Course Overview
Introduction to Engineering Design (IED) is a high school level course that is appropriate for students who are interested in design and engineering. The major focus of the IED course is to expose students to the design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. IED gives students the opportunity to develop skills and understanding of course concepts 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, creative abilities and understanding of the design process. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

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

Course Objectives
At the end of this course, students will be able to:
- Demonstrate an understanding of the engineering design process and how engineers use it to solve problems.
- Discuss the different fields of engineering and their roles.
- Use measurement and statistics to analyze the creation of a product.
- Calculate area, volume, and weight of three-dimensional solids.
- Generate and document ideas through brainstorming.
- Use different types of sketches to share and document ideas.
- Create sketches and solve problems using Computer Aided Drawing (CAD) software.
- Work effectively in a team to solve a design challenge.

Required Supplies
Engineering Notebook
Pencil and Pen
Flash Drive
School Google Account
Headphones

Specific Course Activities
All students will be expected to:
- Maintain an engineering notebook based on the Project Lead the Way standards.
Complete assignments in their notebooks and using our Autodesk Inventor software. 
Maintain a course long portfolio showcasing assignments from each unit. 
Work alongside classmates to complete a variety of design challenges.

Course Outline
- Unit 1 - Design process
- Unit 2 - Technical Sketching and Drawing
- Unit 3 - Measurement and Statistics
- Unit 4 - Modeling Skills
- Unit 5 - Geometry of Design
- Unit 6 - Reverse Engineering
- Unit 7 - Documentation
- Unit 8 - Advanced Computer Modeling
- Unit 9 - Design Teams
- Unit 10 - Design Challenges

Expectations
All students are expected to follow the guidelines as set in the Stevenson High School Student Guidebook, as well as ones set in each individual class.

Evaluation
The overall grade is based on the following:
- Engineering Notebook Assignments and Portfolio
- Tests and Quizzes
- In Class Assignments and Participation

IED Learning Targets
1. Identify and define the terminology used in engineering design and development.
2. Create an engineering notebook to clearly and accurately document the design process according to accepted standards.
3. Explain the importance of creating and maintaining accurate documentation in an engineering notebook.
4. Explain the concept of proportion and how it relates to freehand sketching.
5. Generate non technical concept sketches to represent objects or convey design ideas.
6. Generate and document multiple ideas or solution paths to a problem through brainstorming.
7. Identify the steps in an engineering design process and summarize the activities involved in each step of the process.
8. Use research tools and resources to gather information.
9. Identify and differentiate between mechanical, electrical, civil, and chemical engineering fields.
10. Analyze a design problem and describe requirements for a successful design solution.
11. Create a testable prototype of a problem solution.
12. Describe and demonstrate positive team behaviors and contribute to a positive team dynamic.
13. Define and differentiate invention and innovation.
14. Assess the development of an engineered product and discuss its impact on society and the environment.
15. Generate and document multiple ideas through brainstorming.
16. Explain the concept of proportion and how it relates to freehand sketching.
17. Explain how one can clearly convey the intent of a design to someone unfamiliar with the original problem or the solution.
18. Identify and explain the purpose of line types (including construction lines, object lines, hidden lines, cutting plane lines, section lines, and center lines) in technical drawing.
19. Identify and define technical drawing representations including isometric, orthographic projection, oblique, perspective, auxiliary, and section views.
20. Create hand sketched isometric views of a simple object.
21. Create hand sketched 1-point and 2-point perspective pictorial views of a simple object.
22. Create hand sketched orthographic projections (multiview drawings).
23. Explain how technical drawings can be inadequate or misinterpreted.
24. Define accuracy and precision in measurement.
25. Evaluate and compare the accuracy and precision of different measuring devices.
26. Measure linear distances (including length, inside diameter, and hole depth) with accuracy using a scale, ruler, or dial caliper and report the measurement using an appropriate level of precision.
27. Convert quantities between units in the SI and the US Customary measurement systems.
28. Calculate mean, median, and mode.
29. Use statistics to quantify information, support design decisions, and justify problem solutions.
30. How can statistical data and analysis be used to inform, justify, and validate a design or process?
31. Use a spreadsheet program to store and manipulate raw data.
32. Use a spreadsheet program to perform calculations using formulas.
33. Use a spreadsheet program to create and display a set of data.
34. Dimension orthographic projections and section views of simple objects or parts according to a set of dimensioning standards and accepted practices.
35. Explain why engineers adhere to set dimensioning standards and guidelines.
36. Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints.
37. Generate CAD multi-view technical drawings to fully describe a part according to standard engineering practice.
38. Explain and use each assembly constraint (including mate, flush, insert, and tangent), its role in an assembly model.
39. Create assemblies of parts in CAD and use appropriate assembly constraints to create an assembly that allows correct realistic movement among parts.
40. Create an exploded view of an assembly in CAD.
41. Adjust the material and color of CAD parts to better represent their physical and visual qualities.
42. Create renderings of created CAD parts and assemblies.
43. Create a set of working drawings to detail a design project.
44. Construct a testable prototype of a problem solution.
45. Describe and reflect upon the design process used in the solution of a particular problem.
46. Utilize project portfolios to present and justify design projects.