BIOTECHNOLOGY (BIOT)

BIOT-200 Introduction to Biotechnology 3 Credits
An introductory course to the field of biotechnology and application of biotechnology methodologies in emerging areas. Topics of discussion will include microbial biotechnology, animal biotechnology, forensic biotecnology, agriculture biotecnology, bioremediation and medical biotechnology. Emphasis will be placed on ethical and social considerations and opportunities for improvements in the field.

BIOT-200L Introduction to Biotechnology Laboratory 1 Credit
An introductory laboratory course to the field of biotechnology and application of biotechnology methodologies in emerging areas. Laboratories include aseptic technique, pipetting and measurement, NNA extration and restriction digestion, gel electrophoresis nad PCR. Lab fee required.

BIOT-403 Adv. Research Methods in Biotechnology 3 Credits
Methodology and application in biotechnology. The following topics will be covered: genetic engineering techniques for introducing a gene for a desired protein into a cell with vectors, techniques for growing bacteria and yeast to produce a desired protein, cell transformation by electroporation, blue/white screening for selection of a colony with successful transformation with the desired vector, identification of a plasmid with PCR and DNA sequencing, use of enzyme assays to measure protein concentration in solutions, fed-batch yeast fermentation, mammalian cell culture techniques, and analysis of protein expression by Western blot. Lab fee.

BIOT-405 Bioinformatics 3 Credits
Introduction to bioinformatic resources/methods for biologists. Topics include: biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data.

BIOT-405L Bioinformatics Laboratory 1 Credit
Introduction to bioinformatic resources/methods for biologists. Topics include: biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data. This lab course must be taken concurrently with lecture BIOL-405.

BIOT-500 Career Prep/Biosci Industry Engagement 1 Credit
Preparation for PSM Program and Bioscience Industry Engagement. Career preparation for successful entry and development in biotechnology. Community and interactive discussion topics including the business of science, career opportunities, industry and workforce trends, and overview of the biotechnology industry. Intended to help students identify career values and goals and get them on track for being successful in finding a meaningful project for their capstone experience. Students will research potential internship sites and develop a plan for securing a project. In addition to writing a resume and cover letter, students will develop interviewing and networking skills, set goals and learning objectives, and learn skills that will ensure their success in their internships or research projects.

BIOT-503 Advanced Research Methods in Biotech 3 Credits
Methodology and application in biotechnology. This course is primarily lab based and will prepare students for independent research project. The following topics will be covered: genetic engineering techniques for introducing a gene for a desired protein into a cell with vectors, techniques for growing bacteria and yeast to produce a desired protein, cell transformation by electroporation, blue/white screening for selection of a colony with successful transformation with the desired vector, identification of a plasmid with PCR and DNA sequencing, use of enzyme assays to measure protein concentration in solutions, fed-batch yeast fermentation, mammalian cell culture techniques, and analysis of protein expression by Western blot. Lab fee.

BIOT-505 Bioinformatics 3 Credits
Introduction to bioinformatic resources/methods for biologists. Topics include: biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data.

BIOT-505L Bioinformatics Laboratory 1 Credit
Introduction to bioinformatic resources/methods for biologists. Topics include: biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data. This lab course must be taken concurrently with lecture BIOT-505.

BIOT-508 Legal and Social Ethics in Science 3 Credits
A seminar course that examines the ethical implications of decisions made in biotechnology as well as the responsibilities of life scientists in the biomedical development process, including industry, government, and healthcare authorities and in their communities. Course discussions include stewardship and environmental impacts of biomanufacturing as well as ethical use of laboratory animals. Students examine ethical issues related to biomedical product advancement and use, and specific areas of science are also explored from a Christian ethics viewpoint through lectures, student oral presentations, team debate, and final written projects.

