

# Bioprocessing (BBS)

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## **BBS 201 Introduction to Biopharmaceutical Science** (3 credit hours)

Through this course, students will experience laboratory and manufacturing terminology relevant to the biomanufacturing industries. Students will also gain exposure to regulatory and compliance procedures and issues facing this industry. This course will provide an introduction to prepare students to meet the demands and expectations of this industry and the bioprocessing science program.

*Typically offered in Spring only*

## **BBS 301 Process Validation Science** (3 credit hours)

Process validation is a tested and documented subset of the panel of activities that are performed during the production of a biopharmaceutical. This course will introduce the concept of process validation as it applies to the biotechnology industry, and more specifically, to the manufacture of protein molecules as therapeutic agents.

Prerequisite: (FS 231 and BBS 201) or BBS 426.

*Typically offered in Fall only*

## **BBS 325/FS 325 Introduction to Brewing Science and Technology** (3 credit hours)

For centuries brewing has been and remains a vitally important application of fermentation science, both economically and socially. This course will provide a detailed description of the fundamental chemical and biological processes involved in brewing beer, as well as the physical and hygienic aspects of modern beer production. Successful completion of this course will provide students with the understanding of the science and technology underlying the key steps in a commercial brewing process and provide the basic knowledge necessary for an entry level position in a commercial brewery.

Prerequisite: CH 101 and BIO 183 or BIO 181

*Typically offered in Spring only*

## **BBS 326/FS 326 Brewing Practices and Analyses** (3 credit hours)

This course will provide a hands on learning experience to both complement the classroom lectures offered in BBS/FS 325 and acquaint the student with the equipment and practices encountered in real-world analytical labs of breweries of all scales. The laboratory experience will replicate the sequence of events encountered in actual beer production and illustrate the relevant evaluations and analyses which are concurrent with those processing steps, stressing at each stage not only the execution of the appropriate analytical or testing techniques, but also corrective action that may be taken should undesirable results be obtained.

Prerequisite: BBS/FS 325 Introduction to Brewing Science and Technology

*Typically offered in Fall only*

## **BBS 426/FS 426/BEC 426/BBS 526/FS 526/BEC 526 Upstream Biomanufacturing Laboratory** (2 credit hours)

This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.

Prerequisite: (MB 351 and FS 231) CHE/BEC 463

*Typically offered in Fall and Spring*

## **BBS 427/FS 427 Brewing Equipment, Controls and Operations** (3 credit hours)

Modern commercial brewing is an equipment and utility intensive endeavor. Emphasis on efficiency, flexibility and sanitation has led to equipment and controls which have vastly improved the volume and consistency of brewery output while also improving safety and the quality of the working environment. In order to manage the transfer of material and energy in the brewing process, individual components within the brewing system, as well as the holistic function of the brewery environment have been adapted to maximize efficiency. Knowledge of the specific design and operation of these components within the overall system is crucial to the proper functioning of a brewery. The operation of individual components and processes within the brewery will be examined in terms of the physics and engineering principles driving their function. On completion, this course will provide sufficient knowledge of brewery equipment and operations to function successfully in an entry to mid-level position.

Corequisite: BBS 325 or FS 325

*Typically offered in Spring only*

## **BBS 526/FS 526/BEC 526/BBS 426/FS 426/BEC 426 Upstream Biomanufacturing Laboratory** (2 credit hours)

This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.

Prerequisite: (MB 351 and FS 231) CHE/BEC 463

*Typically offered in Fall and Spring*