Bioprocess Engineering

Career Cluster	STEM
Course Code	21014
Prerequisite(s)	None
Credit	.5
Program of Study and Sequence	Foundational course, cluster course, and career pathway course
Student Organization	None
Coordinating Work-Based Learning	None
Industry Certifications	None
Dual Credit or Dual Enrollment	TBD
Teacher Certification	Agriculture, Food & Natural Resources Cluster Endorsement; Food Products & Processing Pathway Endorsement; Natural Resources & Environmental Service Pathway Endorsement; STEM Cluster Endorsement; Engineering & Robotics Pathway Endorsement; 9-12 Engineering Endorsement; 7-12 Technology Education Endorsement
Resources	http://www.iseek.org/careers/viewCareers?id=15

Course Description: This course is designed to provide information on broad application of ever-emerging field of bioprocessing for students in South Dakota. Students are engaged in an instructional program that integrates academics and technical preparation and focuses on career awareness in bioprocess engineering. This course will prepare students for advanced opportunities that lie in the area of biotechnological advancement. The student will apply the knowledge of engineering and biological sciences to design and develop a process capable of ameliorating environmental pollution, producing valuable products and applying novel technologies to produce alternative sources of transportation fuel. Topics that will be covered in this course include: water and wastewater treatment plants, recycling and reuse, and fermentation processes.

Program of Study Application: This is a pathway course in the STEM cluster engineering pathway. It is recommended that the course be preceded by a series of foundation courses, a cluster course in STEM and more specialized pathway courses such as Introduction

to Engineering, Engineering Design and Development, and Introduction to Manufacturing and followed by dual credit course and/or capstone course.

Course Standards

Indicator # BE 1 Understand the basic concepts of bioprocess system and biotechnological processes

Webb Level	*Sub-indicator*	*Integrated Content*
Level 1: Recall; Level 2: Thinking	BE 1.1 Identify bio-based products	
Level 1: Recall and Understand	BE 1.2 Identify microbial processes that can be implemented in bioprocessing	
Level 2: Understand and Demonstrate	BE 1.3 Understand how biotechnology can be integrated with engineering	

Indicator # BE 2 Apply basic knowledge of biological science and engineering in developing products

Webb Level	*Sub-indicator*	*Integrated Content*
Level 1: Recall; Level 2: Thinking Explain	BE 2.1 Understand how raw materials are used for developing products	
Level 1: Recall; Level 2: Thinking Explain	BE 2.2 Understand how the chemical composition of a raw material affects the design process and product outcome	

Indicator # BE 3 Understand issues associated with implementation and operation of biotechnological processes

Webb Level	*Sub-indicator*	*Integrated Content*

Level 3: Strategic thinking	BE 3.1 Analyze problems associated with bioprocessing, for example, environmental, technical, sustainable	
Level 2: Thinking Explain	BE 3.2 Understand how to operate a bioreactor	

Indicator # BE 4 Career exploration in bioprocess engineering

Webb Level	*Sub-indicator*	*Integrated Content*
Level 3: Strategic thinking	BE 4.1 Explore the role of bioprocess engineering in an agriculture related area	
Level 2: Thinking Explain	BE 4.2 Understand the role of bioprocess engineering in food processing	
Level 2: Thinking Explain	BE 4.3 Understand how bioprocess engineering is critical to water and wastewater treatment technologies	
Level 2: Thinking Explain	BE 4.4 Understand how bioprocess engineering can improve the rural economy	

Indicator # BE 5 Understand safety and health in bioprocessing engineering

Webb Level	*Sub-indicator*	*Integrated Content*
Level 1: Recall; Level 2: Thinking Explain	BE 5.1 Understand implications of health and public safety standards.	

Indicator # BE 6 Understand workplace ethics and professionalism in bioprocess engineering

Webb Level	*Sub-indicator*	*Integrated Content*

Level 1: Recall; Level 2: Skill Concept	BE 6.1 Investigate and demonstrate understanding of professionalism and workplace ethics in the technological environment.	

Adopted March 2021