



IED Syllabus for 2016-2017

August 2017

Dear Guardian and Student,

As we begin a new school year, I would like to take this opportunity to welcome you to the Project Lead the Way Classes. These classes are a new and exciting curriculum being offered at the Career and Technology Center. It is my pleasure to share my enthusiasm for these classes with you.

Project Lead the Way (PLTW) is a not-for-profit organization (from the Rochester Institute of Technology), that promotes pre-engineering courses for middle and high school students. PLTW forms partnerships with public schools, higher education institutions, and the private sector to increase the quantity and quality of engineers and engineering technologists graduating from our educational system. There is a critical shortage of engineers and engineering technologists entering the field at a time when technology is constantly reinventing itself every few years. For more information and answers to frequently asked questions about PLTW, please visit their website at: <http://www.pltw.org>

I feel it is very important for parents and teachers to communicate. Please do not hesitate to contact me with your concerns. You may call the school (847- 4121 ext. 2139) or preferably email me at jdavis@andersonctc.org.

Attached you will find information concerning the course requirements. This information should be kept inside the student's portfolio for future reference. Please read the following pages and sign and return the last page to me before the end of the month.

I am excited about the new school year in which your student will have a productive and successful experience in Introduction to Engineering Design. I hope that upon finishing this course your student will choose to continue on to other upper level PLTW courses being offered at Anderson 1&2 Career and Technology Center.

Sincerely,

James R. Davis
Project Lead the Way Instructor

Anderson 1 & 2 Career and Technology Center Introduction to Engineering and Design Course Syllabus



Instructor: James R. Davis

Room #: PLTW
classroom
& lab

Grade Level: 9th

of Credits: 2

Available for Conferences: After regular school hours Monday thru Thursday. Please schedule when needed.

Text: On class computers R:/IED or published as needed on www.ctcdavis.weebly.com

Course Description:

Introduction to Engineering Design is the first course in the Project Lead the Way curriculum. As students learn about various aspects of engineering and engineering design, such as how engineers communicate through drawing, they will apply what is learned through various activities, projects, and problems. The course covers the following:

- The Role of an Engineer
- The Design Process
- Product Design
- Product Analysis and Improvement
- Designing as an Engineer

As a learning tool that will help them design solutions to different design projects, students will use a state of the art 3-D design software package from Autodesk called Inventor. Working in teams, students will learn about documenting solutions, solving problems, and communicating their solutions to other students and members of the professional community of engineering and engineering design.

Method of Evaluating Students:

Quarterly and Semester Grading 80% Total Grade broke down as follows:

Major Grades (Project Progress Reports & Test)
&
Secondary Grades (Tests, Quizzes, etc.) = 60%

Employability
& = 20%

EOC EXAM

Engineering Notebook

Instructional Philosophy:

By using an activities, project, & problem based learning approach in the classroom students will be better prepared to:

- Demonstrate an understanding of subject content
- Investigate and engage in meaningful activities, projects, and problems
- Become independent learners (student driven projects)
- Make their own connections between posed questions and prior learning
- Use real life technologies and resources
- Obtain ownership of their learning
- Exhibit growth in areas often ignored: social and life skills, Self-management skills and the ability to learn on one's own.

Materials:

Supplied by Career Center -Composition notebook

Student to bring - pencil and pen (black or blue)

Students will be given supplies and a budget as needed

Fees:

The course fee is \$30. Students will receive their notebook once fees have been paid. Please make checks payable to "ACTC."

Course Goals:

Engineering programs must demonstrate that their students have attainment of ABET, Inc. requirements at the basic educational level for entry into engineering practice:

- A. An ability to apply knowledge of mathematics, science, and engineering
- B. An ability to design and conduct experiments, as well as to analyze and interpret data
- C. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- D. An ability to function on multi-disciplinary teams
- E. An ability to identify, formulate, and solve engineering problems
- F. An understanding of professional and ethical responsibility
- G. An ability to communicate effectively
(Yes, all students do present in front of class)
- H. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- I. Recognition of the need for, and an ability to engage in life-long learning
- J. Knowledge of contemporary issues
- K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Classroom Procedures:

