Engineering Design and Development

Engineering Design and Development (EDD) is an engineering research course in which students work as teams and/or individuals 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 and/or individual communicates their solution to a panel of stakeholders at the conclusion of the course. As the capstone course, EDD engages students in critical thinking, problem-solving, time management and teamwork skills. **NOTE: If PLTW curriculum is used, PLTW training is required of the teacher.**

- DOE Code: 4828
- Recommended Grade Level: Grade 12
- Recommended Prerequisites: Introduction to Engineering Design, Principles of Engineering, 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

Implementation Guidance
Domain Zero (0) was created much like a process standard to be implemented throughout the length of the course. These standards should be taught in conjunction with Domains 2-4.

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.

Career and Technical Student Organizations (CTSOs)
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 Technology Students Association (TSA).

Domain 0 – Project Management

Core Standard 1   ***Students will exhibit appropriate safety practices while working with tools and equipment.***

EDD– 0.1.1   Demonstrate relevant safety practices when using tools and equipment as determined by task, materials, environment, and protective attire.

EDD– 0.1.2   Apply corrective action(s) to eliminate hazards.

Core Standard 2   ***Students will investigate various careers within the fields of engineering and technology.***

EDD– 0.2.1   Identify engineering and technology occupations and the roles and responsibilities of each.

EDD– 0.2.2   Report job outlook, demand, and projected wages for engineering and technology careers.

EDD– 0.2.3   Explore job opportunities that are available in engineering and technology.

EDD– 0.2.4   Investigate post-secondary training opportunities and industry certifications that are available.

Core Standard 3   ***Students will document the design process.***

EDD– 0.3.1   Explain the importance of documentation.

EDD– 0.3.2   Apply sketching and annotation skills to document work.

EDD– 0.3.3   Produce working drawings using appropriate drawing styles and techniques.

EDD– 0.3.4   Document project components into an engineering log.

Core Standard 4   ***Students will apply appropriate research techniques.***

EDD– 0.4.1   Formulate unbiased research questions to collect information/data.

EDD– 0.4.2   Apply appropriate investigative strategies.

EDD– 0.4.3   Evaluate sources appropriate for academic research.

EDD– 0.4.4   Select resources with regards to the identified problem.

EDD– 0.4.5   Synthesize information collected during the research process.

EDD– 0.4.6   Generate a list of sources used to gather information using APA or MLA format.

Domain 1 – Defining a Problem

Core Standard 5   ***Students will identify a problem, research, and document how that problem impact society.***

EDD– 1.5.1   Brainstorm to identify problems that exist.

EDD –1.5.2   Justify how the problem exists for a group of stakeholders by analyzing market research.

EDD– 1.5.3   Define the problem by utilizing a Design Brief with criteria and constraints.

Domain 2 – Design & Prototype a Solution

Core Standard 6   ***Students will design and build a prototype solution for an identified problem.***
    EDD– 2.6.1   Generate multiple potential solutions to a problem.
    EDD– 2.6.2   Refine and optimize conceptual ideas into design drawings.
    EDD– 2.6.3   Communicate design concepts using visual and written documentation.
    EDD– 2.6.4   Utilize a decision matrix to decide which design concepts to pursue.
    EDD– 2.6.5   Discuss the ethical implications of the proposed solution and product development.
    EDD– 2.6.6   Investigate types of materials, manufacturing processes, and assembly procedures for a prototype design.
    EDD– 2.6.7   Create designs of the proposed solution using 3D modeling software.
    EDD– 2.6.8   Devise a plan for building a prototype.
    EDD– 2.6.9   Construct an operational prototype.

Domain 3 – Test, Evaluate & Refine Solution

Core Standard 7   ***Students will test a solution, evaluate results, and refine the design until a successful solution if found.***
    EDD– 3.7.1   Choose testing criteria to evaluate the prototype specifications.
    EDD– 3.7.2   Develop an unbiased prototype testing plan with qualitative and quantitative measures to test the effectiveness of the design solution.
    EDD– 3.7.3   Establish safety protocols related to testing of a prototype.
    EDD– 3.7.4   Justify the validity of the selected test procedures.
    EDD– 3.7.5   Perform testing on prototype while collecting accurate data.
    EDD– 3.7.6   Defend the validity of the data collected during testing.
    EDD– 3.7.7   Identify potential modifications to the design using collected test data.
    EDD– 3.7.8   Evaluate proposed modifications to the design solution.
    EDD– 3.7.9   Implement proposed modifications to the design solution.
    EDD-3.7.10   Refine solution until design specifications are met.

Domain 4 – Communicate Results

Core Standard 8   ***Students will effectively communicate a successful design solution to the stated problem.***
    EDD – 4.8.1   Organize research information and data compiled throughout the design process.
    EDD – 4.8.2   Generate visual aids to clarify data.
    EDD – 4.8.3   Utilize presentation aids to enhance and clarify the communication of a successful design solution.
    EDD – 4.8.4   Reflect on the design process and create recommendations for possible next steps.