| Course: Engineering Design<br>Unit #1: Applied Engineering Skills | Year of Implementation: 2019-2020 |
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## Stage One - Desired Results

**Link(s) to New Jersey Student Learning Standards for this course:**
**https://www.state.nj.us/education/cccs/2014/career/CareerReadyPractices.pdf**

**https://www.state.nj.us/education/aps/cccs/career/**

**Unit Standards:**

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

B. Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

C. Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others

D. Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live

B. Technology and Society: Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.
C. Design: The design process is a systematic approach to solving problems.
D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.

9.2 Career Awareness, Exploration, and Preparation:
9.2.12.C.1 Review career goals and determine steps necessary for attainment.

9.3 Career and Technical Education:
9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.
9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.
9.3.12.AC-DES.1 Justify design solutions through the use of research documentation and analysis of data.
9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues
9.3.ST-ET.1 Use STEM concepts and processes to solve problems involving design and/or production.
9.3.ST-ET.2 Display and communicate STEM information.
9.3.ST-ET.3 Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.4 Apply the elements of the design process.

Career Ready Practices:
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.

**Transfer Goal(s):** Students will be able to use their learning to independently select and create accurate drawings using Computer Aided Drawing (CAD) software based on the application and need.

| *Enduring Understandings* | *Essential Questions* |
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| Students will understand that. . .<br><br>*EU 1*<br>the complexity of the object determines the type of drawing to be created.<br><br>*EU 2*<br>engineers use accurate drawings to communicate design intent.<br><br>*EU 3*<br>different engineering professions improve different aspects of a society's quality of life. | <br><br>*EU 1*<br>● Why are different types of drawings needed?<br>● What makes a good drawing?<br><br>*EU 2*<br>● How can using CAD help solve engineering problems?<br>● How important is accuracy?<br>● How do engineers use drawings to communicate with one another?<br><br>*EU 3*<br>● How do different types of engineers affect your daily life? |
| *<u>Knowledge</u>*<br>*Students will know . . .*<br><br>*EU 1*<br>● common drawing terminology.<br>● drawing types and their applications.<br>● the components of a drawing.<br>● how to correctly set up a drawing.<br>● necessary commands and functions of AutoCAD.<br>● necessary commands and functions of Inventor.<br><br>*EU 2*<br>● why communicating design intent in drawings is important.<br>● what accuracy in engineering means.<br><br>*EU 3*<br>● the characteristics of each engineering discipline.<br>● how different engineers influence daily routines. | *<u>Skills</u>*<br>Students will be able to. . .<br><br>*EU 1*<br>● proficiently use a CAD program to set up and create the correct drawing type for a given object/application.<br><br>*EU 2*<br>● use CAD programs to communicate design intent.<br><br>*EU 3*<br>● describe the role that engineers play in society. |

## Stage Two - Assessment

*Other Evidence:*

- Quizzes/Tests that prove an ability to:
  - recognize the meaning of drawing terminology
  - explain what specific drawings would be used for
  - recognize CAD commands and their functions
  - explain how to set up a drawing
  - list the various components of a complete drawing
- Self-Assessment by student of their learning activities
- Teacher observation of student performance during learning activities

## Stage Three - Instruction

*Learning Plan:* **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.**

- Using illustrations of drawings, students will identify the types of drawing and its applications. (**A, EU1)**
- Using a given example, identify the component parts of a typical drawing. (**A,M, EU1)**
- For a given type of drawing, list 10 CAD commands that would be used to create it.(**A, M, EU1)**
- For a given object, create a 3 dimensional model. (**M,T, EU1, EU2)**
- Pick 2 types of drawings and explain how they are different. (**M,T, EU1)**
- Use the 10 selected commands (from bullet #3) and re-create the drawing. List any other commands that you didn't include on your list but had to use to complete it. (**M,T, EU1, EU2)**
- Create a multi-view drawing **(M, EU2)**
- Presentation on career information for a specific engineering discipline and how it has impacted society.(**A,T, EU3)**

- Use the internet to compare and contrast a career in a specific engineering discipline in the United States and a foreign country. (**M, EU3)**

- For a given example, identify what engineering discipline would be needed to create/solve it. (**A, M, EU3)**
- Write an essay on a selected engineering profession and how it positively impacts/improves the quality of life. **(A, M, EU3)**