Instructor Information:

Teacher: Michael J. Pappas  
Technology Education Certified K-12  
National Board Certified Teacher - CTE  
Project Lead the Way Certified Instructor – IED, POE, AE & EDD

Room: Belle Vernon Area High School, Room 007

Contact: Phone: 724-808-2500; ext. 2007  
Email: Michael.Pappas@bellevernonarea.net

Website: http://www.bellevernonarea.net//Domain/193

Required Text: N.A.

Additional Resources: www.my.pltw.org

Course Description:

Introduction to Engineering Design (IED) is a high school level course that is appropriate for 9th or 10th grade students who are interested in design and engineering or another technical career. The major focus of the IED course is to expose students to a design process, professional communication and collaboration methods, design ethics, and technical documentation. IED gives students the opportunity to develop skills in research and analysis, teamwork, technical writing, engineering graphics, and problem solving through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB-learning challenges students to continually hone their interpersonal skills and creative abilities while applying math, science, and technology knowledge learned in other courses to solve engineering design problems and communicate their solutions. IED also allows students to develop strategies to enable and direct their own learning, an ultimate goal of education. No previous knowledge is assumed, but students should be concurrently enrolled in college preparatory mathematics and science courses in order to facilitate the use and understanding of
appropriate math and science concepts necessary for the successful completion of IED coursework. In addition, students will use industry standard 3D solid modeling software to facilitate the design and documentation of their solutions to design problems and challenges. As the course progresses and the complexity of the design problems increase students will learn more advanced computer modeling skills as they become more independent in their learning, more professional in their collaboration and communication, and more experienced in problem solving.

Introduction to Engineering Design is one of the foundation courses in the Project Lead The Way, Pathway to Engineering high school pre-engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

**Course Objectives:**

By the end of this course, the successful student will be able to:

1. Apply the Design Process
2. Create technical sketches and drawings
3. Create engineering documentation and demonstrate drawing standards
4. Demonstrate proper measurement and statistical analysis
5. Use applied geometry
6. Create 3D CAD solid models
7. Complete and reverse engineering project
8. Design a product based on a client’s wants
9. Participate in a virtual design challenge
10. Demonstrate presentation design and delivery

**Academic Honesty:**

Any work submitted by the student shall be his/her own. Work taken from others shall be deemed as unacceptable. Any doubts will initiate the completion of an alternative assignment or a zero on the required effort, depending on the severity of the infraction.

**Class Policies and Expectations:**

1. **Attendance:** Perfect attendance is strongly recommended. Arrive to class on time – Tardiness, without a pass, will be reported to the office. (see student handbook)
2. **Be prepared to work** - Bring all appropriate materials to class (Engineer’s Notebook/Binder and pencil). Immediately take you assigned seat. Daily objectives are posted in classroom. Study Quizlet terms for current unit while you wait for attendance and wait for further instruction.
3. **Pay attention** – All lectures and demonstrations are important. These concepts will be built upon. Lab demonstrations are extremely important because they often involve your safety and the safety of everyone else in the lab.
4. **Food or drink** - Prohibited.
5. **Electronic devices** - Prohibited. Unless required in lesson. Ex. Use cell or digital camera to capture evidence of work to upload to ePortfolio.
6. **Computers** – Are available and used regularly. Students must follow internet usage policy. (see student handbook) Students caught using computer for reasons other than associated with classroom assignment (during assignment) will fail that assignment. Example: Playing games during programming of robot in Robotic Engineering or on Craigslist during instructional time. Students who change settings on computer will not receive help until settings are set back.
7. **Assessments** – Include, but are not limited to, group and/or individual classroom assignments, tests, quizzes (on-line), portfolios, e-portfolio, engineers book and lab assignments. Students must successfully complete a safety quiz (100%) on specific machinery that they will use in the lab. Failure to successfully complete this assessment will not affect their grade, but will prohibit them from using this machine in any lab situation.
8. **Student’s responsibility** – Each student is responsible for his/her actions. Each student should monitor their progress utilizing EDLINE. Check it weekly on EDLINE. It is the student’s responsibility to make up any incomplete assignment(s). To be successful in my class, you must complete all assignments. Student’s also need to activate and use your school issued email via Gmail.
9. **Follow all lab policies and procedures** – Lab policies and procedures are posted throughout the lab. They are then discussed, reviewed and tested in great detail within each course. This includes (but is not limited to) machine/material/tool use, clean up procedures, behavior, lab dress code, and the safety of the individual students and class. Violation of any of these policies/ procedures will not be tolerated. Any violations will be reported to the office and will result in an immediate and permanent removal from class. All students will be closely supervised in classroom and lab situations. It is extremely important that the parent/guardian emphasize, to their child, the importance of appropriate behavior in all lab situations to support classroom instruction. Approved safety glasses, provided, must be worn in the lab at all times.

**Course Grading Criteria:**

All quizzes, tests, and projects will be graded according to the Belle Vernon Area School District grading policy. Total points will be accumulated for all evaluated efforts in this class rather than having letter grades per each effort. The grading scale is as follows:

**The Belle Vernon Area High School grading scale:**

- **A**--------100-90%
- **B**--------89-80%
- **C**--------79-70%
- **D**--------69-60%
- **F**--------59-0%
Assignments per Quarter:

Engineer’s Notebook Random Checks – Informal
Engineer’s Notebook End of Quarter/Year Check – Formal
ePortfolio – Optional
Quizzes (Key Terms) – Formal
Sketches – Informal
Projects – Formal
End Of Course Exam (EOC) – Formal

*Assignments or assessments may vary due to pace of class and individualized instruction.

