GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

COURSE: Engineering Concepts (ET-EC)

UNIT: 7. Principles of Engineering in Communications

INTRODUCTION

Annotation:

This unit will introduce students to communications technologies. Students will examine the primary purpose of communication and some of the basic models associated with all forms of communication. Students also will construct an electronic device for communications that does not require the written or spoken word.

Grade(s):

	9th
X	10th
X	11th
X	12th

Time:

15 hours

Author:

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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.

FOCUS STANDARDS

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

- ENGR-EC-1b – Describe the history and development of engineering.
- ENGR-EC-1c – Compare and contrast engineering to other approaches for solving technological and design problems.
- ENGR-EC-1d – Explain what engineers do.
- ENGR-EC-1e – Describe the principal fields of engineering specialization and identify associated career tracks.
- ENGR-EC-2a – Describe the role of problem identification, problem definition, search, constraints, criteria, alternative solutions, analysis, decision, specification, and communication as activities comprising the engineering design process.
- ENGR-EC-2b – Organize the iterative processes necessary to develop and optimize a design solution.
- ENGR-EC-2c – Apply engineering design to the solution of a problem.
- ENGR-EC-4 – Students will demonstrate a whole systems approach to engineering and problem solving.
- 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-4 – Students will apply principles of science, technology, engineering, mathematics, interpersonal communication, and teamwork to the solution of technological problems.
- 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.
- CTAE-FS-1 – Career Development: Learners plan and manage academic-career plans and employment relations.
- 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-5 – Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.
- CTAE-FS-6 – Systems: Learners understand a variety of organizational structures and functions.
- CTAE-FS-8 – Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.
- CTAE-FS-9 – Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.
- CTAE-FS-10 – Career Development: Learners plan and manage academic-career plans and employment relations.
- CTAE-FS-11 – Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

GPS Academic Standards:

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings:

The student will gain an understanding of the use of electronic components in communication systems.

Essential Questions:

- What events are important in the history of communications systems?
- What effects have advances in communication technologies had on social behavior?
- What are the differences between analog and digital communications technologies?
- What are the various forms of transmitting technologies?
- What is the primary purpose of communication?
- What are the essential elements of all communication systems models?
- What is the primary function of electronic components?
- How are parallel and series circuits used?

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 usin g in the classroom.

- ____ Pre-test
- X 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
- X Constructed Responses
  - __ Chart good reading/writing/listening/speaking habits
  - __ Application of skills to real-life situations/scenarios
- ____ Post-test

Assessment(s) Title:

Cyborg Intelligence Masks

Assessment(s) Description/Directions:

Students will use the principles of simple parallel and/or series circuits to develop a cyborg mask that will be worn by a member of their engineering team. The engineering team must develop a simple language to communicate movement directions to the mask wearer as he or she navigates a maze that is created with masking tape on the floor of the classroom. The team that is able to navigate in and out of the maze in the shortest amount of time wins. See document titled Cyborg Mask Project under instructional materials for complete directions, requirements, materials, and time deductions.

Attachments for Assessment(s): Please list.

- Principles of Engineering in Communications PowerPoint
- Cyborg Mask Project Word Document

LEARNING EXPERIENCES

Instructional planning: Include lessons, activities and other learning experiences in this section with a brief description of the activities to ensure student acquisition of the knowledge and skills addressed in the standards. Complete the sequence of instruction for each lesson/task in the unit.

Sequence of Instruction

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

- ENGR-EC-1b – Describe the history and development of engineering.
- ENGR-EC-1c – Compare and contrast engineering to other approaches for solving technological and design problems.
- ENGR-EC-1d – Explain what engineers do.
- ENGR-EC-1e – Describe the principal fields of engineering specialization and identify associated career tracks.
- ENGR-EC-2a – Describe the role of problem identification, problem definition, search, constraints, criteria, alternative solutions, analysis, decision, specification, and communication as activities comprising the engineering design process.
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- 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.
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- CTAE-FS-10 – Career Development: Learners plan and manage academic-career plans and employment relations.
- CTAE-FS-11 – Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

2. Review Essential Questions.

- What events are important in the history of communications systems?
- What effects have advances in communication technologies had on social behavior?
- What are the differences between analog and digital communications technologies?
- What are the various forms of transmitting technologies?
- What is the primary purpose of communication?
- What are the essential elements of all communication systems models?
- What is the primary function of electronic components?
- How are parallel and series circuits used?

