

## ENGINEERING DESIGN AND DEVELOPMENT (non-PLTW)

*Engineering Design and Development* is an engineering research course in which students work in teams to research, design, test and construct a solution to an open-ended engineering problem. The product development life cycle and a design process are used to guide the team to reach a solution to the problem. The team presents and defends their solution to a panel of outside reviewers at the conclusion of the course. The EDD course allows students to apply all the skills and knowledge learned in previous pre-engineering courses. The use of 3D design software helps students design solutions to the problem their team has chosen. This course also engages students in critical thinking and problem-solving skills, time management and teamwork skills, a valuable set for students' future careers.

- DOE Code: 5698
- Recommended Grade Level: Grade 12
- Required Prerequisites: Introduction to Engineering Design, Principles of Engineering Design, and one pre-engineering specialty course
- Credits: 2 semester course, 2 semesters required, 1 credit per semester, maximum of 2 credits
- Fulfills a Directed Elective or Elective requirement for all diploma types
- Qualifies as a quantitative reasoning course

### Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences.

## Content Standards

### Domain – Defining a Problem

**Core Standard 1** Students integrate research and documentation skills from a design process to identify problems.

#### Standards

- EDD-1.1 Create documentation to support a design process and results
- EDD-1.2 Summarize research findings in visual and verbal form
- EDD-1.3 Analyze current and past products to inform the creation of a problem statement
- EDD-1.4 Identify research that validates and justifies problem statements
- EDD-1.5 Distinguish between credible and non-credible sources while conducting research
- EDD-1.6 Analyze the market to justify whether solving the problem is necessary
- EDD-1.7 Validate data collected during market research

### Domain – Design & Prototype to a Solution

**Core Standard 2** Students design and build a prototype solution for the problem.

#### Standards

- EDD-2.1 Identify criteria and constraints for the design of a product
- EDD-2.2 Create multiple potential solutions to a problem
- EDD-2.3 Distinguish between practical and potentially successful design solutions

- EDD-2.4 Refine and optimize conceptual ideas to effectively solve a problem
- EDD-2.5 Communicate design concepts using visual and written documentation
- EDD-2.6 Verify the product design based on a variety of design factors and implement design changes to improve the product
- EDD-2.7 Create a set of drawings to document proposed product design
- EDD-2.8 Compare the consequences of the product design to determine the ethical implications of product development
- EDD-2.9 Develop a document to present the proposed design and provide justification for further development of a product
- EDD-2.10 Apply engineering concepts to design a prototype
- EDD-2.11 Evaluate types of materials and assembly procedures for a prototype design
- EDD-2.12 Create designs of the prototype using a 3D software package
- EDD-2.13 Develop document resources needed to build prototype
- EDD-2.14 Choose methods for testing a prototype
- EDD-2.15 Create a plan for building prototype
- EDD-2.16 Construct an operational prototype
- EDD-2.17 Evaluate and document prototypes for modifications

#### **Domain – Test, Evaluate & Refine Solution**

**Core Standard 3** Students choose the appropriate statistical analysis tools to test and evaluate prototype for results on how to refine prototype for a viable solution.

##### **Standards**

- EDD-3.1 Choose testing criteria to evaluate the prototype for success of solution
- EDD-3.2 Create a valid method for testing accurately the effectiveness of the design solution
- EDD-3.3 Develop documentation for test procedures to be used on the design solution
- EDD-3.4 Justify the validity of the selected test procedures
- EDD-3.5 Perform testing on prototype
- EDD-3.6 Identify modifications to the design based upon test data

#### **Domain – Communicate Results**

**Core Standard 4** Students validate the design process used to solve the problem for presentation of the final product.

##### **Standards**

- EDD-4.1 Organize data and information compiled throughout the process of the design solution
- EDD-4.2 Utilize presentation aids to enhance and clarify the presentation
- EDD-4.3 Discuss research findings on the chosen solution in a formal presentation

### **Career and Technical Student Organizations**

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in a Career and Technical Student Organization, such as the **Technology Student Association (TSA)**.