

# FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

## Principles of Engineering

**Date:** January 2014

**Subject Area:** Technology

**Proposed Grade Level(s):** 10 & 11

**Course Length:** 1 Year

**Grading:** A-F

**Number of Credits:** 5/semester

**Prerequisites:** Engineering Design with a Grade of 'C' or better suggested

### **COURSE DESCRIPTION:**

Principles of Engineering is designed to create an interest in engineering as a career goal and provide hands-on instruction in a variety of related technologies. Scientific principles, mathematical concepts and communication skills are taught through an activity-oriented approach. All students will explore robotics, electronics, hydraulics, pneumatics and computer design technologies. Student teams will progress through an articulated modular instructional system. Problem-solving groups will research, design and build projects for practical applications and competitions such as the International Odyssey of the Mind Competition. Students will combine interdisciplinary skills to produce a final product using computer integrated manufacturing (CIM) systems. 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.

### **GENERAL GOALS/PURPOSES:**

- Students will recognize the various concepts of safety as it relates 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 Engineering Careers
2. Unit 2 Force
3. Unit 3 Work/Energy
4. Unit 4 Rate/Hydraulics
5. Unit 5 Resistance
6. Unit 6 Power and Energy
7. Unit 7 Force Transformers
8. Unit 8 Robotics and Control Systems
9. Unit 9 Technical Report Writing
10. Unit 10 Job-Seeking Skills

### **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.