CREDIT COURSE OUTLINE

I. COVER PAGE

(1) ENGR 2	(2) ENGINEERING GRAPHICS	(3) 4
Number	Title	Units

(4)	Lecture / Lab Hours:			
	Total Course Hours			
		Total Lec hours:		2.00
		Total Lab hours:		6.00
		Total Contact hours:		144.00
	Lec will generate 0 hour(s) outside work.			
	Lab will generate 0 hour(s) outside work.			
(5)	Grading Basis:	Grading Scale Only		
		Pass/No Pass option		X
		Pass/No Pass only		
(6)	Advisories: Eligibility for English 125 or 126 MATH 4A - TRIGONOMETRY			
(7)	Pre-requisites(requires C grade or better): MATH 102 MATH 103			
	Corequisites:			

(8)Classification:		
	Degree applicable:	X
	Non-degree applicable:	
	Basic skills:	
(9)RC	Fulfills AS/AA degree requirement: (area)	
	Computer Familiarity	
	General education category:	
	Major:	ENGINEERING
	Certificate of:	
	Certificate in:	
(10)CSU	Baccalaureate:	X
(11)Repeatable: (A course may be repeated three times)		0

(12) Catalog Description:
This course covers the principles of orthographic drawing, pictorial drawing, dimensioning, tolerancing, and descriptive geometry and their application to the visualization, representation, analysis, solution, and documentation of engineering problems, using freehand sketching, computer-aided drafting (CAD), and solid modeling.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

Upon completion of this course, students will be able to:

I. graphically represent three-dimensional objects using accepted engineering practices.
II. communicate graphically using computer tools and freehand sketching.
III. use CAD and solid modeling software in an engineering design project.

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:

I. use computer-drawing software to geometrically construct two-dimensional shapes.
II. use computer-drawing software to construct multi-view orthographic projections of three-dimensional objects.
III. create auxiliary and sectional views of objects.
IV. use proper dimensioning and tolerance techniques to fully define an object.
V. demonstrate proficiency at freehand technical sketching.
VI. use solid modeling software to represent a three-dimensional object.
VII. design solutions to engineering challenges by use of engineering drawings.
VIII. apply the principles of orthographic projection, isometrics, and descriptive geometry to the solution of engineering problems.

IV. COURSE OUTLINE:

Lecture Content:

All of the following content is presented in lecture and practiced by students in computer laboratory exercises.

A. Introduction to computer-drawing software
  1. The importance of graphics in the design process
  2. Starting a computer drawing
  3. Saving computer files / Sending and receiving files via e-mail
  4. Basic drawing skills
    a. Drawing Lines
    b. Erasing and trimming lines
    c. Copying lines

B. Geometric constructions
  1. Using rectangular and polar coordinates
  2. Using Arrays

C. Technical sketching
  1. Basic sketching skills
  2. Proportion
  3. Three-dimensional pictorial sketches

D. Multi-view orthographic projections
  1. Projection planes (frontal, horizontal, and profile)
  2. The six principal views
  3. View placement
  4. Multi-view drawings from three-dimensional models
  5. Visualization
  6. Multi-view representations of solid object features
    a. Planes (principal, inclined, and oblique)
    b. Curved surfaces
    c. Holes
    d. Fillets and rounds

E. Auxiliary Views
  1. Projection theory
  2. Auxiliary views from front, top, and side views
  3. Partial auxiliary views
  4. Secondary auxiliary views

F. Sectional Views
  1. Purpose of sectional views
  2. Cutting plane lines
  3. Sectional view types
    a. Full sections
    b. Half sections
    c. Broken-out sections
    d. Revolved sections
    e. Removed sections
    f. Offset sections

G. Dimensioning
  1. Size dimensions
  2. Location dimensions
  3. Hole dimensions
  4. Dimensioning rules and practices

H. Tolerance
  1. General tolerances
  2. Limit dimensions
  3. Plus and minus dimensions
  4. Geometric dimensioning and tolerancing

I. Three-dimensional Pictorial Drawings
  1. Isometric pictorials
  2. Oblique pictorials
  3. Perspective views

J. Descriptive Geometry
  1. Points, lines, and planes
  2. Using auxiliary views
  3. Solving design problems with descriptive geometry

K. Three-Dimensional Solid Models
  1. Creating three-dimensional solid models
  2. Wireframe and solid models
  3. Solving design problems using three-dimensional models

L. Design Project: Using graphics skills to solve a design challenge

Lab Content:

All of the lecture content is practiced by students in computer laboratory exercises:

A. Introduction to computer-drawing software

B. Geometric constructions

C. Technical sketching

D. Multi-view orthographic projections

E. Auxiliary Views

F. Sectional Views

G. Dimensioning

H. Tolerance

I. Three-dimensional Pictorial Drawings

J. Descriptive Geometry

K. Three-Dimensional Solid Models

L. Design Project

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

I. Sample Text Title:

or

1. Recommended - Howard, W. and Musto, J. *Introduction to Solid Modeling, using SolidWorks 2010,* ed. 6 McGraw Hill, 2010,

or

2. Recommended - Earle, J. *Engineering Design Graphics,* ed. 12 Pearson Prentice Hall, 2009,
3. Recommended - Bethune, James D. *Engineering Graphics with AutoCAD 2009,* Pearson Prentice Hall, 2009,
4. Recommended - Bertoline, G and Wiebe, E. *Fundamentals of Graphics Communication,* ed. 5 McGraw Hill, 2007,