BIOT-510 Computing Theory 3 Credits
The goal of this course is to understand the fundamental limits on what can be efficiently computed in our universe and other possible universes. These limits reveal deep and mysterious properties about information, knowledge, and processing, as well as practical issues about what can and cannot be computed. The course introduces the foundations of automata theory, computability theory, and complexity theory. Shows relationship between automata and formal languages. Addresses the issue of which problems can be solved by computational means (decidability vs undecidability), and Introduces concepts related to computational complexity of problems. Lecture, 3 hours.

BIOT-511 Regulations and Quality Management 2 Credits
A course designed for science professionals to develop and apply skills and knowledge for managing business operations. Real-world business cases are used to develop students' management capacity and capability. Areas of focus include the process view of organizations, performance measures, products and product attributes, production processes, process competencies, procurement and supply chain management and regulatory requirements. The laws and regulations enforced by the Food and Drug Administration and other regulatory agencies related to the biotechnology, pharmaceutical, and medical device industries are surveyed. Included is the U.S. legal regulatory system, Food, Drug, and Cosmetic Act and related laws, Freedom of Information Act, regulation affecting foods, drugs, biologics, veterinary products, diagnostics, and devices, FDA enforcement, product liability, and import/export requirements. Reviews the impact of quality systems and the functions, roles, and responsibilities on Quality Assurance and Quality Control.

BIOT-513 Cell Culture Techniques 3 Credits
This course is primarily lab based and will focus on teaching the techniques necessary to maintain mammalian cells in culture and manipulating stem cells. Exercises will include hands-on training isolating, maintaining, characterizing, cryopreserving, and manipulating in vitro cells in addition to independent research experience. Additional skills will include Basic Aseptic Technique; Media Preparation; Cell counting; Survival assays, Live Cell Identification and Transfection. These skills are crucial for individuals seeking career opportunities in the biotechnology field.

BIOT-515 Experimental Design, Stat Analysis/Progm 3 Credits
Introduces advanced statistical concepts and analytical methods for the experimental needs and data encountered in biotechnology and biomedical sciences. Experimental design/conduct, quantitative analysis of data, and statistical inferences and interpretations are studied for scientific hypothesis testing, as well as clinical trials. Explores methodological approaches to bioassay development/testing and provides a foundation for critically evaluating information to support research findings, product claims, and technology opportunities. Students apply statistical analysis software and write algorithms in programming languages commonly used in biotechnology and professional science industries (ie. Python). Topics include statistical tools such as Bayesian statistics, Markov processes, and information theoric indices and how they can be used to analyze sequence homology, the presence of motifs in sequences, gene expression, and gene regulation.

BIOT-550 Advanced Project 1-4 Credits

BIOT-585 Advanced Project 1-4 Credits

BIOT-600 Bioinnovation/Entrepreneurship/Biotech 2 Credits
A seminar course that develops skills in managing bioentrepreneurship projects in the bioscience and biomedical device fields. Students learn how to be responsive team members as well as communicative team leaders. This course also investigates issues and decisions that inventor / scientists, investors, founders, business people, lawyers, and others might typically encounter when they are considering the application and commercialization of early stage scientific discoveries. And how to sustain innovation in organizations and team dynamics.

BIOT-603 Bus Analytics and Proffessional Comm 3 Credits
A course that focuses on oral and written communication for both scientific and nonscientific audiences for a variety of sources in biotechnology, including journals, investor relations, and regulatory documentation. Topics include uses and management of information; decision tools and concepts; quality control.

BIOT-685 Independent Advanced Research 4-6 Credits
Students conduct supervised, independent research in Biotechnology. The student and faculty supervisor together develop a course outline, with a proposal for original research and the method of evaluation, including a formal research paper. Outline must be approved by the department before the student is permitted to register. Students will present their work in oral and written format.

BIOT-699 Graduate Seminar 1 Credit
Seminar series with invited biology speakers including many prominent scientists and leaders working at biotechnology companies. Students will be expected to present their research at these Seminars. Graduate students are to take this course every Spring. This course is repeatable to a maximum of 3 units.