



Teacher: Ashley Thompson
 Chester W. Nimitz Senior High School
 Advanced Engineering Design & Presentation

Curriculum Guide – 2018-2019
 Grades 11- 12/Days: A
 Aldine ISD

Topic/Concept:

Unit: 1

Engineering Notebooks

Duration: 1 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process.

Specific Objectives:

- Identify what makes a good Engineering Notebook
- Decorate Engineering Notebook Covers
- Understand how to document and setup notes
- Cut out and paste design briefings or sketch designs
- Use summaries to explain learning

TEKS:

§130.410 (c) (7) the student uses engineering design methodologies. The student is expected to:

- (A) Demonstrate an understanding of and discuss principles of ideation;
- (B) Demonstrate critical thinking, identify the system constraints, and make fact-based decisions;
- (C) Use rational thinking to develop or improve a product;
- (D) Apply decision-making strategies when developing solutions;
- (E) Use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and
- (F) Use an engineering notebook and portfolio to record the final design, construction, and manipulation of finished projects.

Language Objective(s) (ELPS):

- Use prior knowledge and experiences to understand meanings in English. [ELP.1A]
- Monitor oral and written language production and employ self-corrective techniques or other resources. [ELP.1B]
- Use accessible language and learn new and essential language in the process. [ELP.1F]

Key Vocabulary:

Calculations	Class Notes	Designs Drawings	Engineering Design	Ideas
Interactions	Meeting Notes	Observations	Patents	



Materials:

1. Composition Books
2. Computers
3. Flash Drive
4. Handout – Review Questions and activity mat
5. Tape and glue
6. Scissors
7. Pens/Pencils/Map Pencils/Markers

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Break students into five groups and issue assign topics to research and present to the class.

Guided Practice (We do)

The teacher will introduce the use and purpose of using Engineering Notebooks. Students will research topics given by instructor and present findings to the class as a group. Explain and give examples as they go. When students start the research process; teacher will make sure to monitor the work they are doing the work.

Independent Practice (You do)

Create a PowerPoint presentation to present to the class. Be sure to cite resources. Be creative with PowerPoint. No more than 5 slides. Must add graphics and sound. Each member of the group must present a slide. Students will also design and setup engineering notebooks.

Support Needed from RET Team:

1. Composition Notebooks

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.



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Assessment/Closure:

Students will complete an activity mate to recall importance of engineering notebooks and their uses for grading.

Teacher walks around the room and monitors students as they work on the PowerPoint presentation. Students must use their creativity in completing a design for their engineering notebooks.



Topic/Concept:

Unit: 2

Careers in Engineering

Duration: 2 Weeks

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to identify many career possibilities related to the fields of engineering and drafting and design.

Specific Objectives:

- Take Reality Check online quiz & find out just what all it really takes to make a living
- Pick an Occupation from the available OSCAR Career Clusters and decide if it's a career you want to pursue.
- Pick a Occupation from the available ONET Career
- Find two (2) colleges that you could attend for your Career choice, compare & contrast
- Create a Power Point about what we have learned following the rubric given
- Explain what Work Ethics, Employability, & Interpersonal Skills are and what theirs are
- Explain how social networking sites like Facebook can make or break their career
- Create a resume either for College or Employment

TEKS:

§130.410. (c) (2) the student gains knowledge of and demonstrates the skills necessary for success in the workplace. The student is expected to:

- (A) Distinguish the differences between an engineering technician, engineering technologist, and engineer;
- (B) Identify employment and career opportunities;
- (C) Investigate and work toward industry certifications;

Language Objective(s) (ELPS):

Use prior knowledge and experiences to understand meanings in English. [ELP.1A]
 Share information in cooperative learning interactions [ELP.3E]

Key Vocabulary:

Aerospace Engineer	Architect Engineer	Drafting and Design Engineer	Software Engineer	CAM
Agricultural Engineer	Civil Engineer	Geological Engineer	Marine Engineer	STL files
Automotive Engineer	Computer Engineer	Petroleum Engineer		

Materials:

1. Computers
2. Flash Drive
3. Handout – Review Questions
4. Engineering Notebook



Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Guided Practice (We do)

The teacher will explain the introduction of Careers in Engineering and Design. Students will research topics given by instructor and present findings to the class as a group. Explain and give personal examples as they go. When students start the research process; teacher will make sure to monitor the work they are doing the work.

Independent Practice (You do)

Create a PowerPoint presentation to present to the class. Be sure to cite resources. Be creative with PowerPoint.

Support Needed from RET Team:

1. Contact for industry professionals to setup field trips to big businesses.
2. Setup contacts as guest speakers as per district guidelines.
3. Setup field trip to visit Dr. Wayne Hung at Texas A & M University

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.

