

Introduction to Engineering Design

Mr. Chris Lemoine | Room 405

CONFERENCE: 2:30 pm – 4:00 pm (daily) | TUTORING: 7:15 am – 7:45 am (daily)

Course Overview and Goals

Introduction to Engineering Design (IED) is a high school engineering course in the PLTW Engineering Program. In IED, students explore engineering tools and apply a common approach to solving engineering problems, an engineering design process. Using the activity-project-problem-based (APB) teaching and learning pedagogy, students progress from completing structured activities to solving open-ended projects and problems requiring them to plan, document, communicate, and develop other professional skills.

Through individual and collaborative team activities, projects, and problems, students apply systems thinking and consider various aspects of engineering design, including material selection, human-centered design, manufacturability, assemblability, and sustainability. Students develop technical representation and documentation skills, primarily through 3D computer modeling using a Computer-Aided Design (CAD) application. Students produce precise 3D-printed engineering prototypes using an additive manufacturing process as part of the design process. Student-developed testing protocols drive decision-making and iterative design improvements.

To inform design and problem solutions addressed in IED, students apply computation methods by developing algorithms, performing statistical analysis, and developing mathematical models. As part of a collaborative design team, students build competency in professional engineering practices, including project management, peer review, and environmental impact analysis. Ethical issues related to professional practice and product development are also presented.

Prerequisites

The Introduction to Engineering Design course is uniquely designed for individuals with no prior background in Engineering Design. It offers a highly visual, dynamic, and interactive learning experience, fostering engagement and ensuring active participation for new engineers.

Grading Procedures

This course follows the district's grading procedure, which can be accessed on the district webpage. However, the key points are summarized below.

Categories & Weights

Assignments in this course will be categorized as either **MAJOR ASSIGNMENTS** (tests, reports, research papers, projects/presentations, essays, etc.) or **MINOR ASSIGNMENTS** (daily practice, homework, quizzes, lab work, binder checks, etc.). At the end of the semester, your final grade will be broken down into three parts.

MAJOR ASSIGNMENTS: 48%

MINOR ASSIGNMENTS: 32%

SEMESTER EXAMS: 20%

Absences

Students with an **EXCUSED ABSENCE** from school (including off-campus suspension) will have the opportunity to make up missed work at the rate of one day for one day missed, with a maximum of five days. Students will receive no credit for any major or minor assignment not made up within the allotted time.

Students with an **UNEXCUSED ABSENCE** will not have the opportunity to make up missed work; however, if the absence is determined to be caused by extenuating circumstances, makeup work may be allowed. The grade for the makeup work will be no higher than 70%.

Retesting

Students will be given up to 3 additional school days to redo a **FAILING MAJOR ASSIGNMENT**, but the grade will be no higher than 70%. The teacher has the option of assigning an alternative major assignment and may require additional tutoring, assignments, etc., as appropriate. The teacher will indicate in the grade book that the assignment was redone.

Students will be given three additional days to make up a **LATE MAJOR ASSIGNMENT** and may be required additional tutoring, assignments, etc., as appropriate, with a progressive grade penalty of 10% per day.

Course Breakdown

Unit 1: Design and Problem Solving

Students are introduced to modeling methods and practice modeling skills essential to the design of mechanical systems, including technical sketching, 3D solid modeling, and technical drawing using Computer-Aided Design (CAD), statistical analysis, and prototyping. Emphasis is placed on building CAD skills, which are applied throughout the course. In addition, students learn statistical techniques to evaluate design solutions and use statistics to inform game design.

Unit 2: Assembly Design

Students are introduced to reverse engineering and how to investigate and document the design of multi-component systems. Students learn various techniques to connect components in a system, how systems are designed to allow desired interaction between components, and how to identify and select the materials from which products are made. They are also introduced to methods to improve the manufacturability of a product and reduce production costs. Students learn to apply two methods to create 3D assembly models in CAD and apply those techniques to design and document assemblies.

