

EL DORADO UNION HIGH SCHOOL DISTRICT
Educational Services

Course of Study Information Page

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|--|-----------------------|
| Course Title: Engineering Design and Architecture I (#0517) (Formerly Drafting 1 #0510) | |
| Rationale: This course in Engineering Design will introduce students to the fundamentals of blue print reading, sketching, and drawing, using both the board and computer. | |
| Course Description: A This is one-year course for students with little or no drafting background. This course is recommended as a prerequisite for all Engineering, Construction and Manufacturing classes. Basic skills of sketching, board drawing, and computer operations are emphasized. This course qualifies under the 2+2 Partnership Program as (DFT 12) in which a student can earn 3 units of transferable college credit with a passing grade of "B." | |
| Length of Course | 1 year |
| Grade Level | 9-12 |
| Credit <input checked="" type="checkbox"/> 5 units each semester <input type="checkbox"/> Meets graduation requirements <input type="checkbox"/> Request for UD "a-f" requirements <input type="checkbox"/> College Prep <input checked="" type="checkbox"/> Elective <input checked="" type="checkbox"/> Vocational | |
| Prerequisite: | None |
| Department (s): | Trades and Industries |
| District Sites: | EDHS, ORHS, PHS, UMHS |
| Board of Trustees Adoption Date: | January 15, 2008 |
| Textbook(s)/Instructional Material: | |
| Date Adopted by the Board of Trustees: | |

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Course Title: Engineering Design and Architecture I #517

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Unit 1: Orientation

- Goals:**
- A) Students will understand the goals and objectives of the course.
 - B) Students will learn how to properly use the tools of the trade.
 - C) Students will learn how to present their projects in the community.

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|---|
| The student will: | |
| 1. Understand the short and long term goals of the course and the steps necessary to achieve their goals. | <ul style="list-style-type: none"> ▪ lecture ▪ explanation of grading policies and assessments ▪ syllabus |
| 2. Understand the tools of the trade, past, present, and future. | <ul style="list-style-type: none"> ▪ Demonstration of proper use of equipment and class materials ▪ lecture ▪ reading -Chapter 1 and 2 pages 1-29 ▪ Small group demonstrations ▪ Individual assessment |
| 3. Understand the rules for class management, time manage, an equipment management | <ul style="list-style-type: none"> ▪ lecture ▪ demonstration ▪ reviewing schedules |

Content Standards: *Engineering Design Pathway*

C1.0 Students recognize historical and current events related to engineering design and their effects on society:

C1.1 Know historical and current events that have relevance to engineering design.

C1.2 Understand the development of graphic language in relation to engineering design.

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Unit 2: Tools and Equipment

Goal: Students will understand the effective use of Engineering Design equipment

| OBJECTIVES | SUGGESTED ACTIVITIES |
|--|--|
| The student will: | |
| 1. Understand how to care for the equipment | <ul style="list-style-type: none"> ▪ lecture on safety and proper maintenance and use of equipment ▪ demonstration ▪ reading Chapter 4 pages 48-74 ▪ student activities and practice |
| 2. Understand different techniques and uses of equipment – tools of the trade, past, present, and future | <ul style="list-style-type: none"> ▪ lecture ▪ demonstration ▪ reading Chapter 6 Pages 103 - 131 ▪ student activities and practice |
| 3. Understand the different types of pencils and media used for particular projects | <ul style="list-style-type: none"> ▪ demonstration bond paper and vellum ▪ lecture ▪ student activities and practice |

Content Standards: *Engineering Design Pathway*

C2.0 Students understand the effective use of engineering design equipment:

C2.1 Use methods and techniques for employing all engineering design equipment appropriately.

C2.2 Apply conventional engineering design processes and procedures accurately, appropriately, and safely.

C2.3 Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.

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Unit 3: Measurement

- Goals:**
- A) Students will understand how the various measurement systems apply to Engineering Design.
 - B) Students will demonstrate the ability to accurately use measurements to create engineering designs.

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|---|
| The student will: | |
| 1. Learn different types of measurement systems. | <ul style="list-style-type: none"> ▪ lecture – Imperial and Metric ▪ worksheets ▪ projects ▪ quizzes ▪ reading - Chapter 4 pages 63-71 |
| 2. Understand how to use scales. | <ul style="list-style-type: none"> ▪ lecture ▪ demonstrations ▪ guided practice ▪ reading - Chapter 4 pages 63-71 ▪ worksheets |
| 3. Understand the importance of proportions. | <ul style="list-style-type: none"> ▪ student practice drawing sketches ▪ demonstration ▪ reading - Chapter 4 pages 63-71 |
| 4. Understand how to use fractions and decimals to solve problems | <ul style="list-style-type: none"> ▪ worksheets ▪ guided practice |
| 6. Understand how to lay out a drawing based on area | <ul style="list-style-type: none"> ▪ sketches ▪ demonstration ▪ guided practice |
| 7. Understand how to lay out a drawing based on the Cartesian Coordinate System | <ul style="list-style-type: none"> ▪ demonstration ▪ student projects ▪ sketches |

Content Standards: *Engineering Design Pathway*

- C3.0 Students understand measurement systems as they apply to engineering design:*
C3.1 Know how the various measurement systems are used in engineering drawings
C3.2 Understand the degree of accuracy necessary for engineering design.

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Unit 4: Careers

- Goals:**
- A) Students will learn about the variety of career paths open to students in Engineering Design.
 - B) Students will understand the sequence of courses necessary to complete various career paths in this field.

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|---|
| The student will: | |
| 1. Learn about the various career possibilities from CAD Drafter to Engineer/ Architect | <ul style="list-style-type: none"> ▪ lecture ▪ guest speaker ▪ counselor review of 4 year planner ▪ computer research of projected job openings in the field ▪ use of COIN to determine skills and interests |
| 2. Understand the different specialized branches of engineering. | <ul style="list-style-type: none"> ▪ lecture ▪ review of programs available at local colleges (Sierra College, Folsom Lake, CSUS) |

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|--|
| <p>Content Standards: <i>Engineering Design Pathway</i></p> <p><i>C1.0 Students recognize historical and current events related to engineering design and their effects on society</i></p> <p><i>C1.1 Know historical and current events that have relevance to engineering design</i></p> <p><i>C1.2 Understand the development of graphic language in relation to engineering design.</i></p> |
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Unit 5: Print Reading

Goal: Students will understand how to apply dimensions to various projects

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|--|
| The student will: | |
| 1. Learn how to read line types and understand their meaning | <ul style="list-style-type: none"> ▪ review alphabet of lines ▪ worksheets ▪ review Chapter 5 Pages 86-88 |
| 2. Understand different positions of views | <ul style="list-style-type: none"> ▪ review Ortho Graphic Projection |
| 3. Learn how to apply dimensions to projects | <ul style="list-style-type: none"> ▪ sketches, projects ▪ guided practice ▪ reading Chapter 10 Pages 193 - 219 |
| 4. Understand the difference between sectional, auxiliary, and pictorial drawings and know how to apply to engineering design | <ul style="list-style-type: none"> ▪ sketches ▪ demonstration ▪ reading Chapter 12 Pages 253 - 265 ▪ Chapters 7 and 13 |

Content Standards: *Engineering Design Pathway*

C3.0 Students understands measurement systems as they apply to engineering design.

C3.1 Know how the various measurement systems are used in engineering drawings.

C3.2 Understand the degree of accuracy necessary for engineering design

C6.0 Students understand and apply proper dimensioning to drawings.

C6.1 Know a variety of drafting applications and understand the proper dimensioning styles for each.

C6.2 Apply dimensioning to various objects and features.

C6.3 Edit a dimension by using various editing methods.

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Unit 6: Sketching

Goal: Students will understand the sketching process used in concept development.

| OBJECTIVES | SUGGESTED ACTIVITIES |
|--|---|
| The student will: | |
| 1. Review different types of materials. | <ul style="list-style-type: none"> ▪ lecture ▪ demonstration ▪ guided practice ▪ Read Chapter 2 |
| 2. Understand different types of sketching techniques. | <ul style="list-style-type: none"> ▪ demonstration ▪ guided practices ▪ apply different techniques to create engineering models |
| 3. Understand the process of developing line types | <ul style="list-style-type: none"> ▪ practice producing two and three dimensional sketches ▪ create freehand graphic communication to represent design concepts ▪ Read Chapter 2 Pages 21 - 32 |

Content Standards: *Engineering Design Pathway:*

C10.0 Students understand the sketching process used in concept development.

C10.1 Understand the process of producing proportional two- and three-dimensional sketches and designs.

C10.2 Use sketching techniques as they apply to a variety of architectural and engineering models.

C10.3 Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts.

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Unit 7: Single and Multi View Drawings (Ortho Graphic Projection)

Goal: A) Students will understand the proper projection techniques to develop orthographic drawings

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|--|
| The student will: | |
| 1. Learn how geometry and drafting apply to engineering design. | <ul style="list-style-type: none"> ▪ review geometric shapes, construction, degrees and angles ▪ practice problem solving – worksheets, teacher generated samples ▪ review terminology used for drawings ▪ quizzes ▪ worksheets |
| 2. Learn how to create single view drawings. | <ul style="list-style-type: none"> ▪ review lines of symmetry (center lines) ▪ model the stages to develop single view drawings ▪ guided practice |
| 3. Learn how to create multi-view drawings | <ul style="list-style-type: none"> ▪ lecture ▪ review visualization techniques from pictorial to multi-view ▪ practice measuring and view placement ▪ practice problem solving and application from teacher generated models/samples |
| 4. Learn how to apply dimensions to ortho graphic drawings | <ul style="list-style-type: none"> ▪ lecture on standards, types and styles, applications, measuring, fractions, decimals and conversion ▪ guided application and worksheets |
| 5. Learn how to store drawings | <ul style="list-style-type: none"> ▪ Students create a hard copy portfolio of projects/assignments for continuous review. Reflection, and assessment |

Content Standards: Engineering Design Pathway:

C4. Students use proper projection techniques to develop orthographic drawings:

C4.1 Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means.

C4.2 Understand the orthographic projection process for developing multi-view drawings.

C4.3 Understand 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.

C6.0 Students understand and apply proper dimensioning to drawings.

C6.1 Know a variety of drafting applications and understand the proper dimensioning styles for each.

C6.2 Apply dimensioning to various objects and features.

C6.3 Edit a dimension by using various editing methods.

C7.0 Students understand sectional view applications and functions.

C7.1 Understand the function of sectional views.

C7.2 Use a sectional view and appropriate cutting planes to clarify hidden features of an object

C9.0 Students understands the methods of inserting text into a drawing.

C9.1 Understand the processes of lettering and text editing.

C9.2 Develop drawings using notes and specifications. C9.3 Understand the methods of title block creation.

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Unit 8: Pictorials

- Goals:**
- A) Students will use proper projection techniques to develop orthographic drawings.
 - B) Students will understand different types of pictorial views

| OBJECTIVES | SUGGESTED ACTIVITIES |
|---|---|
| The student will: | |
| 1. Understand how to move from multi-view object to pictorial | <ul style="list-style-type: none"> ▪ lecture ▪ modeling ▪ reading Chapte17 375 - 399 ▪ sketches ▪ practice various techniques for viewing objects ▪ use geometric construction to complete drawings |
| 2. Understand Isometric and other types of pictorial views | <ul style="list-style-type: none"> ▪ use a sectional view and appropriate cutting planes to clarify hidden views of an object |
| 3. Apply problem solving techniques and application to develop drawings | <ul style="list-style-type: none"> ▪ review methods of title block creation ▪ lecture ▪ demonstration ▪ guided practice |

Content Standards: *Engineering Design Pathway:*

C4.0 Students use proper projection techniques to develop orthographic drawings.

C4.3 Understand 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.

C7.0 Students understands sectional view applications and functions.

C7.2 Use a sectional view and appropriate cutting planes to clarify hidden features of an object.

C9.0 Students understands the methods of inserting text into a drawing.

C9.3 Understand the methods of title block creation.

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Unit 9: Project Application and Problem Solving

- Goals:**
- A) Students will use engineering design techniques to create a project
 - B) Students will understand the procedures and requirements for project development

| OBJECTIVES | SUGGESTED ACTIVITIES |
|--|--|
| The student will: | |
| 1. Develop a drawing of their choice that requires both orthographic projection with dimensions and some form of pictorial view(s) | <ul style="list-style-type: none"> ▪ review sheet size and layout ▪ review assessment tools for project ▪ review dimensions ▪ complete drawings covering single view, multi-view, sectional, auxiliary, and pictorials |

Content Standards: *Engineering Design Pathway:*

- C4.0 Students use proper projection techniques to develop orthographic drawings.*
- C4.1 Understand the commands and concepts necessary for producing drawings*
- C4.2 Understand the orthographic projection process for developing multi-view drawings.*
- C4.3 Understand 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.*
- C6.0 Student understands and applies proper dimensioning to drawings.*
- C6.1 Know a variety of drafting applications and understand the proper dimensioning styles for each.*
- C6.2 Apply dimensioning to various objects and features.*
- C6.3 Edit a dimension by using various editing methods.*
- C7.0 Students understand sectional view applications and functions.*
- C7.1 Understand the function of sectional views.*
- C7.2 Use a sectional view and appropriate cutting planes to clarify hidden features of an object*
- C9.0 Students understand the methods of inserting text into a drawing.*
- C9.1 Understand the processes of lettering and text editing. C9.2 Develop drawings using notes and specifications.*
- C9.3 Understand the methods of title block creation.*

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Unit 10: Computer Software and Drawing

- Goals:**
- A) Students will understand the tools and commands used in CADD
 - B) Students will refine their portfolios for final assessment and/or competitions

| OBJECTIVES | SUGGESTED ACTIVITIES |
|--|---|
| The student will: | |
| 1. Understand how to use lines, arcs, circles and other means of drawing on the CADD screen | <ul style="list-style-type: none"> ▪ lecture ▪ reading Chapters 1,3,4,5,6,7 and 8 ▪ guided practice in applying Auto Cad |
| 2. Understand how to manipulate and edit objects | <ul style="list-style-type: none"> ▪ teacher demonstration ▪ guided practice ▪ sample exercises |
| 3. Learn how to draw including text, notes, and dimensions on a drawing. | <ul style="list-style-type: none"> ▪ teacher demonstration ▪ guided practice ▪ sample exercises/drawings |
| 4. Learn how to use layers and line types to complete designs | Review electronic alphabet of lines |
| 5. Refine portfolios to create both a hard copy and an electronic copy for future coursework, evaluations, and/or competitions | <ul style="list-style-type: none"> ▪ sketches ▪ drawings ▪ reflections ▪ rubrics |

Content Standards: Engineering Design Pathway:

C3.0 Students understands measurement systems as they apply to engineering design.

C3.1 Know how the various measurement systems are used in engineering drawings.

C3.2 Understand the degree of accuracy necessary for engineering design.

C4.0 Students use proper projection techniques to develop orthographic drawings.

C4.1 Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means.

C4.2 Understand the orthographic projection process for developing multi-view drawings.

C4.3 Understand 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.

C5.0 Students know various object-editing techniques and CADD programs:

C5.1 Understand the commands and concepts necessary for editing engineering drawings.

C5.2 Know the various object-altering techniques.

C5.3 Know the CADD components and the operational functions of CADD systems.

C5.4 Apply two-dimensional and three-dimensional CADD operations in creating working and pictorial drawings, notes, and notations.

C6.0 Students understand and apply proper dimensioning to drawings:

C6.1 Know a variety of drafting applications and understand the proper dimensioning styles for each.

C6.2 Apply dimensioning to various objects and features.

C6.3 Edit a dimension by using various editing methods.

C7.0 Students understand sectional view applications and functions.

C7.1 Understand the function of sectional views.

C7.2 Use a sectional view and appropriate cutting planes to clarify hidden features of an object.

C9.0 Students understand the methods of inserting text into a drawing:

C9.1 Understand the processes of lettering and text editing.

C9.2 Develop 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 | <u>1</u> | Vocabulary Development | <u>1</u> |
| Writing | <u>1</u> | Study Skills | <u>1</u> |
| Oral Speaking | <u>3</u> | Computation | <u>1</u> |
| Grammar | <u>1</u> | Career Awareness | <u>1</u> |
| Technology Skills | <u>1</u> | Service Learning | <u>3</u> |

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