-on experience with lab techniques applicable to addressing a variety of scientific problems. Specifically, this course will challenge students to apply their knowledge and skills to construct and express recombinant proteins in mammalian cells, purify, and quantitate their products. Prerequisite: Concurrent or prior enrollment in BIOL 350 and BTEC 300; or consent of instructor. LEC.

BTEC 310. Scientific Communications. 3 Hours N.
Theory and practicum exploring communications relevant to careers in science. This course will explore the fundamentals of clear, effective communications in written and oral formats. Students will gain experience communicating in a variety of real-world situations with technical and lay audiences. Particular emphasis will be placed on the communications occurring within the work place setting. Students will also be challenged to build a network with the biotech industries through external events. Prerequisite: ENGL 102; or consent of instructor. Students must be in their junior or senior year of a science-related degree. LEC.

BTEC 341. Principles of Bioprocessing Laboratory I. 1 Hour N.
Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Includes bacterial cell culture techniques, principles of bioreactor/fermentation operations and purification techniques, and calibration. Primary goal of this course is to provide students with an advanced background in bacterial upstream and downstream biotechnology. Prerequisite: BTEC 300; BTEC 340 or concurrent enrollment in BTEC 340. LAB.

BTEC 400. Applied Immunology. 3 Hours N.
An integrated lecture and laboratory course exploring the fundamentals of immunology. The course focuses on developing a conceptual knowledge of the constituents and processes of the immune system. Students will develop a functional understanding of how to operate and apply current immunology-based techniques. Laboratory activities will explore the use of immunological tools for research, discovery, and analysis of processes and experimental compounds. Prerequisite: BTEC 300; BTEC 305; or consent of instructor. LEC.

BTEC 424. Independent Study in Biotechnology. 1-3 Hours N.
Independent project at a related bioscience industry partner or faculty in selected topics of current translational research interest. May be undertaken only with the consent of the major advisor who will guide the research after determining objectives with the interested industry partner or faculty. Prerequisite: Consent of instructor. IND.

BTEC 441. Principles of Bioprocessing Laboratory II. 1 Hour N.
Mammalian cell culture techniques, principles of bioreactor operations and purification techniques, and calibration. The primary goal of this course is to provide students with an advanced background in mammalian
upstream and downstream biotechnology. Prerequisite: BTEC 341; BTEC 440 or concurrent enrollment in BTEC 440. LAB.

**BTEC 460. Introduction to Quality Control/Quality Assurance in Biotechnology. 3 Hours N.**
Quality control techniques, assurance issues, and management methods. Quality in design and planning, in the constructed project, and in production of goods and services. Prerequisite: BTEC 330. LEC.

**BTEC 475. Applied Separation Science and Quantitative Analysis. 6 Hours N.**
An integrated lecture and laboratory course exploring the fundamentals of separation science and quantitative analysis of small molecules, peptides, and proteins. Students will be challenged to develop a functional understanding of the theory and application of sample preparation, separation technologies, and methods for quantification. Prerequisite: BTEC 300; or consent of instructor. LEC.

**BTEC 494. Selected Topics in Biotechnology. 1 Hour N.**
A synthesis and discussion of current trends related to biotechnology. Emphasis is placed on providing students with an awareness of advances on the leading edge of discovery, critically analyzing data, and developing skills for success in the next stage of a career in biotechnology. This course can be repeated for up to 2 credit hours. Prerequisite: Concurrent or prior enrollment in BTEC 300; or consent of instructor. Students must be in their junior or senior year of a biology-related degree. LEC.

**BTEC 501. Biotechnology Ethics and Responsible Conduct of Research. 1 Hour N.**
Student investigations and discussions of current controversial issues in biotechnology. This course emphasizes thinking about new technologies in a rational and thoughtful way. Prerequisite: BTEC 300. LEC.