Assessment/Closure:

Students will present findings of the Occupation from the available OSCAR Career Clusters and describe and report a career they want to pursue.

Pick an Occupation from the available ONET Career

Find two (2) colleges that you could attend for your Career choice, compare & contrast

Create a Power Point about what we have learned following the rubric given

Explain what Work Ethics, Employability, & Interpersonal Skills are and what theirs are

Explain how social networking sites like Facebook can make or break their career

Create a resume either for College or Employment



Topic/Concept:

Unit: 3

Technical Drafting

Duration: 3 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to use basic drafting skills and techniques when solving problems.

Specific Objectives:

- Demonstrate basic drafting skills.
- Use basic drafting skills and techniques when solving drawing problems.
- Make accurate measurements using a drafting scale.
- Draw horizontal, vertical, inclined, and perpendicular lines.
- Identify common sheet size formats for drafting.

TEKS:

§130.410 Engineering Design and Presentation I:

- (1) (C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions
- (5) (F) handle and store tools and materials correctly
- (8) (B) use tools, laboratory equipment, and precision measuring instruments to develop prototypes
- (9) (D) produce engineering drawings to industry standards

Language Objective(s) (ELPS):

Narrate, describe, and explain with increasing specificity and detail as more English is acquired.
 [3H]

Key Vocabulary:

Architect's scale	Border line	Break lines	Centerlines	Construction lines	Scale
Dimension lines	Engineer's scale	Erasing shield	Extension lines	Guidelines	
Line conventions	Mechanical drafters scale	Metric scale	Object line	Phantom lines	



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Scale clip	Section lines	Symmetry centerlines	Visible lines	Hidden lines	
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Materials:

1. Textbook Chapter 5
2. Chapter 5 PowerPoint® Presentation
3. G-W Companion Website
4. Computers
5. Flash Drive
6. Handout – Review Questions

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Guided Practice (We do)

The teacher will explain the PowerPoint presentation assignment and answer questions.

Independent Practice (You do)

Students will complete the activity mate identifying techniques, terms and purpose of drafting techniques.

Support Needed from RET Team:

Differentiation (*SpEd, 504, Dyslexia, GT*):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.

Assessment/Closure:

Students will be assessed on notes and documentation in their engineering notebooks.



Topic/Concept:

Unit: 4

Engineering Design Process

Duration: 2 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to understand the Engineering Design Process.

Specific Objectives:

- Explain the purpose of design
- Identify the basic steps of the design process
- Explain the purpose of design
- Identify the basic steps of the design process
- Identify some specific features and characteristics of each step in the design process
- Explain the importance of planning before building
- Practice the design process with simple to advanced drawings

TEKS:

130.410 (c) (7) the student uses engineering design methodologies. The student is expected to:
 (A) Demonstrate an understanding of and discuss principles of ideation;
 (B) Demonstrate critical thinking, identify the system constraints, and make fact-based decisions;
 (C) Use rational thinking to develop or improve a product;
 (D) Apply decision-making strategies when developing solutions;
 (E) Use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and
 (F) Use an engineering notebook and portfolio to record the final design, construction, and manipulation of finished projects.

Language Objective(s) (ELPS):

(4)(G) Demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade-level needs [4G]

Key Vocabulary:

Constraints	Creativity	Criteria	Data	Design	Distribution
Experiment	Invention	Marketing	Problem solving	Product	Process
System	systematic	Technology	Engineering Design Process (EDP)		



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Materials:

1. Autodesk Fusion 360 – Provided by district 2. Computers 3. Flash Drive 4. Handout – Review Questions

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Break students into five groups and issue assign topics to research and present to the class.

Guided Practice (We do)

We will discuss findings. Students will research topics given by instructor and present findings to the class as a group. When students start the research process; teacher will make sure to monitor the work they are doing the work.

Independent Practice (You do)

Using engineering notebook, come up with a problem and use the engineering design procedure to find a solution and or identify an problem you and your group can prefect. i. e Apple co. Create a PowerPoint presentation to present to the class. Be sure to cite resources. Be creative with PowerPoint. No more than 5 slides. Must add graphics and sound. Each member of the group must present a slide.

Support Needed from RET Team:

Fusion 360 software: Aldine District provided.

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.

Assessment/Closure:

Assessment will be on the engineering notebook, notes, PowerPoint presentation and warmups.



Topic/Concept:

Unit: 5

Fusion 360

Duration: 3 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to get the knowledge about product design in Autodesk Fusion 360.

