GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ENGINEERING & TECHNOLOGY

COURSE: Engineering Concepts (ET-EC)

UNIT: 3. Three Dimensional Modeling

INTRODUCTION

Annotation:

In this unit, students learn the importance of the graphic language of drafting, the transformation from two dimensions to three dimensions and the principles of solid modeling. This unit is not software specific. However, it is recommended that 3-D solid modeling software is introduced to students as a tool for these overall principles.

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-5a – Use multi-view projection and pictorial drawings to communicate design specifications.
- ENGR-EC-5b – Apply descriptive geometry and graphical vector analysis to the analysis of engineering design problems.
- ENGR-EC-5c – Apply accurate dimensions to a technical drawing, including size and geometric tolerances.
- 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.
- 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.

GPS Academic Standards:

National / Local Standards / Industry / ISTE:

UNDERSTANDINGS & GOALS

Enduring Understandings:

Students will have the ability to use 3-D software for the development of an artifact.

Essential Questions:

- What are the principle methods of sketching?
- What are the principle methods of engineering lettering?
- What are the principle methods of orthographic projections?
- What is the difference between wire molding, surface modeling, and solid modeling?
- What are the benefits of solid modeling?
- What is rapid prototyping?
- What are the solid modeling and parametric functions?

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
X Individual project
X 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:

Dragster Design Challenge

Assessment(s) Description/Directions:

This unit was designed for Autodesk Inventor. Please change assessment to match your desired software requirements. See Dragster Design Assignment for more details.

Rubric:

- See Dragster Design Assignment for details.

  Assembly: ____ / 100 points

  ANSI.IDW: ____ / 50 points

  Rendering: ____ / 50 points

  TOTAL: ____ / 200 points

Attachments for Assessment(s): Please list.

- Dragster Design Assignment
- PowerPoints:
  - Graphic Language and Lettering
  - Sketching
  - Multiviews
  - Parametric Modeling

LEARNING EXPERIENCES

Sequence of Instruction

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

- ENGR-EC-5a – Use multi-view projection and pictorial drawings to communicate design specifications.
- ENGR-EC-5b – Apply descriptive geometry and graphical vector analysis to the analysis of engineering design problems.
- ENGR-EC-5c – Apply accurate dimensions to a technical drawing, including size and geometric tolerances.
- 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.
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- CTAE-FS-3 – Communications: Learners use various communication skills in expressing and interpreting information.

2. Review Essential Questions.

- What are the principle methods of sketching?
- What are the principle methods of engineering lettering?
- What are the principle methods of orthographic projections?
- What is the difference between wire molding, surface modeling, and solid modeling?
- What are the benefits of solid modeling?
- What is rapid prototyping?
- What are the solid modeling and parametric functions?

3. Identify and review the unit vocabulary.

4. Assessment Activity.

- Introduce students to graphic language and lettering using the correlating PowerPoint. Allow students to practice their technique.
- Introduce students to sketching and the proper techniques they should exercise using the correlating PowerPoint. Allow time for students to practice.
- Introduce students to multiviews and orthographic projections using the correlating PowerPoint.
- Introduce students to 3D solid modeling using the correlating PowerPoint.
- Have students use their acquired skills to design a dragster according to the specification used by the Technology Student Association. Specifications and design criteria can be found in the Dragster Design Assignment and the activities manual provided by the National TSA.
- Allow students to present their designs to the class at the end of the lesson.

Attachments for Learning Experiences: Please list.

- EC_3_Dragster Design Assignment
- EC_3_Graphic Language Lettering
- EC_3_Multiviews
- EC_3_Parametric Modeling
- EC_3_Sketching

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

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Culminating Unit Performance Task Description/Directions/Differentiated

Attachments for Culminating Performance Task

UNIT RESOURCES

Web Resources:

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		