- Place book bags on shelf opposite of student desk at beginning of class
- Purses may stay under desk
- Be on time and prepared for class. This includes, but is not limited to having your notebook, assignments, pen/pencil, and paper. Students should be seated in their desks when the tardy bell rings to avoid confusion.
- Have a good attitude about learning. Be prepared to *actively* participate in class. Accept feedback with a positive attitude.
- Students will follow all written and oral directions as well as safety precautions. This is for your own safety as there will be hands-on activities.
- Complete all assignments in a timely fashion. You must work diligently to stay caught up. **Late assignments are subject to 25 points per day deduction.**
- Be respectful of others and their property.
- Take care of the learning environment. Keep your area neat and clean. Always clean your space before you leave for the day. Put materials away in their proper place.
- Get the instructor's permission before obtaining materials from any storage area.
- Cheating will not be tolerated. Students found cheating will receive a zero for that assignment. The instructor and/or school will decide any further course of action.
- *Your Employability grade (weighted 20%) is directly related to these classroom procedures. However, experience has proven when a student follows these procedures they do better in all areas of the program.*

Computer Lab Procedures:

- Do not change **any** of the settings on the computers. This includes the screen saver.
- Do not download programs (including games) to the computer.
- Do not access inappropriate content on the internet.
- Take care of the learning environment. Keep your area neat and clean. Always clean your space before you leave for the day.
- Follow all existing school computer and internet policies.
- Do not make pictures or recordings without knowledge of teacher's or students' knowledge and their consent.
- Unless instructed differently, save assignment work in their P:drive first and half sized copies added to engineering notebook. Work on Desktop and C:drive is subject for deletion
- We have access to a shared drive. It is for team projects only.

Make-up Policy:

Students are responsible for makeup work when absent. Each student will have **3** school days to make up missed work, assuming the end of the nine weeks cycle is not ended. Quizzes and handouts will be placed in a makeup in the R: drive under assignments. It is the students responsibility to check this folder when absent before consulting the instructor.

Instructional Delivery Plan:

Instructional delivery will vary including, but not limited to: traditional lecture, socratic lecture, demonstration, inquiry activities, hands on activities, group activities, and individual activities.

Consequences:

- Verbal Warning
- Conference with Student and/or Contact Parent
- Loss of Break Time,
- Written Referral
- Removal from Classroom
- *If a student acts in a manner that is totally unacceptable or unsafe, he or she may be immediately removed from class with a disciplinary referral.*

Major Projects:

Student Projects may include but are not limited to:

Content

Outline:

Unit 1: Introduction to Design

Week 1: Design Process

It is expected that students will be able to:

- Apply engineering notebook standards and protocols when documenting their work during the school year.
- Identify and apply group brainstorming techniques and the rules associated with brainstorming.
- Identify the design process steps used in given scenarios and be able to list the steps.
- Follow laboratory safety procedures.

Week 2 : Introduction to Technical Sketching and Drawing

It is expected that students will be able to:

- Identify, sketch, and explain the function of points, construction lines, object lines, and hidden lines.
- Plot points on grid paper to aid in the creation of sketches and drawings.
- Explain the concepts of technical sketching and drawing.
- Sketch an isometric view of simple geometric solids.
- Explain how an oblique view of simple geometric solids differs from an isometric view.
- Sketch one-point, two-point, and three-point perspectives of simple geometric solids.
- Sketch multi-view drawings of simple geometric solids.
- Determine the front view for a given object.

Week 3: Measurement and Statistics

It is expected that students will be able to:

- Measure and record linear distances using a scale to a precision of 1/16 inch and 1 mm.
- Measure and record linear distances using a dial caliper to a precision of 0.001 inch.
- Add and subtract U.S. standard and metric linear measurements.
- Convert linear distance measurements from inches to millimeters and vice versa.
- Apply linear dimensions to a multi-view drawing.
- Calculate the mean, mode, median, and range of a data set.
- Create a histogram of recorded measurements showing data elements or class intervals, and frequency

Week 4: Modeling Skills

It is expected that students will be able to:

- Concept, Graphical, and Mathematical Modeling
- Create simple extruded solid Computer Aided Design (CAD) models from dimensioned sketches.
- Generate dimensioned multi-view drawings from simple CAD models.
- Measure and Fabricate parts for a functional prototype from the CAD multi-view drawings.
- Assemble the product using the CAD modeling software.
- Test and evaluate the prototype and record results.

- Apply geometric and numeric constraints to CAD sketches.
- Identify the purpose of packaging in the design of consumer products.

Unit 2: Design Solutions

Week 5: Geometry of Design

It is expected that students will be able to:

- Identify common geometric shapes and forms by name.
- Calculate the area of simple geometric shapes.
- Calculate the surface area and volume of simple geometric forms.
- Identify and explain the various geometric relationships that exist between the elements of two-dimensional shapes and three-dimensional forms.
- Identify and define the axes, planes, and sign conventions associated with the Cartesian coordinate system.
- Apply geometric and numeric constraints to CAD sketches.

