

COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	Survey of Biomanufacturing
COURSE NUMBER	BMFR-0100
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Biomanufacturing
CIP CODE	41.0303
CREDIT HOURS	3
CONTACT HOURS/WEEK	Class: 1 Lab: 2

PREREQUISITES None

COURSE PLACEMENT Students must meet the correct placement measure for this course. Information may be found at:

<https://www.kckcc.edu/admissions/information/mandatory-evaluation-placement.html>

COURSE DESCRIPTION

This survey course provides students with basic training on the field of biomanufacturing production. Students are introduced to an understanding of the career opportunities and basic technical skills required in high-demand, high-skill careers in biomanufacturing. This course will include an introduction to the local Life Science industry and related career opportunities and employment requirements; the basic math and technical skills required of an entry-level position; and basic knowledge of documentation, safety, and bioprocess requirements in a biomanufacturing facility. Upon completion of this course, the students will earn an OSHA-10 Safety card.

Program Learning Outcomes

1. Overview of Biomanufacturing: Demonstrate an understanding of the subjects at the interface of Biology and Business central to Biomanufacturing field.

2. Lab Skills: Demonstrate proficiency in basic bio-manufacturing/biotechnology laboratory skills including: making measurements, preparing cultures and solutions, checking pH, using a microscope, DNA extraction, western blotting, agarose gel electrophoresis, bacterial transformations, PCR, growing cells in the Bioreactor, centrifugation and chromatography.
3. Documentation Skills: Learn and follow required recording, analyzing and documenting skills for maintaining a laboratory notebook with experimental procedures, results, and analysis.
4. Understanding the Manufacturing Industry: Demonstrate competency in (1) Math and Measurement, (2) Spatial Reasoning and Manufacturing Technology, and (3) Business Acumen and Quality.

TEXTBOOKS

<http://kckccbookstore.com/>

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom.

Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. Overview of Life Science Industry
- II. Basic technical skills required of an entry level biomanufacturing position
- III. Biomanufacturing processes
 - A. Documentation
 - B. Safety
 - C. Aseptic techniques
- IV. Biochemistry methods and biomanufacturing tools
- V. Career opportunities and workplace realities

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the student will:

- A. Be able to discuss the status of the regional life science industry.
- B. Perform basic mathematical calculations required in lab
 - i) Convert weights and volumes in metric system
 - ii) Express numbers in scientific notation and use both negative and positive exponents, base 10.
 - iii) Calculate molarity, molality, percentage
- C. Identification and appropriate use of glassware, measuring devices and laboratory equipment.
 - i) Proper use of digital balance, micropipets, pH meter, centrifuge, autoclave, bioreactor, microscope, shakers, vortexes, water baths, electrophoresis equipment, thermocycler, spectrophotometer, etc.
- D. Be able to understand Quality Control and current Good Manufacturing Practices (cGMPs)
 - i) Quality Control: Wear appropriate personal protective equipment (PPE), access and utilize Material and Safety Data Sheet (MSDS), use hood where appropriate, dispose of hazardous material/wastes/glass/sharps properly
 - ii) GMPs: Follow SOPs, record and maintain data in lab notebook, write experimental procedures using scientific terminology, maintain instrument and equipment log book, clean and sanitize workspaces, label samples appropriately, perform and document cleaning, perform scheduled sanitization of hoods
- E. Demonstrate a basic understanding of microbes, their function and processes used to control or eliminate the presence of microbes in a manufacturing area
 - i) Describe the basic differences among bacteria, viruses, and fungi.
 - ii) Perform a gram stain and correctly focus a microscope on the stain.

- iii) Aseptically inoculate vials and plates for bacterial growth.
 - iv) Discuss the relationship of killing or inactivation of microbes with disinfectant contact time and heat.
 - v) Discuss how bacteria and cells are used in the Bio-manufacturing industry.
 - vi) Describe the basic phases of a bacterial growth curve.
 - vii) Describe the role of recombinant DNA in the Bio-manufacturing industry.
- viii) Be able to understand and practice proper aseptic techniques to prevent contamination
- i) Identify and discuss sources and causes of contamination.
 - ii) Discuss basic principles to apply during aseptic manufacturing.
 - iii) Describe the methods of prevention and removal of contaminants.
 - iv) Describe meanings of clean, sanitized, disinfected and sterilized.
 - v) Gowning and proper use of PPE, disinfecting laminar flow hood, sterilizing inoculating loops using bacti-cinerator, handling of media and culture plates
 - vi) Demonstrate isolation, subculture and maintenance of microbes using proper aseptic techniques
 - vii) Streak plate method
- ix) Be able to perform basic biochemistry lab methods and techniques
- i) Handle and weigh chemicals safely, measure small volumes using appropriate equipment
 - ii) Prepare the pH indicator and a reference scale, check pH of some household chemicals, effect of antacids, buffer solutions
 - iii) Prepare solutions of different volumes, percentages, and molarities
 - iv) Prepare diluted solutions from concentrated solutions, perform serial dilution
 - v) Qualitative and quantitative analysis of solutions using spectrophotometer
 - vi) Perform biochemical tests to identify carbohydrates, proteins, lipids and nucleic acids
 - vii) Synthesis of Aspirin

- x) Describe the basics of a bioprocess operation in various biomanufacturing industries (Medical Biotechnology, Industrial Biotechnology, Agricultural Biotechnology, Marine Biotechnology)
- xi) Be able to discuss basic safety procedures in an industry environment.
- xii) Be able to identify professional behavior in the workplace.

ASSESSMENT OF COURSE LEARNING OUTCOMES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.