

COURSE SYLLABUS

LAST REVIEW	Spring 2021
COURSE TITLE	Manufacturing Technician Training
COURSE NUMBER	BMFR-0145
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Biomanufacturing
CIP CODE	41.0303
CREDIT HOURS	3
CONTACT HOURS/WEEK	Class: 3
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

The Manufacturing Technician Training course will provide students an understanding of industrial Lean manufacturing, Safety, and some of the physics of behind machines. These include levers, pulley systems, hydraulics, and electricity. Students will also learn to interpret two dimensional drawings into three dimensional structures.

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. Biomanufacturing tools
- V. Career opportunities and workplace realities

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. Apply different method of measurement for different materials
 1. Be able to use a decimate inch machinist's ruler to measure a length.
 2. Use a U.S. ruler and tape measure to measure a length.
 3. Use a metric ruler and tape to measure length.
 4. Measure liquids/weights in metric and U.S. customary units.
 5. Apply basic math skills to convert between common fraction inches and decimal inches.
- B. Use algebra for manufacturing based math problems.
 1. Perform correct order of operation to simplify mathematical expressions.
 2. Generate linear equations with one unknown for situations described in text.
 3. Solve simple linear equations with one unknown.
- C. Apply basic math skills to monitor production efficiency and quality.
 1. Read and interpret histograms, bar charts, line graphs, and scatter plots.
 2. Interpret descriptive statistics: Mean median, mode, and range.
 3. Demonstrate qualitative reasoning for situations involving statistical data and probabilities.
- D. Use Spatial Reasoning to translate 2D schematic drawing into 3D structures.
 1. Visually translate from 2D drawings to 3D images and back.
 2. Identifying different views for given isometric drawing of an object.
 3. Identifying the different elements of an object in various views
 4. Predict behavior of visual representations of simple mechanisms.

- E. Understand the mechanics of machines
 1. Demonstrate qualitative reasoning about mechanical force and systems involving pulleys, levers, and gears.
 2. Determine mechanical advantage of different systems of pulleys
 3. Determine effects of different lever configurations on the force required to lift an object.
 4. Generate different configurations of gears and axels to increase power or speed.

- F. Understand fundamentals of fluid power and thermodynamics.
 1. Generate causal explanations of behavior of:
 - i. Simple systems involving changes in pressure, temperature and volume
 - ii. Simple hydraulic/pneumatic devices and
 - iii. Principles of heat transfer.
 2. Predict the effects of changes in pressure on volume and temperature.
 3. Predict the effects of changes in temperature on volume and pressure.
 4. Predict the mechanical advantage of simple hydraulic and pneumatic systems.
 - 5.

- G. Understand basic wiring and electrical power in electric motors and generators.
 1. Generate causal explanations of the relationship between electrical and magnetic forces and explanations of how electric motors, generator, colenoids, and relay switches behave.
 2. Generate causal explanations and predictions of electric circuit behavior involving simple series and parallel circuits containing relays, capacitors, resistors and simple devices such as light bulbs and pumps.

- H. Apply basic chemistry in media production.
 1. Core Concepts: Classify substances as a molecule, element, mixture, or compound; classify changes in substances as chemical reaction, mixture, or physical change; classify and apply characteristics acids and bases; interpret the periodic chart; and classify methods for separating mixtures (filtration, evaporation, distillation).
 2. Chemical Reactions: Explain chemical bonding and structural changes that take place in common chemical reactions and interpret chemical formulas and equations.
 3. Polymers: Generate explanations of molecular structural difference and physical characteristics between common types of polymers such as slime, flexi-putty, rubber and plastic bags.

- I. Understand Manufacturing Processes & Control.
 1. Generates the Sequence of Operation and a Flow Diagram for production tasks and processes.
 2. Generate explanations of how electrical mechanical controls and sensors operate in simple systems and devices.

3. Create flow charts for models (mock-up) of simple computer controlled systems such as a traffic light or washing machine.
- J. Practice and implement Quality and Lean Manufacturing Concepts
1. Identify descriptions of manufacturing quality and lean production initiatives as examples of value stream mapping, waste elimination, 5S, DMAIC, and Total Productive Maintenance (TPM)
 2. Create a process map and value stream map to improve a process or reduce waste
 3. Demonstrate using a industry standard problem solving method such as DMAIC for improving production processes. Currently using DMAIC
- K. Apply SPC statistical analyses to monitor processes.
- L. Understand the monetary impact of everyday activity on business.
1. Predict how actions, strategies, and decisions impact the bottom line.
 2. Classify examples of common business financial terms.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

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>.