



Secondary Course Outline

Forest Lake Area Schools

Course name: **Engineering Design**

Grade(s): **11-12**

Course description (as found in the registration guide):

Engineering Design is a course geared at taking students through the Design Process that all engineers use while problem solving solutions. Students will learn how to take a common problem from an abstract idea to creating and building a prototype to solve the problem and ultimately testing their solution. Students will utilize Solid Works CAD systems to create designs and then implement manufacturing technologies such as welding and machining to build their solutions. This is an entry level view of what students can expect in a college level engineering course.

Graduation standard(s) information: (alignment with Minnesota Academic Standards or national standards)

See Attached CTE Common Career Technical Core standards as well as National STEM Core Courses which include Problem Solving and Critical Thinking skills as well TeamWork and System Applications skills.

Learner outcomes:

Students will understand and be able to utilize the Engineering Design Process (Attached) This is the national foundation in every engineering curriculum and is used in all college level engineering programs. This class will integrate students experience in Science and Math with the Critical Thinking and Problem Solving skills needed to solve real world problems. Further, students will then integrate their design and manufacturing skills with the above skills to create a prototype to solve a specific problem. Students will ultimately test and present their findings to a panel of experts.

Course content: (Write this in outline format.)

Course Outline:

- I. Engineering Design Process:**
 - a. Overview and Application of Design Loop**
- II. Identifying a Problem**
 - a. Discover the Problem**
 - b. Prove the Problem Exists**
 - c. Supporting Documentation**
- iii. Define the Problem**
 - a. Create a Problem Statement**
 - b. Research the Problem (Inquiry)**
 - c. Create Problem Criteria**

- d. **Research all Constraints**

- iv. **Developing Possible Solutions**
 - a. **Brainstorming**
 - b. **Idea sketching**
 - c. **Idea evaluation**

- v. **Find Promising Solutions**
 - a. **technical refinement**
 - b. **user friendly**
 - c. **aesthetics**
 - d. **probability of success**

- vi. **Prototype Construction**
 - a. **blueprint design**
 - b. **prototyping**
 - c. **model building**

- vii. **Testing/Evaluation**
 - a. **testing protocols/procedure**
 - b. **testing data/outcomes**

- viii. **Presentation of Findings**
 - a. **portfolio presentation**
 - b. **story board presentation**
 - c. **final conclusions**

Required Curriculum Materials: (This section should contain information regarding textbooks, technology integration, films, videos and various resources used in teaching the course. Please note whether items already exist in-district or will need to be purchased. Any additional notes that are useful to teachers should be included.)

The primary need for the class is a set of laptops for R&D as well as CAD and CAM programming. The recommendation would be to set up a portable cart to use the laptops within the department as they can be used in the Intro to Metals/Machine Tool/Metal Fabrication classes as well as Engineering Design. The need would be 14-16 laptops on a cart with Solid Works/CAM for software as well as google presentations/PowerPoint/Prezi compatible.