GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

PATHWAY: Engineering

COURSE: Foundations of Engineering and Technology

UNIT: 14: Construction Systems

INTRODUCTION

Annotation: Briefly describe the unit topics, tasks, methods, etc.

In this unit students will gain an understanding of construction systems, the processes used in planning construction, and the methods of constructing buildings.

Grade(s):

X	9th
X	10th
X	11th
X	12th

Time:

10 Hours

Author:

Cameron Smith

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

Notes to the Teacher:

Optional: Text: Schwaller, Anthony E. (1989) Transportation, Energy, and Power Technology, Delmar Publishers, Inc. Albany, NY.

FOCUS STANDARDS

GPS Focus Standards: Please list the standard and elements covered.

- ENGR-FET-1d – Participate in hands-on activities related to multiple engineering and technology pathways.
- ENGR-FET-2a – Identify key historical events and their impact on engineering and technology.
- ENGR-FET-2d – Describe the impact of governmental and political systems on technological innovation.
- ENGR-FET-3a – Describe the processes of input, processing, output, and feedback that comprise the universal systems model.
- ENGR-FET-3b – Demonstrate applications of the universal systems model across the spectrum of technologies.
- ENGR-FET-4a – Describe the role of mathematics and science in technological development.
- ENGR-FET-4b – Construct a mathematical model for a known technological system.
- ENGR-FET-4c – Explain the scientific principles behind a basic machine.
- ENGR-FET-5 – Students will describe the essential systems and processes involved with invention, innovation, and entrepreneurship.
- ENGR-FET-6a – Demonstrate fundamentals of technical sketching.
- ENGR-FET-6b – Present a technical design using computer generated visuals.
- ENGR-STEM-1 – Students will recognize the systems, components, and processes of a technological system.
- ENGR-STEM-2 – Students will identify the impact of engineering and technology within global, economic, environmental, and societal contexts.
- ENGR-STEM-3 – Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation, invention, and fabrication while considering economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.
- ENGR-STEM-5 – Students will select and demonstrate techniques, skills, tools, and understanding related to energy and power, bio-related, communication, transportation, manufacturing, and construction technologies.
- ENGR-STEM-6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.
- CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.
- CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

- CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.
- CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.
- CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

GPS Academic Standards:

- MM3P1. Students will solve problems (using appropriate technology).
- MM3P3. Students will communicate mathematically.
- MM3P4. Students will make connections among mathematical ideas and to other disciplines.
- SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.
- MM3P2. Students will reason and evaluate mathematical arguments.
- ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings: Enduring understandings are statements summarizing important ideas and have lasting value beyond the classroom. They synthesize what students should understand – not just know.

Students will understand how engineers use construction systems to benefit modern society.

Essential Questions: Essential questions probe for deeper meaning and understanding while fostering the development of critical thinking and problem-solving skills. Example: Why is life-long learning important in the modern workplace?

- Why is construction important?
- What are the four basic types of construction?
- How are the seven resources used as inputs?
- What types of structural materials are used in construction systems?
- How do processes, outputs, and feedback work in construction systems?
- What factors must be considered when selecting a site?
- What are the steps in the design process?
- What are the types of working drawings and what do they show?

- What is involved in preparing a construction site for a project?
- How are superstructures built?
- How are interiors finished?
- How is Vector Analysis applied in construction technology? *(See Web Resource Section)*

Knowledge from this Unit: Factual information.

Skills from this Unit: Performance.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

_____ Pre-test
_____ Objective assessment - multiple-choice, true- false, etc.
__ Quizzes/Tests
__ Unit test
_____ Group project
_____ Individual project
_____ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
__ Academic prompts
__ Practice quizzes/tests
_____ Subjective assessment/Informal observations
__ Essay tests
__ Observe students working with partners
__ Observe students role playing
_____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
_____ Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
__ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
_____ Constructed Responses
__ Chart good reading/writing/listening/speaking habits
__ Application of skills to real-life situations/scenarios
_____ Post-test

Assessment(s) Title:

Electronic Graphic Organizer Rubric

Assessment(s) Description/Directions:

The teacher should use the Graphic Organizer Rubric to assess the electronic graphic organizer created over the 15 Unit Concepts and Vector Analysis.

Attachments for Assessment(s): Please list.

Graphic Organizer Rubric

LEARNING EXPERIENCES

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

- ENGR-FET-1a – Identify potential career opportunities related to engineering and technology.
- ENGR-FET-1b – Explain the educational requirements and professional expectations associated with a chosen technological career path.
- ENGR-FET2c – List key persons who have contributed to technological change.
- CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.
- CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

2. Review Essential Questions.

- What are the potential career opportunities related to engineering and technology?
- What are the education requirements for professional engineers and engineering technologists?
- How have the opportunities in engineering grown and expanded as technology has developed?

3. Identify and review the unit vocabulary.

Discipline

Role

Engineering

4. Assessment Activity.

- Day 1 – Construction Systems (teacher leads Class Discussion to complete worksheet over Unit Understandings 1-5), Students use worksheet to create an electronic graphic organizer of content including appropriate pictures.
- Day 2 – Planning Construction (Teacher leads Class discussion to complete worksheet over Unit Understandings 6-10), Students use worksheet to create an electronic graphic organizer of content including appropriate pictures.
- Day 3 – Constructing Buildings (Teacher leads class discussion to complete worksheet over Unit Understandings 11-15), Students use worksheet to create an electronic graphic organizer of content including appropriate pictures.
- Day 4 – Floor Plans – Students use graph paper to draw a floor plan for the example cabin
- Day 5 – Elevations – Students draw elevations of the example cabin
- Day 6 – Vectors in truss and bridge design, Truss Design for the Example cabin
- Day 7 – Truss Design for Example Cabin
- Day 8 – Introduction to scale in architecture, Begin construction of example cabin
- Day 9 – example cabin construction
- Day 10 – Finish example cabin construction, construction systems quiz

Attachments for Learning Experiences: Please list.

Architectural Model Rubric

Engineering Careers Test

Graphic Organizer Rubric

NAEP Construction Learning Module

NAEP Construction Newsletter

NAEP Construction Teacher Guide

NAEP Construction Worksheet

Notes & Reflections: May include notes to the teacher, pre-requisite knowledge & skills, suggestions, etc.

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Example Cabin Construction

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

The teacher should select a simple floor plan (from the Internet or other source) of a cabin or other simple structure. Students will draw a floor plan, elevations, and landscape plan for this structure. They will also use simple material such as poster board to create a 1/4" = 1' scale model of this structure. Have students draw and color the four sides of the structure and the roof on poster board. In addition, students should create a scale drawing of the floor and elevation views of the interior walls of the structure using the same sheet of poster board. They should be encouraged to add details such as door/windows and to add color where possible. When finished, students should use scissors to cut out the floor, walls, and roof. These components can be glued or taped together to create a simple architectural model.

Attachments for Culminating Performance Task: Please list.

NAEP Construction Learning Module

NAEP Construction Newsletter

NAEP Construction Teacher Guide

NAEP Construction Worksheet

UNIT RESOURCES

Web Resources:

West Point Bridge Design Material: http://bridgecontest.usma.edu/pdfs/la3.pdf

Online Virtual Bridge Builder Tool: http://www.jhu.edu/virtlab/bridge/bridge.htm

Attachment(s): Supplemental files not listed in assessment, learning experiences, and performance task.

What 21st Century Technology was used in this unit:

	Slide Show Software		Graphing Software		Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System	X	Desktop Publishing	X	Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email	X	Website		