Introduction to Engineering

Career Cluster	STEM
Course Code	21001
Prerequisite(s)	None
Credit	.5
Program of Study and Sequence	Foundation courses – cluster course – Introduction to Engineering – specialized pathway course – capstone experience
Student Organization	None
Coordinating Work-Based Learning	Industry, guest speakers, field trips
Industry Certifications	None
Dual Credit or Dual Enrollment	TBD
Teacher Certification	STEM Cluster Endorsement; Engineering & Robotics Pathway Endorsement; 7-12 Technology Education Endorsement
Resources	O*NET - https://www.**onet**online.org/ Brinell Hardness Test Methods - www.hardnesstesters.com › Applications National Society of Professional Engineers – https:// www.**nspe**.org

Course Description:

The Introduction to Engineering course is designed to provide a foundation in engineering for students in South Dakota. Students are engaged in an instructional program that integrates academics and technical preparation and focuses on career awareness and ethics in engineering. This course will prepare students for advanced educational opportunities. Topics addressed in Introduction to Engineering include: exploring the field of engineering, understanding materials and processes used in engineering, investigating systems used in engineering and practicing effective communication.

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 and a cluster course in STEM, and followed by a more specialized pathway course such as Industrial and Bioprocess Engineering, Mechanical Drafting & Design or Architectural Drafting.

Course Standards

Indicator # IE 1   Examine the fields of engineering

Webb Level	Sub-indicator	Integrated Content
Three Strategic Thinking	IE.1.1 Examine the evolution of engineering *Example:* • Assess the influence of engineering on history • Differentiate two different fields of engineering • Formulate a time line of major engineering development • Investigate engineering events that affected the world	• Discuss ethics of engineers • Discuss good and bad designs and how they affect people
One Recall	IE.1.2 Identify the types of engineers *Example:* • Define a job description of an engineer • Identify the work tasks, duties, and responsibilities of different types of engineers • During a field trip, recall and state the activities of an engineer	Code of Ethics for Engineers: NSPE (National Society of Professional Engineers)
One Recall	IE.1.3 Describe the engineering team *Example:* • Illustrate the duties of the members of the engineering team • Identify work setting/environments of engineering teams • Identify various branches of engineering	Soft Skills • Teamwork • Responsibility • Leadership

Notes:

Indicator # IE 2   **Investigate various engineering systems**

Webb Level	Sub-indicator	Integrated Content
One Recall	IE.2.1 Identify various types of engineering systems *Example:* • Define each engineering system and give an example for each • Match engineering systems to common processes • List the components of an engineering system	
Two Skills and Concepts	IE.2.2 Apply engineering systems to solve problems *Example:* • Construct circuits from a schematic diagram • Construct a mechanical system from visual or written instructions • Construct/modify a device to control the temperature in an enclosure	

Notes:

Indicator # IE 3   Apply the engineering process to a product

Webb Level	Sub-indicator	Integrated Content
Two Skill/Concept	IE.3.1 Design a product *Example:* • Graph and interpret thumbnail sketches to create ideas • Modify a three view orthographic projection of a design • Construct a design of a doghouse using computer-aided design (CAD)	
Two Skill/Concept	IE.3.2 Construct a three-dimensional (3-D) model *Example:* • Construct a scale model • Relate 3-D printouts to explore form, function, and feel • Construct a 3-D floor plan	
Two Skill/Concept Three Strategic Thinking	IE.3.3 Build and test a prototype *Example:* • Revise and use the prototype in real-world conditions • Assess a feasibility study on the prototype • Draw conclusions from data generated from testing the prototype	
Two Skill/Concept Four Extended Thinking	IE.3.4 Develop a system to produce a final product *Example:* • Organize and construct an assembly line that would effectively and efficiently produce a final product • Create a process that would allow for product development • Create and design a flow chart demonstrating the product development process	Soft Skills: • Teamwork

Notes:

Indicator # IE 4   Demonstrate effective communication

Webb Level	Sub-indicator	Integrated Content
Two Skill/Concept Three Strategic Thinking	IE.4.1 Demonstrate effective oral communication *Example:* • Organize and present a speech that addresses environmental issues related to engineering • Develop a logical argument and a solution to solve a problem • Cite evidence of the importance of each step in the engineering design process through an oral presentation	Soft skills • Communication • Teamwork • Organization • Leadership • Time management • Presentation
Three Strategic Thinking Four Extended Thinking	IE.4.2 Demonstrate effective written communication *Example:* • Formulate a report summarizing how an engineering system works • Create a set of directions to assemble a product • Design a newspaper editorial and prove your view on a controversial engineering issue	Soft skills • Communication • Organization • Time management
Four Extended Thinking	IE.4.3 Demonstrate effective graphic communication *Example:* • Design and present an idea for a product to the class using software application of choice • Design and connect concepts learned using publishing software and graphic programs • Analyze and defend prototype data to the class using charts and graphs	Ethics Language Arts skills Math skills Soft Skills • Communication • Presentation

Notes:

Indicator # IE 5   **Examine testing procedures used on materials in engineering**

Webb Level	Sub-indicator	Integrated Content
Three Strategic Thinking	IE.5.1 Analyze materials based on their properties *Example:* • Compare and contrast materials used in engineering • Assess availability and cost of materials	
Three Strategic Thinking	IE.5.2 Analyze material testing procedures *Example:* • Investigate the physical factors of the material(s) • Compare the cost factor(s) for various testing processes • Draw conclusions from the Brinell Hardness test on materials	

Notes: