EL DORADO UNION HIGH SCHOOL DISTRICT
Educational Services

Course of Study Information Page

Course Title: **Engineering Design and Architecture II (#0518)** (Formerly Adv Drafting #0511)	
Rationale: Second in a sequence of Engineering Design and Architecture classes that progress the student to the ability to use drafting and the computer as tools of design.	
Course Description: A one-year course for students who wish to continue learning about engineering design. Students will use the principles learned in Engineering I to understanding how basic machines work and will apply these mechanical devices to design features which will allow the student to solve engineering problems. Problem solving techniques will also be applied to architectural designs. All work will be assembled into the student's portfolio.	
Length of Course:	1 Year
Grade Level:	9 - 12
Credit: Number of units: 5 units per semester ☐ Meets graduation requirements ☐ Request for UC "a-f" requirements ☐ College Prep ☒ Elective ☒ Vocational	
Prerequisites:	Engineering Design 1
Department(s):	Trades and Industry
District Sites:	EDHS, ORHS, PHS, UMHS
Board of Trustees Adoption Date:	January 15, 2008
Textbook(s)/Instructional Materials:	
Date Adopted by the Board of Trustees:	

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Course Title: Engineering Design and Architecture II #518

Unit 1: Orientation

Goals: A) Students will understand the goals, objectives, sequence, and expectations of the course.
B) Students will understand the measurement systems used to complete engineering designs.

OBJECTIVES The student will:	**SUGGESTED ACTIVITIES**
1. Understand the short and long term goals of the course and the steps necessary to achieve their goals.	▪ lecture ▪ explanation of grading policies and assessments ▪ syllabus
2. Understand the tools of the trade, past, present, and future (review)	▪ Demonstration of proper use of equipment and class materials ▪ lecture ▪ reading -Chapter 2 pages 41-56 ▪ Small group demonstrations ▪ Individual assessment
3. Understand the rules for class management, time manage, an equipment management	▪ lecture ▪ Demonstration ▪ reviewing schedules
4. Understand how to measure with precision	▪ Demonstration ▪ Reading Chapter 2 pages 58 –59 ▪ Complete measurement skills assignment

Content Standards: Engineering and Design Career Pathways California Career Technical Education Model Curriculum Standards
C1.0 Students recognize historical and current events related to engineering design and their effects on society.
C1.2Understand the development of graphic language in relation to engineering design.
C2.0 Students understand the effective use of engineering design equipment.
C2.1Use methods and techniques for employing all engineering design equipment appropriately.
C2.2Apply conventional engineering design processes and procedures accurately, appropriately, and safely.
C2.3Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.
C3.0Students understand measurement systems as they apply to engineering design.
C3.1Know how the various measurement systems are used in engineering drawings
C3.2Understand the degree of accuracy necessary for engineering design.

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Unit 2: Technical Illustration

Goals: A) Students will understand how to use the various object-editing techniques and CADD programs
B) Students understand the sketching process used in concept development.

OBJECTIVES The student will:	**SUGGESTED ACTIVITIES**
1. Understand how to use the CADD programs in sketching, computer drawing and illustration.	▪ Teacher demonstration ▪ Create projects and sketches using different CADD programs ▪ Complete CADD tutorial binder ▪ Practice various sketching techniques ▪ Students produce proportional geometric sketches
2. Understand how to research trade journals, Technical data and the Machinists Handbook to solve technical problems.	▪ Students produce proportional geometric sketches from information found in the trade journals, Technical data and the Machinists Handbook; ▪ Develop CAD drawings from sketches

Content Standards: Engineering and Design Career Pathways California Career Technical Education Model Curriculum Standards
C5.1Understand the commands and concepts necessary for editing engineering drawings
C5.2Know the various object-altering techniques.
C5.3Know the CADD components and the operational functions of CADD systems.
C5.4Apply two-dimensional and three-dimensional CADD operations in creating working and pictorial drawings, notes, and notations.
C5.5Understand how to determine properties of drawing objects.
C10.1 Understand the process of producing proportional two- and three-dimensional sketches and designs.
C10.2Use sketching techniques as they apply to a variety of architectural and engineering models.
C10.3Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts

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Unit 3: Introduction to Mechanics

Goals: A) Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.
B) Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
C) Students understand the essential knowledge and skills common to all pathways in the Manufacturing and Product Development sector.

OBJECTIVES The student will:	**SUGGESTED ACTIVITIES**
1. Understand the development of simple machines and their use.	▪ lecture ▪ Demonstration
2. Understand the mechanics used in the design and use of a Pull Toy or a Whirly Gig	▪ Review simple machines ▪ Develop sketches, drawings and simple models

Content Standards: Engineering and Design Career Pathways California Career Technical Education Model Curriculum Standards
D4.3 Know the six simple machines and their applications.
D4.4 Know how energy is transferred; know the effects of resistance in mechanical systems.
D4.5 Solve problems by using the appropriate units applied in mechanical engineering systems.
5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
5.2 Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components.
5.3 Use critical thinking skills to make informed decisions and solve problems.
10.1 Use and maintain tools, equipment, systems, and products common to the school manufacturing facility.
10.5 Complete a comprehensive working sketch and drawing of a product to be produced.
Foundation Standards
10.6 Apply the design process in the development, evaluation, and refinement of a manufacturing

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Unit 4: Reverse Engineering

Goal: Students will understand measurement systems as they apply to engineering design.

