DRAFTING III

Grades 9-12

Prerequisite: Drafting I & II

Credits: 5

ABSTRACT

This is an intensive course designed for the advanced drafting student who exhibits a high level of skill in both traditional drafting methods and Computer Aided Drafting (CAD). It places special emphasis on common methods of manufacturing and fabrication of materials. The student will draw on previously acquired knowledge and techniques to perform those tasks needed to complete assigned or self-initiated design projects. Emphasis will be placed on the application of problem solving techniques and use of the design loop. Students will learn to explain the principles and purposes of a cam and then draw a complete set of working drawings of a cam problem; identify various types of gears and draw a machinist drawing of each, and plan and design a variety of systems.

BOE approved 06/19/2018
## Unit of Study: Class & Self-Management/Health & Safety

### Unit 1: 1 week - Design Project I

**Established Goals:**

- **NJSLS:** (include technology and 21st century standards)

**Enduring Understandings:**

- Safety is a priority in all school settings.
- Student self-management is key to preventing accidents and injuries.
- Students are obliged to follow all rules, policies and laws regarding safety set by the Board of Education (MBOE), New Jersey and the Federal Government (OSHA).

**Essential (Guiding) Questions:**

1. What are the safety concerns to be considered when working in a shop setting in school or on the job?
2. What hazards and dangers can Personal Protective Equipment (PPE) be used to protect against?
3. What elements should an effective school/occupation and safety and health program include?

### Class & Self-Management/Health & Safety

### Design Project I

**Unit 2: 5 weeks - Precision Measuring**

**Established Goals:**

- **NJSLS:** (include technology and 21st century standards)

**Enduring Understandings:**

- Everything we use every day has been designed.
- Design is influenced by form, as well as function.
- Designers consider a wide array of elements and factors when designing new products.

**Essential (Guiding) Questions:**

1. What are the steps of the Engineering Design Process and why are they important?
3. How important is the railway system?

### Precision Measuring

**Unit 3: 6 weeks**

**Established Goals:**

- **NJSLS:** (include technology and 21st century standards)

**Enduring Understandings:**

- Precision is necessary with different types of measuring tools.
- Any object that is important can be measured.
- Measurements impact the way we live. Without measurement Humankind could not track time, mass produce items, make maps, pay for items with money, or develop musical, mathematical, navigational, commercial and administrative skills.

**Essential (Guiding) Questions:**

1. Why is measuring so important in every field of technology and science?
2. What are tolerances?
3. What tools are used to take precise measurements?
### Assessments & Evidence:
(Through what authentic performance tasks will students demonstrate the desired understandings?)
(By what criteria will performance of understanding be judged?)

- Quiz on safety signage.
- Student self-assessment of safety procedures.
- Performance test to include safety scenarios and emergency situations.
- Informal, ongoing observations of students following safety procedures.

**The proficient student will be able to:**
- Practice the safe use of tools and equipment.
- Implement safety procedures in the classroom.
- Model methods for maximizing personal productivity in a safe environment.
- Maintain the equipment in safe operating condition.

### STAGE 3: Learning Plan

<table>
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<tr>
<th>Learning Activities: (What specific activities will students do and what skills will students know as a result of the unit?)</th>
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<th>Research</th>
<th>Laboratory Work</th>
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<tr>
<td>- Divide class into 3 or 4 teams. Students will compete in a quiz bowl testing their safety sign/symbol knowledge. Use whatever is available to ring in (bell buzzer,) Team with most correct answers receives extra credit reward.</td>
<td>- PowerPoint presentation on classroom and occupational safety procedures, PPE and hazardous signage.</td>
<td>- PowerPoint presentation on ENGINEERING DESIGN PROCESS AND DESIGN I PROJECT.</td>
<td>- Use textbooks, guided notes packets, online supporting materials to complete the design challenge by compiling everything into proper Engineering Design Process model.</td>
<td>- In teams, design and draw a tool (water pump flange puller) that could be used in a shop.</td>
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<td>Lecture</td>
<td>- PowerPoints on PPE and Hazardous Signage.</td>
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<td>- Draw detailed drawing that includes proper dimensioning, labeling and tolerance specifications.</td>
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<td>Research</td>
<td>- Use magazines and websites to identify PPE and</td>
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<td>- One on one instruction</td>
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### Occupational Safety Procedures

