Murrieta Valley Unified School District
High School Course Outline
April 2011

Departments: Practical Arts

Course Title: Engineering Technology II (aka Engineering Concepts and Applications II)

Course Number: 2455

Grade Level: 10-12

Length of Course: Year

Prerequisite: Engineering Technology I (aka Engineering Concepts and Applications I)

UC/CSU (A-G) Requirement: G

Course Description: The Engineering Design II provides learning opportunities for students interested in developing advanced skills for careers in the design, production, and maintenance of mechanical, telecommunications, electrical, electronics, and electromechanical products and systems areas of engineering. The focal point of the course is the design and fabrication of a street legal competition solar race car which is raced in the Winston Solar Challenge each year.

I. Goals

The student will:

D1.0 Students know how to communicate and interpret information clearly in industry-standard visual and written formats:

- D1.1 Understand the classification and use of various electronic components, symbols, abbreviations, and media common to electronic drawings.
- D1.2 Understand, organize, and complete an assembly drawing by using information collected from detailed drawings.
- D1.3 Know the current industry standards for illustration and layout.
- D1.4 Draw flat layouts of a variety of objects by using the correct drafting tools, techniques, and media.
- D1.5 Prepare reports and data sheets for writing specifications.

D3.0 Students know the fundamentals of the theory, measurement, control, and applications of electrical energy, including alternating and direct currents:

	D3.1	Analyze relationships between voltage, current, resistance, and power related to direct current (DC) circuits.
	D3.2	Understand the characteristics of alternating current (AC) and how it is generated; the characteristics of the sine wave; the basic characteristics of AC circuits, tuned circuits, and resonant circuits; and the nature of the frequency spectrum.
	D3.3	Calculate, construct, measure, and interpret both AC and DC circuits.
	D3.4	Use appropriate electronic instruments to analyze, repair, or measure electrical and electronic systems, circuits, or components.
	D3.5	Analyze and predict the effects of circuit conditions on the basis of measurements and calculations of voltage, current, resistance, and power.
	D3.6	Classify and use various electrical components, symbols, abbreviations, media, and standards of electrical drawings.
	D3.7	Understand how electrical control and protection devices are used in electrical systems.
	D3.8	Calculate loads, currents, and circuit-operating parameters.
D4.0	*Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems:*	
	D4.1	Understand scalars and vectors.
	D4.2	Solve problems by using the concept of vectoring to predict the resultant forces.
	D4.3	Know the six simple machines and their applications.
	D4.4	Know how energy is transferred; know the effects of resistance in mechanical, electrical, fluid, and thermal systems.
	D4.5	Solve problems by using the appropriate units applied in mechanical, electrical, fluid, and thermal engineering systems.
D5.0	*Students understand the design process and how to solve analysis and design problems:*	
	D5.1	Understand the steps in the design process.
	D5.2	Determine what information and principles are relevant to a problem and its analysis.
	D5.3	Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
	D5.4	Translate word problems into mathematical statements when appropriate.
	D5.5	Understand the process of developing multiple details into a single solution.
	D5.6	Build a prototype from plans and test it.
	D5.7	Evaluate and redesign a prototype on the basis of collected test data.
D6.0	*Students understand industrial engineering processes, including the use of tools and equipment, methods of measurement, and quality assurance:*	
	D6.1	Know the common structure and processes of a quality assurance cycle.
	D6.2	Understand the major manufacturing processes.

D6.3 Use tools, fasteners, and joining systems employed in selected engineering processes.
D6.4 Estimate and measure the size of objects in both Standard International and United States units.
D6.5 Calibrate and measure objects by using precision measurement tools and instruments.

D7.0 Students understand the concepts of physics that are fundamental to engineering technology:

D7.1 Understand Newton's laws and how they affect and define the movement of objects.
D7.2 Understand how the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.
D7.3 Analyze the fundamentals and properties of waveforms and how waveforms may be used to carry energy.
D7.4 Understand how electric and magnetic phenomena are related and know common practical applications.

D11.0 Students understand the effective use of engineering technology equipment:

D11.1 Use methods and techniques for employing all engineering technology equipment appropriately.
D11.2 Apply conventional engineering technology processes and procedures accurately, appropriately, and safely.
D11.3 Apply the concepts of engineering technology to the tools, equipment, projects, and procedures of the Engineering Technology Pathway.

II. Outline of Content for Major Areas of Study

Semester I

A. Areas of Study
1. Project Management in Engineering
2. Electrical Engineering
3. Mechanical Engineering
4. Fabrication

B. Manufacturing Design
1. Solar model design (electrical, mechanical, aerodynamics)
2. Manufacturing Tools Training

Semester II

A. Manufacturing
1. Transmission
2. Chassis
3. Roll Cage
4. Motor Mounts
5. Suspension
6. Steering

7. Breaking System
8. Power System
9. Aerodynamics
10. Aesthetic Design

B. Design Evaluation
1. Solar Cup Competition

III. Accountability Determinants

A. Key Assignments
As listed above

B. Assessment Methods
1. Rubric for each manufacturing project
2. Network Storage for Rhino 3D computer work
3. Engineer Notebook
4. Formal Assessments

IV. Instructional Materials and Methodologies

A. Required Textbook(s)
1. Advanced Engineering Technology
2. Hayes Welding Techbook

B. Supplementary Materials
NA

C. Instructional Methodologies
1. Guided instruction through lecture
2. Self Direct learning
3. Exploratory Learning (Constructivism)
4. Demonstration
5. Projects based Learning and Assessments