

Instructor Information

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Best times to be reached: 7:45 – 8:55 AM

Course Description

This unit uses solid modeling (a sophisticated mathematical technique for representing solid objects) to introduce students to the design process. Utilizing this design approach, students understand how solid modeling has influenced their lives. Students also learn sketching techniques and use descriptive geometry as a component of design, measurement, and computer modeling. Using the design process, students brainstorm, research, develop ideas, create models, test and evaluate design ideas, and communicate their solution to solve problems.

District Standards and Power Benchmarks

Power Standards

Students will be able to:

1. Demonstrate the ability to use three-dimensional modeling software.
2. Demonstrate the use of problem-solving model to improve existing products and invent new ones in and outside the classroom.
3. Experience the creative thinking process through the use of vertical and lateral thinking; identifying, categorizing, and selecting a solution to a problem; and communicating that solution in written and verbal formats.

Power Benchmarks

Students will be able to:

1. Discuss the history of engineering and engineering technology design.
2. Utilize sketching and visualization techniques.
3. Communicate conceptual ideas through written and verbal formats.
4. Practice effective communication and teamwork techniques.
5. Apply the steps of the design process to solve a variety of design problems.
6. Translate a three-dimensional drawing or model into corresponding orthographic drawing views.
7. Construct various geometric forms and shapes.
8. Demonstrate assembly modeling skills to solve a variety of design problems.
9. Explore a working knowledge of products cost analysis.
10. Develop a portfolio to organize and display evidence of work.

Instructor Expectations

- Respect for fellow class members (and their individuality), the instructor and yourself. Translation, I will treat you with respect, and I expect the same. Class will be conducted in a manner that reflects: punctual attendance, prior preparation, and the procedure of turning off cell phones/pagers and other similar devices.
- Unethical Behavior: Academic dishonesty (cheating) will not be tolerated and may result in course failure (see student handbook).
- Teacher's role: to help you be successful in this class, but **your success in this class will hinge largely on self-discipline and the quality & quantity of effort you apply.**
- Student Handbook & Student Conduct. The handbook clearly defines the district's expectation of student behavior, consequences, and due process. Although my expectations are stated above, the district's rules will come to bear when they are applicable and must, therefore, be considered a part of this syllabus.

Course Outline/Calendar

Lesson 1.1 What is Engineering?

- Explain the relationship between science, technology, engineering and math.
- Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products.
- Describe impacts that technology has had on society.
- Distinguish between invention and innovation.
- Assemble an engineering notebook and a portfolio.

Lesson 1.2 Design Process

- Describe the design process and how it is used to aid in problem solving.
- Use the design process to solve a technical problem.
- Recognize design criteria and constraints.
- Describe the purpose and importance of working in a team.
- Explain a design brief and apply the concept when using the design process.
- Describe the elements of design and apply this concept to the design process.
- Use a decision matrix to select the best solution to a design problem.

Lesson 1.3 Measurement

- Demonstrate the ability to measure accurately with different devices and scales.
- Explain how to measure in different contexts.
- Measure using both the English and Metric systems.

Lesson 1.4 Sketching and Dimensioning Techniques

- Summarize the reasoning for using sketching as a communication tool.
- Use visualization, spatial reasoning, and geometric shapes to sketch two and three dimensional shapes.
- Recognize and create thumbnail, perspective, isometric, and orthographic sketches.
- Recognize and accurately interpret one and two point perspective drawings.
- Communicate ideas for a design using various sketching methods, notes, and drafting views.
- Dimension an orthographic sketch following the guidelines of dimensioning.

Lesson 1.5 Designing for Production

- Create a three-dimensional (3D) model of an object.
- Apply geometric and dimension constraints to design CAD-modeled parts.
- Assemble the product using the CAD modeling program.
- Demonstrate the ability to produce various annotated working drawings of a 3D model.
- Identify the difference between a prototype, a model and a mock-up and analyze what circumstances call for the use of each.
- Explain why teams of people are used to solve problems.
- Brainstorm and sketch possible solutions to an existing design problem.
- Create a decision-making matrix.
- Select an approach that meets or satisfies the constraints given in a design brief.

Grading (Evaluation)

Grades will be determined by a combination of the following assessments with a strong emphasis on the highlighted methods: Academic prompts, Checklists, Computerized assessment, Concept mapping, Demonstrations / Presentations, Informal observations/discussions/conferences, Other evidence, Student self-reflection/assessment, Performance assessment, Paper and pencil tests, Performance tasks, Portfolios, Project/Product(s), Individual and group work, Rubric, and Tests and/or Quizzes.

A	93 and above	Firm command of knowledge domain High level of skill development
A⁻	90 - 92	Exceptional preparation for later learning
B⁺	87 - 89	Command of knowledge beyond the basic concepts of knowledge Advanced development of most skills
B	83 - 86	Has prerequisites for later learning
B⁻	80 - 82	
C⁺	77 - 79	Command of the basic concepts of knowledge Demonstrates ability to use basic skills
C	73 - 76	Lacks a few prerequisites for later learning
C⁻	70 - 72	
D⁺	67 - 69	Lacks knowledge of some fundamental ideas Some important skills not attained
D	63 - 66	Deficient in many of the prerequisites for later learning
D⁻	60 - 62	
F	59 and below	Most of the basic concepts and principles not learned Most essential skills have not been demonstrated Lacks most prerequisites needed for later learning

Instructional Procedures & Support

1. Instructional procedures will consist of lecture, demonstration, reference materials, and exemplars.
 2. Extra help will be provided before and after school upon request.
 3. Teachers will facilitate the APPB (Activities, Projects, Problems) Learning Model.
- Activities are a method of instruction that involves directed teaching of a particular process or procedure. Activities engage students in learning skills that are later applied in more complex situations. Activities lead students to higher levels of learning.

Project-based learning is a comprehensive approach to instruction that presents a project or relevant activity that enables students to synthesize knowledge and to individually resolve problems in a curricular context.

Problem-based learning is both a curriculum organizer and an instructional strategy that presents a problem, which is relevant and related to the context where students are the stakeholders. Students synthesize and construct knowledge to help them actively grapple with the complexities of the problem and develop strategies to direct their own learning. When students experience a problem in context, they are more likely to make connections and thus see the value in what they are learning.

Academic Accommodation

Anyone who needs an academic accommodation based on a documented disability should inform the teacher.