Unit 3: Thoughtful Product Design

Students are exposed to design principles (other than the visual design principles presented in Unit 2) that can impact a product's appeal, usability, safety, and sustainability. Design topics that are introduced or reinforced include product lifecycle, sustainability, manufacturability, human-centered design, and systems thinking.

Unit 4: Making Things Move

Students will apply their new knowledge in the design of an electromechanical solution. Students also learn advanced CAD skills to support the design, documentation, and communication of engineering solutions

Class Materials

- Engineering Notebook
 - o For documenting the design process, ideas, sketches, and reflections
- Sketching Supplies
 - o Graph paper, pencils, rulers, and erasers for technical sketching and isometric drawing.
- Statistical Analysis Tools
 - o Calculator or software for performing statistical evaluations
- Game Design Material
 - o Basic supplies for prototyping and testing carnival games (e.g., cardboard, tape, markers)
- Presentation Materials
 - o Posterboards, markers, and any additional materials for creating presentations.
- Headphones (optional but recommended)

Classroom Rules

- Be respectful to everyone
- Come prepared and ready to learn
- Follow all school policies regarding technology use
- Participate actively in class activities and discussions
- Complete assignments on time

Teacher Expectations

- Students should attend class regularly and be on time
- Students should actively participate and engage with the course materials
- Students should seek help when needed and attend tutoring sessions if required

Academic Dishonesty

In alignment with the philosophies from Carol Dweck's work on mindset, my approach to academic integrity focuses on fostering a growth mindset and understanding the learning process. Academic dishonesty undermines this process and the development of essential skills.

Definition

Academic dishonesty includes cheating, plagiarism, fabrication, unauthorized collaboration, and other behavior that misrepresents your work or efforts. Understanding that these actions prevent genuine learning and personal growth is crucial.

First Offense

- **EDUCATIONAL APPROACH:** Instead of immediate punitive measures, we will meet to discuss why academic dishonesty occurred and the importance of integrity in your work
- **REFLECTION ASSIGNMENT:** You will complete a reflection assignment on the impact of academic dishonesty on your learning and future goals. This assignment is designed to help you understand the value of honest effort and resilience and to reflect on how academic dishonesty can hinder your personal and educational growth.

- **REDO THE ASSIGNMENT:** You can redo the assignment or an alternative one to demonstrate your understanding and effort. The new grade will be capped at 70% to acknowledge the mistake while allowing room for growth. This policy provides a learning opportunity while maintaining the grading system's integrity.

Second Offence

- **PARENTAL INVOLVEMENT:** You, your parents, and I will schedule a meeting to discuss the repeated behavior and collaboratively develop strategies for improvement.
- **INCREASED SUPPORT:** You will receive additional support, which may include tutoring sessions or check-ins with me, to ensure you have the skills and understanding needed to succeed.
- **REDO THE ASSIGNMENT:** You will again be allowed to redo the assignment with a maximum grade of 50%.

Subsequent Offenses

- **ADMINISTRATIVE INVOLVEMENT:** Further instances of academic dishonesty will be referred to school administration for additional consequences, which may include academic probation or other disciplinary actions as per school policy.
- **SUPPORT PLAN:** We will develop a comprehensive support plan involving teachers, parents, and counselors to address underlying issues and promote positive behavior changes.

I aim to help you understand that learning is a process and mistakes are growth opportunities. By focusing on development and understanding, I strive to create an environment where you feel encouraged to put forth your best effort honestly and learn from your experiences.

Acknowledgment

I have read and understood the course syllabus for Introduction to Engineering Design. I agree to adhere to the grading procedures, attendance policies, and all other guidelines outlined in this syllabus. By signing this statement, I understand that I acknowledge my commitment to the course requirements and expectations.

Student Name (Printed) _____ Date _____

Student Signature _____

Parent Signature _____

Teacher Signature _____