Week 5: Dimensions and Tolerances

It is expected that students will be able to:

- Explain the differences between size and location dimensions.
- Identify and dimension fillets, rounds, diameters, chamfers, holes, slots, and screw threads in orthographic projection drawings.
- Explain the rules that are associated with the application of dimensions to multi-view drawings.
- Identify, sketch, and explain the difference between general tolerances, limit dimensions, unilateral, and bilateral tolerances.
- Differentiate between clearance and interference fits.

Week 6: Advanced Modeling Skills

It is expected that students will be able to:

- Sketch and model an auxiliary view of a given object to communicate the true size and shape of its inclined surface.
- Describe the purpose and demonstrate the application of section lines and cutting plane lines in a section view drawing.
- Sketch a full and half section view of a given object to communicate its interior features.
- Identify algebraic relationships between the dimensional values of a given object.
- Apply assembly constraints to individual CAD models to create mechanical systems.
- Perform part manipulation during the creation of an assembly model.
- Create an exploded model of a given assembly.
- Determine ratios and apply algebraic formulas to animate multiple parts within an assembly model.

Week 7-8: Advanced Designs

It is expected that students will be able to:

- Brainstorm and sketch possible solutions to an existing design problem.
- Create a decision making matrix.
- Select an approach that meets or satisfies the constraints given in a design brief.
- Create solid computer-aided design (CAD) models of each part from dimensioned sketches using a variety of methods.
- Apply geometric numeric and parametric constraints to form CAD modeled parts.
- Generate dimensioned multi-view drawings from simple CAD modeled parts.
- Assemble the product using the CAD modeling software.
- Explain what constraints are and why they are included in a design brief.

Unit 3: Reverse Engineering

Week 9-10: Visual Analysis

It is expected that students will be able to:

- Identify visual design elements within a given object.
- Explain how visual design principles were used to manipulate design elements within a given object.
- Explain what aesthetics is, and how it contributes to a design's commercial success.
- Identify the purpose of packaging in the design of consumer products.
- Identify visual design principles and elements that are present within marketing ads.
- Identify the intent of a given marketing ad and demographics of the target consumer group for which it was intended.

Week 11: Functional Analysis

It is expected that students will be able to:

- Identify the reasons why engineers perform reverse engineering on products.

- Describe the function of a given manufactured object as a sequence of operations through visual analysis and inspection (prior to dissection).

Week 12-13: Lesson 3.3: Structural Analysis

It is expected that students will be able to:

- Describe the differences between joinery, fasteners, and adhesives.
- Identify the types of structural connections that exist in a given object.
- Use dial calipers to precisely measure outside and inside diameter, hole depth, and object thickness.
- Identify a given object's material type.
- Identify material processing methods that are used to manufacture the components of a given

commercial product.

- Assign a density value to a material, and apply it to a given solid CAD model.
- Perform computer analysis to determine mass, volume, and surface area of a given object.

Week 14-15: Product Improvement by Design

It is expected that students will be able to:

- Write design brief that focuses on product innovation.
- Identify group brainstorming techniques and the rules associated with brainstorming.
- Use decision matrices to make design decisions.
- Explain the difference between invention and innovation.

Unit 4: Design Problems

Week 16: Engineering Design Ethics

It is expected that students will be able to:

- Create a brainstorming list of different products made from common materials that are used daily.
- Research and construct a product impact timeline presentation of a product from the brainstorming list and present how the product may be recycled and used to make other products after its lifecycle is complete.
- Identify the five steps of a product's lifecycle and investigate and propose recyclable uses for the material once the lifecycle of the product is complete.

Week 17-18: Design Teams

It is expected that students will be able to:

- Identify group norms that allow a virtual design team to function efficiently.
- Establish file management and file revision protocols to ensure the integrity of current information.
- Identify strategies for addressing and solving conflicts that occur between team members.
- Create a Gantt chart to manage the various phases of their design challenge.

1st homework assignment for Mr. Davis' Class
Due within first 3 days of class

I have read the 3 class starter documents and have discussed the contents with my son/daughter:

1) Class syllabus (see ctcdavis.weebly.com)

Circle one: IED POE CEA EDD

2) Parent/student handbook (see andersonctc.org)

3) Computer Internet Use Agreement ([ctcdavis.weebly.com/student forms](http://ctcdavis.weebly.com/student%20forms))

Student Name

Student Signature

Parent/Guardian Name

Parent/Guardian Signature

Parent/Guardian Email (*please print clearly*)