**Laboratory Work**
- Create a group poster to the theme “Safety Matters”.
- One on one instruction
- Peer demonstration
- Brainstorming
- Projects
- Homework
- Rubrics (where appropriate)
- Critiques
- Class participation
- Marking Period tests
- Written and Performance exams
- Benchmarks

### Resources:

- Classroom supplies for Technological Learning Activities (TLA)
- Current class textbook: Engineering Drawing and Design
- Internet
- PowerPoint presentations
- Instructor knowledge
- Sample online resources:
  - [http://www.osha.gov](http://www.osha.gov)
  - [http://www.state.nj.us](http://www.state.nj.us)

### Interdisciplinary Connections:

**English**
- Writing responses and discussion notes
- Critique writing
- Open ended writing responses
- The class requires descriptive technical writing

**Mathematics**
- The class requires basic mathematical computation

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**Students performing at a higher level can:**
- Be given a more complicated project to perform.

**Students performing at a lower level could be:**
- Provided with specific resources to support the creation of a report.
| Unit of Study:  
(Title, timeframe, description) | Power Transmission  
Unit 4: 3 weeks | Sketching/Designing  
Unit 5: 2 weeks | Amusement Park Ride  
Unit 6: 7 weeks |
|---|---|---|---|
| **Established Goals:**  
NJSLS:  
(include technology and 21st century standards) | Technology  
8.2.12.C.6, 8.2.12.C.7, 8.2.12.D.1  
8.2.12.D.3  
21st Century Life and Careers  
9.3.ST-ET., 9.3.ST-ET., 9.3.ST-ET.5  
9.3.12.AC-DES.1, 9.3.12.AC-DES.6, 9.3.12.AC-DES.7  
9.3.12.AC-DES.8 | Technology  
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9.3.12.AC-DES.8 |
| **Enduring Understandings:**  
(students will understand . . .) | ● Energy moves the world and can be in many different forms.  
● When energy is changed from one form to another, heat is produced (loss of energy). | ● Design and engineering processes are affected by design constraints and specific limitations.  
● Many great ideas initially start off as pencil scratches on a napkin or corner of a page.  
● Explanation of one’s thoughts and ideas can easily be enhanced through sketching. | ● Amusement park rides are custom-made by designers and engineers using a wide array of statistical data, established practices, emerging technologies, and experimental techniques.  
● The success of a ride is based on both form and function. |
| **Essential (Guiding) Questions:**  
(What provocative questions will foster inquiry, understanding, and transfer of learning?) | ● Where is power transmission implemented?  
● How is power transmitted?  
● What are the trade-offs of transmitting power? | ● What are good habits to develop when sketching?  
● What do designers do with their sketches, used & unused?  
● Why is sketching so important in designing? | ● How do designers research new ride designs?  
● What are the different amusement ride types and examples of each?  
● Why is modeling vital to ride and attraction development? |
| **Assessments & Evidence:**  
(Through what authentic performance tasks will students demonstrate the desired understandings?)  
(By what criteria will performance of understanding be judged?) | ● Self and peer evaluations  
● Performance Task Rubric  
● Individual projects  
*The proficient student will be able to:*  
● Determine output from various gear ratios. | ● Self and peer evaluations  
● Performance Task Rubric  
● Individual projects  
*The proficient student will be able to:*  
● Successfully complete sketching packet.  
● Show high quality or incredible improvement in sketching. | ● Self and peer evaluations  
● Performance Task Rubric  
● Individual projects  
*The proficient student will be able to:*  
● Research, design, document, and develop a presentation and sales pitch for a new attraction for the Around the World Amusement Park (AtWAP). |
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<td><strong>Lecture</strong></td>
<td>● PowerPoint presentation on POWER TRANSMISSION.</td>
<td>● Watch video about amusement park ride designing at Disney</td>
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<td><strong>Research</strong></td>
<td>● Using textbooks and the internet, research how transmissions convert power for speed or torque.</td>
<td><strong>Lecture</strong></td>
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<td><strong>Laboratory work</strong></td>
<td>● In teams, disassemble and reassemble a small 3 speed transmission.</td>
<td>● PowerPoint presentation on AMUSEMENT PARK RIDE DESIGNS.</td>
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<td>● Calculate the distance a lawnmower wheel will travel in 5 transmission rotations in each of the 3 gears.</td>
<td>● Videos about new emerging technologies in amusement park rides.</td>
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<td>● One on one instruction</td>
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<td>● Peer demonstration</td>
<td>● Students will research the entire design process from initial request to end of life for an amusement park ride.</td>
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<td>● Brainstorming</td>
<td>● Discover how branding and themes of rides can make or break ride success.</td>
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<td>● Projects</td>
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<td>● Homework</td>
<td>● Research, brainstorm, choose, design, construct, test, modify, and present their own amusement park ride that fits required theme.</td>
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<td>● Rubrics(where appropriate)</td>
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● Students performing at a higher level can:  
  o Be given a more complicated project to perform.  
● Students performing at a lower level could be:  
  o Provided with specific resources to support the creation of a report. | ● The class requires basic mathematical computation  
● The class requires descriptive technical writing |
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# MONTVILLE TOWNSHIP PUBLIC SCHOOLS