Academic Standards:

Students will be reacquainted with the International Technology Engineering Pennsylvania Academic Standards that have been adopted by the Department of Education, along with the Common Core Standards that are in the process of being implemented nationwide. Students will be made aware of the importance of the standards and the efforts to meet them.

Edline:

Grades will be updated every Friday on Edline. It is the responsibility of the student to monitor and check their grade on a regular basis. If you lost or cannot remember log in information, please contact our Child Accounting Department at 724-808-2500 ext. 1108.

Schoolwires (Website):

My website will be updated every Friday. Course Topics, Assignments, and Quizzes and Tests are also posted weekly. A link to www.my.pltw.org is also listed. Students can access all course material there. The following signatures state that all parties are aware of the preceding syllabus.

Student Signature____________________Date_______________

Parent Signature_____________________Date_______________

Teacher Signature____________________Date_______________
## Course Outline:

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<th>1st Quarter</th>
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<td><strong>I. Unit 1 - Design Process – Documentation</strong>&lt;br&gt;• Identify and define the terminology used in engineering design and development.&lt;br&gt;• Identify the steps in an engineering design process and summarize the activities involved in each step of the process.&lt;br&gt;• Complete a design project utilizing all steps of a design process, and find a solution that meets specific design requirements.&lt;br&gt;• Construct a testable prototype of a problem solution.</td>
<td><strong>I. Unit 4 – Modeling Skills</strong>&lt;br&gt;• Create three-dimensional solid models, multi-view drawing and orthographic projections of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints.&lt;br&gt;• Utilize project portfolios to present and justify design projects.</td>
<td><strong>I. Unit 7 – Documentation</strong>&lt;br&gt;• Complete a design project utilizing all steps of a design process, and find a solution that meets specific design requirements.&lt;br&gt;• Utilize research tools and resources (such as the Internet).&lt;br&gt;• Write a design brief to communicate the problem, problem constraints, and solution criteria.&lt;br&gt;• Generate and document multiple ideas or solution paths to a problem through brainstorming.&lt;br&gt;• Hand sketch orthographic projections.&lt;br&gt;• Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints.&lt;br&gt;• Generate CAD multi-view technical drawings.&lt;br&gt;• Create assemblies of parts in CAD. Manipulate the assembly model to demonstrate the movement.&lt;br&gt;• Create a CAD assembly drawing, detailed drawing and</td>
<td><strong>I. Unit 9 – Design Team</strong>&lt;br&gt;• Complete a design project utilizing all steps of a design process, and find a solution that meets specific design requirements.&lt;br&gt;• Use presentation software effectively to support oral presentations.&lt;br&gt;• Assess the development of an engineered product and discuss its impact on society and the environment.&lt;br&gt;• Describe the contributions of engineers from different engineering fields in the design and development of a product, system, or technology.&lt;br&gt;• Identify and explain how the basic theories of ethics relate to engineering.&lt;br&gt;• Incorporate the use of the visual elements and principles of design in the design of an engineered product.&lt;br&gt;• Identify team member skill sets needed to produce an effective team.&lt;br&gt;• Identify and assign team member roles.&lt;br&gt;• Identify strategies to resolve team conflict.&lt;br&gt;• Demonstrate positive team behaviors and</td>
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• Utilize an engineering notebook.
• Establish common goals, equitable workloads, accountability, and create a set of team norms.
• Practice appropriate conflict resolution strategies within a team environment.
• Participate on a virtual team using remote collaboration tools to support team collaboration and problem solving.
| appearance.  
• Hand sketch 1-point and 2-point perspective.  
• Hand sketch isometric views and orthographic projections at a given scale.  
• Create drawings or diagrams as representations of objects, ideas, events, or systems. | scale, ruler, or dial caliper and report the measurement using an appropriate level of precision.  
• Solve real world and mathematical problems involving area and surface area of two- and three-dimensional objects. | projection, oblique, perspective, auxiliary, and section views.  
• Determine the minimum number and types of views necessary to fully detail a part.  
• Choose and justify the choice for the best orthographic projection of an object to use as a front view on technical drawings.  
• Create a set of working drawings to detail a design project.  
• Hand sketch orthographic projections.  
• Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings  
• Utilize an engineering notebook. | norms and discuss the importance of norms in creating an effective team environment.  
• Identify strategies to resolve team conflict.  
• Demonstrate positive team behaviors and contribute to a positive team dynamic.  
• Establish common goals, equitable workloads, accountability, and create a set of team norms.  
• Contribute equitably to the attainment of group goals based on assigned roles.  
• Practice appropriate conflict resolution strategies within a team environment. |
### III. Unit 3 – Measurement and Statistics
- Identify the steps in an engineering design process and summarize the activities involved in each step of the process.
- Complete a design project utilizing all steps of a design process, and find a solution that meets specific design requirements.
- Calculate statistics, represent data, distinguish between sample statistics and use a spreadsheet program to store and manipulate raw data.
- Use function tools within a spreadsheet program to calculate statistics for a set of data including mean, median, mode, quartiles, range, and standard deviation.

### III. Unit 6 – Reverse Engineering
- Evaluate and compare multiple materials and fastener choices for a product design.
- Measure linear distances.
- Measure mass.
- Determine the minimum number and types of views necessary to fully detail a part.
- Hand sketch isometric views and orthographic projections.
- Create three-dimensional solid models of parts within CAD from sketches.
- Generate CAD multi-view technical drawings.
- Utilize an engineering notebook to clearly and accurately document the design process.
- Describe the process of reverse engineering.
- Justify the use of reverse engineering.
- Demonstrate positive team behaviors and contribute to a positive team dynamic.