3. Identify and review the unit vocabulary.

4. **Assessment Activity.**

- Teach students the principles of engineering in communications concepts using the PowerPoint titled Principles of Engineering in Communications. Because of the PowerPoint's length, the teacher may want to teach the presentation in section, stopping to complete each assignment and project as they come up in the PowerPoint.
- Assignment 1: Communications Systems PowerPoint Assignment. Directions and rubric can be found under Unit Performance Task(s) above, as well as the Word document titled Communications Systems PowerPoint Assignment
- Allow students to present their communication technology PowerPoint to the class
- Assignment 2: Principles of Engineering in Communications Vocabulary. Directions can be found under Unit Performance Task(s) above and the worksheet can be found as an instructional material titled Principles of Engineering in Communications Vocabulary
- Assignment 3: Morse Code. Directions can be found under Unit Performance Task(s) above.
- Assignment 4: Ohm's Law. Directions can be found under Unit Performance Task(s) above and the Excel spreadsheet can be found as an instructional material titled Ohms Law.
- Assignment 5: Sample Circuits. Directions can be found under Unit Performance Task(s) above and the website containing the sample circuits can be found on slide 69 of the PowerPoint, as well as under the Performance Tasks' Web Resources.
- Project/Assessment: Cyborg Mask Project. Directions can be found under Balanced Assessment above. More detailed directions, requirements, materials, and time deductions can be found as an instructional material titled Cyborg Mask.
- Once masks have been completed, set up a maze in the classroom using masking tape on the floor and time each group as they navigate through the maze.

Attachments for Learning Experiences: Please list.

- Engineering Disasters PowerPoint
- Engineering Disasters Rubric
- Teton Dam PowerPoint
- Tacoma Narrows PowerPoint
- Walk a Mile in 'Dem Shoes
- Civil Engineering I PowerPoint (USMA WPBB Book – Rossler)
- Stress, Strain, and Elasticity – Excel Spreadsheet
- Elasticity of Balsawood
- Elasticity Data Worksheet
- Deflection of a Material – Excel Spreadsheet
- Cantilever Beam

- Simple Truss Example 1
- Simple Truss Example 2
- String Contest
- Fore- Cantilever Design Challenge
- Civil Engineering II PowerPoint (USMA WPBB Book – Rossler)
- Truss Blank
- Final Truss Challenge

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

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

- Assignment 1: Communications Systems PowerPoint Assignment
- Assignment 2: Principles of Engineering in Communications Vocabulary
- Assignment 3: Morse Code
- Assignment 4: Ohm's Law
- Assignment 5: Sample Circuits

Culminating Unit Performance Task Description/Directions/Differentiated

1. Students are to examine one communication technology system and provide the class with an in-depth presentation. Minimum requirements of the presentation can be found below in the performance task rubric. The assignment sheet and requirements can also be found in the document titled Communications Systems PowerPoint Assignment, an instructional material accompanying this lesson.
2. Have students complete the Principles of Engineering in Communications vocabulary sheet (titled Principles of Engineering in Communications Vocabulary under instructional materials) over the course of this unit. Students may use the PowerPoint, textbook, and any other resources to complete the worksheet.
3. Using an old set of walkie talkies, have students send messages to their classmates using Morse code. The international Morse code characters are listed on this lesson's PowerPoint.
4. Have students solve the problem on the Excel spreadsheet titled Ohm's Law. This will give students the opportunity to practice calculating voltage.
5. Have students complete the 6 beginner sample circuits for additional circuit practice. The link to the sample circuits can be found on slide 69 of the PowerPoint, as well as under Web Resources below.

Attachments for Culminating Performance Task

- Communications Systems PowerPoint Assignment Word Document
- Principles of Engineering in Communications Vocabulary
- Ohms Law Excel Spreadsheet

Attachments for Culminating Performance Task

Assignment 1:

Slide	Requirements	Points Possible	Points Earned
Overall	5 slide minimum	10	
Overall	4 graphics/photographs	10	
Overall	2 sound bytes	10	
Overall	3 separate references (web-sites are acceptable)	10	
1	Name of communication technology, your name, course and date	5	
2	Date the communication technology was introduced or patented, and person or company credited with innovation or invention	15	
3	Description of the technology and how it works	20	
4	Explanation of the social change that this technology brought about Example: drive thru technologies have impacted the relationship we have with local merchants	15	
5	Bibliography, including books, web-sites used for information, and photographs	5	
TOTAL:		100	

UNIT RESOURCES

Web Resources:

Sample Circuits:

http://library.thinkquest.org/16497/projects/beginner/index.html#BEGINNER%20CIRCUITS

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

Materials & Equipment:

What 21st Century Technology was used in this unit:

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