**BTEC 540. Biotechnology Capstone I. 3 Hours N.**
A project-based course that challenges students to develop, plan, execute, and communicate the results of a biotech-related project. Students will be guided through the initial stages of project design, project management, logistics, and technical training necessary to complete their project. This course is the first of a two semester series (BTEC 540 BTEC 640.) Prerequisite: BTEC 305; BTEC 475; concurrent or prior enrollment in BIOL 600; or consent of instructor. LAB.

**BTEC 541. Gene Expression Analysis: Microarrays. 2 Hours N.**
This course reviews current theory, techniques, instrumentation, troubleshooting, analysis tools, and advanced protocols for microarray analysis. Students have the opportunity to utilize skills learned during lecture in a laboratory environment. At the conclusion of this course, students understand microarray experimental design, its tools, and analysis of generated data. Prerequisite: BTEC 300. LAB.

**BTEC 542. Protein Expression in Insect Cells. 2 Hours N.**
Introduction to the insect cells expression system, and its advantages and disadvantages. Introduction to expression of recombinant proteins with baculovirus. Outline of antibody and antibody fragments as well as other complex proteins. Basic techniques used for growth and maintenance of insect cell cultures. The lab portion of the course provides students with practical experience in protein expression techniques in the insect cells expression system. Prerequisite: BTEC 300. LAB.

**BTEC 545. RNA Interference and Model Organisms. 2 Hours N.**
Introduction and history of RNA interference technology. Principles, mechanism, and applications of RNA interference in model organisms. Laboratory sessions include RNA interference-mediated silencing of genes in plants, C. elegans, and mammalian cell culture. Prerequisite: BTEC 300. LAB.

**BTEC 547. Bioanalytical Lab. 2 Hours N.**
Analytical methods used for testing biotherapeutics are examined. Emphasis is placed on assessing protein concentration, purity, identity and activity. The importance of sample processing, throughput and level of validation are explored as samples from upstream processing, downstream processing and final bulk are interrogated. Students also learn key concepts used to validate the performance of analytical methods. Prerequisite: BTEC 300. LAB.

**BTEC 550. Applied Bioinformatics. 2 Hours N.**
Overview of the fields of bioinformatics and genomics. Topics, tools, issues and current trends in these and related fields are discussed. Principles and practical application of bioinformatics tools in molecular biology, genetics, and electronic medical records are evaluated. The haploid human genome occupies a total of just over 3 billion DNA base pairs. The medical records of a population contain clues concerning better identification and treatment of disease. This information is not contained in books, but stored in electronic databases. This course is designed for life scientists from all fields to introduce them to the power of bioinformatics and enable them to access and utilize biological information in databases for their own research. Prerequisite: BTEC 300; BIOL 570 or MATH 365 (preferred); consent of instructor. LEC.

**BTEC 599. Biotechnology Internship. 1-6 Hours N.**
Supervised internship at a biotech company; or an independent thesis; or honors thesis with Honors Program. This course can be repeated for up to a total of 6 credit hours. Prerequisite: BTEC 305; BTEC 475; and consent of instructor. FLD.

**BTEC 630. Biotechnology, Regulation, Quality Control, and Quality Assurance. 3 Hours N.**
An integrated lecture and laboratory course exploring quality control, quality assurance, and regulatory considerations. Hands-on experimentation will develop a functional understanding of protocol design and a practical knowledge of GXP-guided processes. This course will focus on issues relevant to manufacturing, packaging, labeling, testing, and control of pharmaceutical products. Guest lectures from field-experts in the biotechnology industry. Prerequisite: Concurrent or prior enrollment in BTEC 599; or consent of instructor. LEC.

**BTEC 640. Biotechnology Capstone II. 3 Hours AE61 / N.**
A project-based course that challenges students to develop, plan, execute, and communicate the results of a biotech-related project. Students will be guided through the execution of their proposed plan with particular emphasis placed on managing scientists, gathering and analyzing data, and instituting quality controls/quality assurance protocols. Students will communicate the results of their project through a combination of an oral presentation and poster. This course is the second of a two semester series (BTEC 540 BTEC 640.) Prerequisite: BTEC 540; or consent of instructor. LAB.