

Biotechnology - CPS (BTC)

Courses

BTC 1300. Introduction to Biotechnology. (3 Hours)

Introduces the integrated science of genomics, proteomics, and bioinformatics using a case study, hands-on, problem-solving approach. Offers students an opportunity to practice accessing and using online databases to engage in real-time discoveries using the same approach current scientists use in their own research. Focuses on the process of doing genomic analysis and thinking from a genomics perspective. Uses integrated multimedia and web resources to introduce new technologies and to allow students to research and analyze real genomics data.

Prerequisite(s): BIO 1200 with a minimum grade of D- ; BIO 1201 with a minimum grade of D-

Corequisite(s): BTC 1301

BTC 1301. Lab for BTC 1300. (1 Hour)

Accompanies BTC 1300. Designed to introduce cutting-edge skills and techniques used in research labs and biopharmaceutical companies. Offers students an opportunity to learn the theoretical background of a technique in the lecture portion of the course and to be able to practice the techniques in the lab—to learn to read and write protocols; to accurately and precisely measure liquids and solids; to prepare solutions and media; to keep a virtual lab notebook, all while working in a safe and aseptic lab setting; and to learn how to perform electrophoresis, protein quantification, DNA extraction, and the basic use of a bioreactor.

Prerequisite(s): BIO 1200 with a minimum grade of D- ; BIO 1201 with a minimum grade of D-

Corequisite(s): BTC 1300

BTC 1990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 2700. Cell and Tissue Culture Techniques. (3 Hours)

Seeks to provide students with an understanding of mammalian cell culture. Introduces modern cell culture techniques that are used in research labs and in biopharmaceutical companies. Offers students an opportunity to learn the theoretical background and basic lab math via a short lecture at the beginning of each class. Topics include aseptic technique, cell passaging, cell counting, thawing cells, freezing cells, plating cells, and mammalian cell transfection. Studies these techniques for both adherent and suspension mammalian cells.

Prerequisite(s): BTC 1300 with a minimum grade of D- ; BTC 1301 with a minimum grade of D-

Corequisite(s): BTC 2701

BTC 2701. Lab for BTC 2700. (1 Hour)

Accompanies BTC 2700. Provides a hands-on understanding of mammalian cell culture. Explores aseptic technique, cell passaging, cell counting, thawing cells, freezing cells, plating cells, and mammalian cell transfection. Offers students an opportunity to practice reading protocols, writing protocols, and critical thinking in the laboratory.

Prerequisite(s): BTC 1300 with a minimum grade of D- ; BTC 1301 with a minimum grade of D-

Corequisite(s): BTC 2700

BTC 2990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 3990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 4300. Biotechnology and Pharmaceutical Processing. (3 Hours)

Focuses on the fundamental principles and elements in the process of manufacturing biopharmaceuticals using current good manufacturing practices (CGMPs). Covers kinetics of enzymatic reactions; selected microbial and cell metabolism and relevant control mechanisms; kinetics of cell growth, cell death, substrate consumption, and product formation; mathematical modeling and representation of bioprocesses; and examples of industrial bioprocesses to illustrate types and operations of upstream and downstream unit operations and mass transfers in fermentation systems. Emphasizes bioprocesses for recombinant protein production. Explores in-depth selected methods, techniques, and instruments used in biotechnology. Covers up-to-date CGMPs used in biotech/biopharmaceutical industries and how those practices influence quality control/management of downstream products.

Prerequisite(s): BTC 1300 with a minimum grade of D- ; BIO 2300 with a minimum grade of D-

Corequisite(s): BTC 4301

BTC 4301. Lab for BTC 4300. (1 Hour)

Provides students with up-to-date good manufacturing practices (CGMPs) used in biotech/biopharmaceutical industries and how those practices influence quality control/management of products. Covers kinetics of cell growth, cell death, substrate consumption, and product formation; selected microbial and cell metabolism and relevant control mechanisms; examples of industrial bioprocesses for the production of proteins, enzymes, and vaccines. Explores selected methods, techniques, and instruments used in biotechnology. Designed to refine and build upon cutting-edge lab skills and techniques. Offers students an opportunity to learn the theoretical background of a technique in the lecture portion of the course and be able to practice the techniques in this lab course; to read and write protocols; to accurately and precisely measure liquids and solids; to prepare solutions and media; to keep a virtual lab notebook; to use a bioreactor, plate-reader, purification machine, etc.; all while working in a safe and aseptic lab setting.