Specific Objectives:

- Navigate through the user interface of Autodesk 360
- Understand design process in Autodesk Fusion 360
- Create conceptual design and organic forms using T-Splines
- Design mechanical parts using solid modeling tools
- Create mechanical assemblies and motion studies

TEKS:

§130.410. (c) (6) the student applies the concepts of sketching and skills associated with computer-aided drafting and design. The student is expected to:

- (E) Use advanced construction techniques;
 - (F) Prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards;
 - (G) Demonstrate knowledge of effective file structure and management;
 - (H) Use advanced dimensioning techniques;
 - (I) construct and use basic 3D parametric drawings; and
 - (J) Develop and use prototype drawings for presentation.
- (7) The student uses engineering design methodologies. The student is expected to :(
 A) Demonstrate an understanding of and discuss principles of ideation; demonstrate critical thinking, identify the system constraints, and make fact-based decisions;
 (B) Demonstrate critical thinking, identify the system constraints, and make fact-based decisions;

Language Objective(s) (ELPS):

Identify Fusion 360 user interface. [5A]

Key Vocabulary:

Assemblies	Browser Menu	Constraints	Rendering	CAM
Animate	Computer Aided Design (CAD)	Degrees' of Freedom	Views	STL files



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Materials:

1. Autodesk Fusion 360 – Provided by district
2. Computers
3. Flash Drive
4. Handout – Review Questions

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.
Break students into five groups and issue assign topics to research and present to the class.

Guided Practice (We do)

The teacher will explain the introduction of Fusion 360 PowerPoint presentation. Students will research topics given by instructor and present findings to the class as a group. Explain and give personal examples as they go. When students start the research process; teacher will make sure to monitor the work they are doing the work.

Independent Practice (You do)

Create a PowerPoint presentation to present to the class. Be sure to cite resources. Be creative with PowerPoint. No more than 5 slides. Must add graphics and sound. Each member of the group must present a slide.

Support Needed from RET Team:

Direction and contacts setting up the Student Elite Program.
Fusion 360 software: Aldine District provided.

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.
504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.
Dyslexia - Supplemental aids/graphic organizers, extended time.
GT: Extended research.

Assessment/Closure:

Students will receive a handout of the Autodesk Fusion 360 interface and identify where icons are located and their uses for grading.



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Teacher walks around the room and monitors students as they work on the PowerPoint presentation. Correct or redirect mistakes before they get too bad. If they do get too bad, give them direction and helpful examples and have them try again.



Topic/Concept:

Unit: 6

3D Printing and its Processes

Duration: 3 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to get the knowledge about product design in Autodesk Fusion 360.

Specific Objectives:

After studying this chapter, you should be able to:

- Explain why industry uses models, mockups, and prototypes.
- Define the terms model, mockup, and prototype.
- Describe how different industries use models, mockups, and prototypes.
- Construct simple models.
- Use model making equipment and supplies safely.

TEKS:

130.410 (c) (10) the student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:

- (A) Identify and describe the steps needed to produce a prototype;
- (B) Identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and
- (C) Present the prototype using a variety of media.

Language Objective(s) (ELPS):

Use pre-reading supports such as graphic organizers, illustrations, and pre-taught topic related vocabulary and other pre-reading activities to enhance comprehension of written text. [4D]

Key Vocabulary:

Mockup	Model	Production fixture	Prototype	Surface model	Solid model
wireframe	Stl file	ABS	Build platform	CAD	CNC
Curing	FDM	Hardening	OBJ	Photopolymer	SLA

Materials:

1. Autodesk Fusion 360 – Provided by district
2. Computers
3. Flash Drive



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4. Handout – Review Questions

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Guided Practice (We do)

Discuss project and answer any question students may have on the design process. Demonstrate how to start with an idea and a sketch using engineering notebooks and draft using Fusion 360.

Independent Practice (You do)

See handout: Construct a model helicopter similar to the one shown in Figure 18-16 in your textbook. Design and construct from balsa wood a minimum building that would protect the helicopter from the elements and 3D print a model using Fusion 360.

Support Needed from RET Team:

Fusion 360 software: Aldine District provided.

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.

Assessment/Closure:

Student will be assessed on their engineering notebook, class participation and steps taking to produce a final project.



Topic/Concept:

Unit: 7

Traditional Manufacturing

Duration: 2 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to identify and describe basic manufacturing processes.

Specific Objectives:

- Name and describe the different types of conventional machine tools used to manufacture products.
- Name and describe the different types of modern machine tools used to manufacture products.
- Explain the different methods of cutting, shaping, and forming metals.
- Explain the different methods of casting metals.
- Explain the different methods of molding plastics.
- Identify and describe additive manufacturing processes.