## Unit of Study:

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<th>Design a Dynamic Device</th>
<th>Build the Dynamic Device</th>
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<td><strong>Unit 7:</strong> 4 weeks</td>
<td><strong>Unit 8:</strong> 6 weeks</td>
<td><strong>Unit 9:</strong> 6 weeks</td>
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### STAGE 1: Desired Results

#### Established Goals:

**NJ CCCS and/or CCSS:**

(include technology and 21st century standards)

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#### Enduring Understandings:

(students will understand . . .)

- Some of the most important technological advances to mankind has been those that allow us to travel faster than biologically possible.
- With the invention of the wheel, man has continually evolved toward moving faster and easier.
- Physics principles through the design and use of trebuchet devices.
- Designing adjustments within devices can allow for fine tuning and range of capabilities.
- Construction principles and techniques.
- Physics and mathematics principles through calculation and aiming of a projectile.

#### Essential (Guiding) Questions:

(What provocative questions will foster inquiry, understanding, and transfer of learning?)

- What is walking weight?
- Which basic geometric shapes are the strongest and why?
- How is a trebuchet different than a catapult?
- How does weight affect the distance thrown?
- Why is the arm ratio important?
- Why are triangles important in building the trebuchet?

### STAGE 2: Evidence

#### Assessments & Evidence:

(Through what authentic performance tasks will students demonstrate the desired understandings?)

(By what criteria will performance of understanding be judged?)

- Self and peer evaluations
- Performance Task Rubric
- Individual projects

The proficient student will be able to:

- Use hand tools to successfully cut accurate sized pieces of wood with various joints.
- Work effectively as a team, able to share ideas, provide constructive feedback.

- Self and peer evaluations
- Performance Task Rubric
- Individual projects

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<td><strong>●</strong> PowerPoint presentation on PEOPLE MOVING DEVICES DESIGN.</td>
<td><strong>●</strong> PowerPoint presentation on DYNAMIC DEVICE DESIGNING.</td>
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<td>● Bridge construction</td>
<td>● Medieval weaponry</td>
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<td>● Structural shapes</td>
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<td>● Working in teams, design and build a device to a specification capable of holding the walking weight of a 200 lbs. man.</td>
<td>● Working in teams of 2, design a Trebuchet that will use a 5 lbs. weight for its power source.</td>
<td>● Working in teams, build the trebuchet from the created design/detail drawings</td>
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**Resources:**
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- Sample online resources: [http://www.butlercc.edu/engineering/en115/en115_basic_treb_design.cfm](http://www.butlercc.edu/engineering/en115/en115_basic_treb_design.cfm)

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