Prerequisite(s): BTC 1301 with a minimum grade of D ; BIO 2300 with a minimum grade of D

Corequisite(s): BTC 4300

BTC 4450. Quality Control and Validation Issues. (3 Hours)

Introduces the regulations and guidelines affecting the development, production, registration, and sale of medical devices, diagnostics, pharmaceuticals, and biotechnology products worldwide. Focuses on why regulations are necessary, ethical considerations, and international standards. Offers practical instruction in the basics of quality control and process/facility validation for the biotechnology industry. Reviews appropriate regulations, including personnel and process flow, environmental and water testing, sterility testing, and incoming material and in-process testing. Other topics include the establishment of a master validation plan; description of facility, equipment, and process validations; and cleaning validations.

Prerequisite(s): BTC 1300 with a minimum grade of D- ; (MTH 2300 with a minimum grade of D- or MTH 2310 with a minimum grade of D- or MTH 3300 with a minimum grade of D-)

BTC 4850. Biotechnology Senior Project. (3 Hours)

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field.

Prerequisite(s): BIO 2300 with a minimum grade of D- ; BIO 2500 with a minimum grade of D-

Attribute(s): NUpath Capstone Experience, NUpath Writing Intensive

BTC 4990. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 5210. Human Experimentation: Methodological Issues Fundamentals. (3 Hours)

Explores issues related to human experimentation, including scientific, technical, and methodological issues and the ethical, clinical, and financial repercussions of clinical trial studies. Covers how effective study designs can mitigate the common limitations and problems of clinical trials. Considers ethical issues, such as selective reporting of clinical research, informed consent, and protection of research participants in domestic and international clinical trials. Offers students an opportunity to develop and study statistical modeling and methodologies utilized in constructing clinical study designs.

BTC 6210. Human Experimentation: Methodological Issues Fundamentals. (4 Hours)

Explores issues related to human experimentation, including scientific, technical, and methodological issues and the ethical, clinical, and financial repercussions of clinical trial studies. Covers how effective study designs can mitigate the common limitations and problems of clinical trials. Considers ethical issues, such as selective reporting of clinical research, informed consent, and protection of research participants in domestic and international clinical trials. Offers students an opportunity to develop and study statistical modeling and methodologies utilized in constructing clinical study designs.

BTC 6211. Validation and Auditing of Clinical Trial Information. (4 Hours)

Presents a comprehensive overview of the management of quality assurance in clinical trials, Good Clinical Practices (GCP), and management of audit outcomes, as well as current issues and trends in the validation and auditing of clinical studies.

Prerequisite(s): BTC 6210 with a minimum grade of C- ; (RGA 6000 with a minimum grade of C- or RGA 6001 with a minimum grade of C-)

BTC 6213. Clinical Trial Design Optimization and Problem Solving. (4 Hours)

Discusses quantitative data analysis in creating dynamic drug-disease models, strategic market models, trial simulation models, and integrated financial models, which enable key variable analysis in clinical trial developments in real time. This integrated approach allows all decisions in the design to optimize value against both scientific and business criteria simultaneously and continuously. Offers students an opportunity to learn to take a complete view of the development process at the outset—across time, across the portfolio, and at all levels in the organization. This allows for greater insight into a drug's potential early in the process and leads to a more focused program for promising compounds, including an optimized clinical trial design. It also allows for earlier cessation of unpromising clinical trials, saving time and funds.

Prerequisite(s): (BTC 6210 with a minimum grade of C- ; RGA 6000 with a minimum grade of C-) or RGA 6001 with a minimum grade of C-

BTC 6962. Elective. (1-4 Hours)

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.