TEKS:

130.412 (c) (8)(8) the student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:

- (A) Identify and define an engineering problem;
- (B) Formulate goals, objectives, and requirements to solve an engineering problem;
- (C) Determine the design parameters associated with an engineering problem such as materials, personnel, resources, funding, manufacturability, feasibility, and time;
- (D) Establish and evaluate constraints pertaining to a problem, including health, safety, social, environmental, ethical, political, regulatory, and legal;
- (E) Identify or create alternative solutions to a problem using a variety of techniques.

Language Objective(s) (ELPS):

Use pre-reading supports such as graphic organizers, illustrations, and pre-taught topic related vocabulary and other pre-reading activities to enhance comprehension of written text. [4D]

Key Vocabulary:

Additive manufacturing	Blanking	Broach	Casting	Composite	Compression molding
CNC	Direct casting	direct shell	Production casting	Drilling	Forming
Fused deposition modeling	Grinding	Injection molding	Just-in-time (JIT) manufacturing	Lathe	Manufacturing machine tool



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Materials:

1. Autodesk Fusion 360 – Provided by district
2. Computers
3. Flash Drive
4. Handout – Review Questions
5. Engineering Notebook

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.

Guided Practice (We do)

Review the Drafting Vocabulary with students.

Have on hand a collection of items produced by different manufacturing processes. Have students examine the items and explain how they think they were made. To increase interest, show students how to use common measuring tools, such as a rule, micrometer, vernier caliper, and dial indicator. A collection of metals and plastics can also be used as teaching aids. Catalogs and brochures from machine tool manufacturers can also be made available for student examination.

Independent Practice (You do)

- Read chapter 25.
- Textbook Chapter 25 Test Your Knowledge questions

Support Needed from RET Team:

2. Acquiring equipment such as: dial caliper, micrometer, Vernier caliper etc.
3. Fusion 360 software: Aldine District provided.

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.

504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.

Dyslexia - Supplemental aids/graphic organizers, extended time.

GT: Extended research.

Assessment/Closure:

G-W Learning Companion Website Test Your Knowledge questions

G-W Learning Companion Website Pretest and Posttest



Topic/Concept:

Unit: 8

Project: Pen Base & Pen Holder

Duration: 4 Week

Content Objective(s) (TEKS):

Upon completion of this lesson/assignment, students will be able to integrate previous lesson prior to this unit to produce pen base and pen holder for a final project.

Specific Objectives:

After studying this chapter, you should be able to:

- Explain why industry uses models, mockups, and prototypes.
- Define the terms model, mockup, and prototype.
- Describe how different industries use models, mockups, and prototypes.
- Construct simple models.
- Use model making equipment and supplies safely.

TEKS:

§130.410. (c) (6) the student applies the concepts of sketching and skills associated with computer-aided drafting and design. The student is expected to:

- (E) Use advanced construction techniques;
- (F) Prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards;
- (C) Improve a system design to meet a specified need, including properties of materials selected;
- (c) (10) (A) identify and describe the steps needed to produce a prototype;
- (B) Identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and
- (C) Present the prototype using a variety of media.

Language Objective(s) (ELPS):

Narrate, describe, and explain with increasing specificity and detail as more English is acquired.
 [3H]

Key Vocabulary:

Additive manufacturing	Blanking	Broach	Casting	Composite	Compression molding
Model	Production fixture	Prototype	Surface model	Solid model	Model



Fused deposition modeling	Grinding	Injection molding	Just-in-time (JIT) manufacturing	Lathe	Manufacturing machine tool
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Materials:

1. Autodesk Fusion 360 – Provided by district
2. Computers
3. Flash Drive
4. Handout – Review Questions

Lesson Sequence:

Teacher Modeling (I do)

Facilitate instruction.
 Handout rubric for independent projects.

Guided Practice (We do)

Independent study.

Independent Practice (You do)

Follow handout of drawing process and design a pen base and pen holder. Prepare STL files for printing.

Support Needed from RET Team:

4. Tour of Texas A&M for printing and machining pen base.
5. Fusion 360 software: Aldine District provided.

Differentiation (SpEd, 504, Dyslexia, GT):

SpEd - Change of pace. Supplemental aids/graphic organizers, extended time.
 504 - Simplified instructions. Change of pace. Supplemental aids/graphic organizers, extended time.
 Dyslexia - Supplemental aids/graphic organizers, extended time.
 GT: Extended research.

Assessment/Closure:

Find product.



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Teacher walks around the room and monitors students as they work on the PowerPoint presentation. Correct or redirect mistakes before they get too bad. If they do get too bad, give them direction and helpful examples and have them try again.