

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

COURSE OUTLINE
Engineering Product Development

Date: May 2001

Subject Area: Technology

Proposed Grade Level(s): 11 & 12

Course Length: 1 Year

Grading: A-F

Number of Credits: 5/Semester

Prerequisites: Teacher approval

COURSE DESCRIPTION:

Engineering Product Development is the culminating sequence of courses in Engineering Technology in the Polytechnic Academy and is designed to provide instruction in a variety of related technologies, scientific principles, mathematical concepts, and communication skills that are taught through an activity-oriented approach. All students will explore robotics, electronics, hydraulics, pneumatics and computer design technologies in designing an engineering problem of a national challenge or of an original engineering problem identified by the team and approved by the instructor. Problem-solving groups will research, design and build projects for practical applications that combine interdisciplinary skills to produce a final product of a national significance. This project will include team design of an engineering drawing, a production plan, a cost estimate and a technical report. Age-appropriate activities are designed for students and will be an integral part of the course. All students will benefit from this course regardless of their respective learning styles, learning rates, or gender. This course is part of the sequence in the Engineering Technology Polytechnic Academy.

GENERAL GOALS/PURPOSES:

Students will recognize the various concepts of safety as they relate to technical apparatus operation and performance in industrial settings.

Students will identify the different types of productive energy and energy systems in our environment.

Students will understand the principles of robotic systems and use multiple components in developing a programmable logic controller demonstration.

Students will know how to prepare engineering sketches and develop reports and technical data specifications of typical product designs,

Students will understand how to use a computer, computer-aided design software and peripheral devices to create an image or drawing in the design and documentation,

Students will know the fundamentals of the theory, measurement, control and applications of electrical energy, to include AC/DC, components with transistors, motors and digital devices.

Students will understand key concepts in group dynamics, team conflict resolution, and negotiation. They will demonstrate cooperative working relationships.

Students will demonstrate problem-solving ability through competition-based applications and projects of engineering concepts.

Students will understand principles of hydraulics, pneumatics, and mechanics as they relate to manufacturing and industrial processes.

STUDENT READING COMPONENT:

Students will locate, understand, and interpret written information in documents such as manuals, graphs, and textbooks.

STUDENT WRITING COMPONENT:

Students will communicate thoughts, ideas, information, and messages in writing through letters, directions, reports, graphs, and flowcharts.

STUDENT ORAL COMPONENT:

Students will communicate orally in giving directions to a project and short presentations.

STUDENT MATH COMPONENT:

Students will perform basic and algebraic computations and approaches to practical problems by choosing appropriately from a variety of mathematical techniques.

DETAILED UNITS OF INSTRUCTION:

1. Unit 1 Overview and Perspective of Design and Problem Solving Process

- 1.1 Evolution of Design and Drawing
- 1.2 Relevancy and Career Opportunities
- 1.3 Human, Economic, and Environmental Impact
- 1.4 Product Development Process

2. Unit 2 Model Documentation

- 2.1 Documentation Basics
- 2.2 Geometric Construction
- 2.3 Annotating/Detailing Models
- 2.4 Detail Views

3. Unit 3 Prototyping

- 3.1 Traditional Prototyping
- 3.2 Rapid Prototyping
- 3.3 Reverse Engineering

4. Unit 4 Analysis and Evaluation

- 4.1 Boundary Element Analysis
- 4.2 Eight Dimensions of Quality
- 4.3 Safety
- 4.4 Economics
- 4.5 Environmental Considerations

5. Unit 5 Production and Continuous Improvement

- 5.1 CAM/CNC
- 5.2 Automation
- 5.3 Continuous Improvement

THIS COURSE WILL PREPARE STUDENTS FOR THE HSEE AND/OR THE FCUSD EXIT EXAMS:

Math, Reading, Writing

LAB FEE IF, REQUIRED: \$20 per year for consumable and take home materials

SUBJECT AREA CONTENT STANDARDS TO BE ADDRESSED:

Industrial and Technology Education Content and Performance Standards 1996:

Standard 3 Electronics

Standard 4 Manufacturing

Standard 5 Chemical

Standard 6 Physics

Standard 7 Mechanics of Solids

Standard 8 Mechanics of Fluids

Standard 9 Mechanics of Heat and Sound

DISTRICT ESLR'S TO BE ADDRESSED:

When students complete an Industrial and Technology Education course, they will be:

1. **Self-directed Learners** who will be able to solve engineering problems;
2. **Effective Communicators** who can express technology concepts to others effectively;
3. **Quality Producers** who can solve technology problems in a neat and organized manner;
4. **Constructive Thinkers** who are able to approach complex technology problems in a organized, logical, and systematic fashion;
5. **Collaborative Workers** who can work in teams to accomplish a task; and
6. **Responsible Citizens** who accept responsibility for their actions.