OBJECTIVES The student will:	**SUGGESTED ACTIVITIES**
1. Understand how to complete precision measurements.	▪ lecture ▪ Demonstration
2. Understand the use of cams, gears, and fasteners.	▪ Reading – Chapter 15,16 pages 573-597
3. Understand the various techniques involved in sketching a design.	▪ Complete sketches which include dimensions and notes
4. Understand the function of pictorials.	▪ Complete sketches and CAD Pictorial drawing on Google Sketchup
5. Understand how to complete a design using orthographic projection.	▪ Complete sketches and CAD drawings that use Ortho Graphic projection
6. Understand the importance of dimensions in sketches.	▪ Completely dimension and note on both sketches and CAD drawings

Content Standards: Engineering and Design Career Pathways California Career Technical Education Model Curriculum Standards
C3.1Know how the various measurement systems are used in engineering drawings
C3.2Understand the degree of accuracy necessary for engineering design.

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Unit 5: Project Application and Problem Solving

OBJECTIVES The student will:	**SUGGESTED ACTIVITIES**
1. Research possible product design to meet consumers needs	▪ lecture ▪ Demonstration ▪ Research in Trade Journals, magazines and on line to solve a assigned problem
2. Understand the various techniques involved in sketching a possible solution to a design problem.	▪ Complete sketches which include dimensions and notes
3. Understand how to develop a set of drawings, from sheet layout to completed drawings and possible model to solve design problem	▪ Complete sketches and CAD Pictorial drawing on Google Sketchup ▪ Complete CAD drawings that use Ortho Graphic projection ▪ Develop a scale model to prove design

Content Standards: ***Engineering Design Pathway****:*
C3.0Students understand measurement systems as they apply to engineering design.
C3.1 Know how the various measurement systems are used in engineering drawings.
C3.2Understand the degree of accuracy necessary for engineering design.
C4.0Students use proper projection techniques to develop orthographic drawings.
C4.1Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means.
C4.2Understand the orthographic projection process for developing multi-view drawings.
C4.3Understand the various techniques for viewing objects.
C4.4 Use the concepts of geometric construction in the development of design drawings.
C4.5 Apply pictorial drawings derived from orthographic multi-view drawings and sketches and from a solid modeler.
C5.0Students know various object-editing techniques and CADD programs:
C5.1Understand the commands and concepts necessary for editing engineering drawings.
C5.2 Know the various object-altering techniques.
C5.3Know the CADD components and the operational functions of CADD systems.
C5.4Apply two-dimensional and three-dimensional CADD operations in creating working and pictorial drawings, notes, and notations.
C6.0Students understand and apply proper dimensioning to drawings:
C6.1Know a variety of drafting applications and understand the proper dimensioning styles for each.

C6.2Apply dimensioning to various objects and features.
C6.3Edit a dimension by using various editing methods.
C7.0Students understand sectional view applications and functions.
C7.1Understand the function of sectional views.
C7.2Use a sectional view and appropriate cutting planes to clarify hidden features of an object.
C9.0Students understand the methods of inserting text into a drawing:
C9.1Understand the processes of lettering and text editing.
C9.2Develop drawings using notes and specifications.
C9.3 Understand the methods of title block creation.

Academic Foundation Standards used in this course are included in the Engineering and Design Career Pathways of the California Career Technical Education Model Curriculum Standards.

Assessment and Evaluation:

Standard	The Student will:	Sample:
C 1.0	Understand the development of the graphic language	Students will create projects using different elements of the graphic language.
C 2.0	Understand the use of engineering design equipment.	Students will use manual and computer equipment to create engineering drawings.
C 3.0	Understand the Engineering measurement system.	Students will use a common ruler to a one-sixteenth degree of accuracy
C 4.0	Understand orthographics and orthographic projection techniques.	Students will complete multiple orthographic drawings with appropriate views.
C 5.0	Understand object editing techniques.	Students complete CAD tutorial binder.
C 6.0	Understand fundamental dimensioning techniques.	Students place basic dimensions appropriately on an engineering drawing
C 7.0	Understand basic sectioning principles.	Students will construct full, half and offset sections based on an assigned cutting plane.
C 9.0	Understand the standard methods of using text.	Students place all necessary required text on drawings.
C 10.0	Understand the sketching process used in concept development.	Students will produce proportional geometric sketches
C11.0	Understand the need to maintain a working portfolio.	Students collect copies of manual and computer work.

• Note the extent of skills development in the following areas: (Use #1 - Extensive; #2 - Moderate; #3 - Minimal)

Reading	1	Vocabulary Development	1
Writing	1	Study Skills	1
Oral Speaking	3	Computation	1
Grammar	1	Career Awareness	1
Technology Skills	1	Service Learning	3

Grading Policy: Students will be graded on a standard grading scale with 10% increments:

90-100% =A 80-89% = B 70-79% = C 60-69% = D 59% = F