II. Other Readings

___ Global or international materials or concepts are appropriately included in this course
___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing Check either 1 or 2 below			
	1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.		
X	***2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.***		
	a) essay exam(s)		d) written homework
	b) term or other paper(s)		e) reading reports
	c) laboratory report(s)		f) other (specify)

Required assignments may include but are not limited to the following:

B. Problem Solving Computational or non-computational problem-solving demonstrations, including:			
X	a) exam(s)		d) laboratory reports
	b) quizzes		e) field work
	c) homework problems	X	f) other (specify): Computer Drawing Lab Activities

Required assignments may include but are not limited to the following:
1. Determining the missing view of an object in a multi-view projection.

2. Determining the distance between two lines in space.

C. Skill demonstrations, including:			
X	a) class performance(s)	X	c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:
1. Constructing the multi-view drawing of a given object.

2. Constructing an auxiliary view of an object.

D. Objective examinations including:			
	a) multiple choice		d) completion
	b) true/false		e) other (specify):
	c) matching items		

COURSE GRADE DETERMINATION:
Description/Explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
Lab Drawings: 50% Tests: 30% Projects: 20%

VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):	College-Level Criteria Met YES	NO
Textbook	X	
Reference materials	X	
Instructor-prepared materials		X
Audio-visual materials		X

Indicate Method of evaluation:

Used readability formulae (grade level 10 or higher)	
Text is used in a college-level course	X
Used grading provided by publisher	
Other: (please explain; relate to Skills Levels)	

Computation Level (Eligible for MATH 101 level or higher where applicable)	X	
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	X	
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	X	
Requires independent thought and study	X	
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	X	

List of Reading/Educational Materials
Recommended - Howard, W. and Musto, J. *Introduction to Solid Modeling, using SolidWorks 2010,* ed. 6 McGraw Hill, 2010,
Recommended - Earle, J. *Engineering Design Graphics,* ed. 12 Pearson Prentice Hall, 2009,
Recommended - Bethune, James D. *Engineering Graphics with AutoCAD 2009,* Pearson Prentice Hall, 2009,
Recommended - Bertoline, G and Wiebe, E. *Fundamentals of Graphics Communication,* ed. 5 McGraw Hill, 2007,

Comments:

_____ This course requires special or additional library materials (list attached).
__X__ This course requires special facilities:
Computer Lab with CAD Software

Attached Files:

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 101. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

(eligibility for English 125) (as outcomes for English 252) __X__ Writing complete English sentences and avoiding errors most of the time. __X__ Using the conventions of English writing: capitalization, punctuation, spelling, etc. __X__ Using verbs correctly in present, past, future, and present perfect tenses, and using the correct forms of common irregular verbs. __X__ Expanding and developing basic sentence structure with appropriate modification. __X__ Combining sentences using coordination, subordination, and phrases. __X__ Expressing the writer's ideas in short personal papers utilizing the writing process in their development.	1. Writing descriptions of engineering drawing techniques. 2. Writing summaries of engineering design solution to complement engineering drawings. 3. Writing interpretations of engineering drawings in order to show comprehension of notation and symbols.
(eligibility for English 126) (as outcomes for English 262) __X__ Using phonetic, structural, contextual, and dictionary skills to attack and understand words. __X__ Applying word analysis skills to reading in context. __X__ Using adequate basic functional vocabulary skills. __X__ Using textbook study skills and outlining skills. __X__ Using a full range of literal comprehension skills and basic analytical skills such as predicting, inferring, concluding, and evaluating.	1. Reading CAD software manual and textbook and applying topics to engineering drawings. 2. Translating verbal information into mathematical equations or geometric diagrams. 3. Reading descriptions of engineering design problem and applying information to problem solving method.

Check the appropriate spaces.
_____ Eligibility for Math 101 is advisory for the target course.
_____ Eligibility for English 126 is advisory for the target course.
_____ Eligibility for English 125 is advisory for the target course.

If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.

REQUISITES

Subject Prerequisite -- MATH 102 PLANE GEOMETRY	
• Apply deductive reasoning with a geometric context.	• use computer-drawing software to geometrically construct two-dimensional shapes.
Subject Prerequisite -- MATH 103 INTERMEDIATE ALGEBRA	
• Simplify and/or factor mathematical expressions into forms more conducive to analysis.	• use computer-drawing software to geometrically construct two-dimensional shapes.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

1. _____ The prerequisite/corequisite is required by law or government regulations.
   Explain or cite regulation numbers:
2. _____ The health or safety of the students in this course requires the prerequisite.
   Justification: Indicate how this is so.
3. _____ The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
   Justification: Indicate how this is so.
4. _____ The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
   Justification: Indicate how this is so.
5. _____ Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
   Justification: Cite the statistical evidence from the research.
6. _____ The prerequisite course is part of a sequence of courses within or across a discipline.
7. __X__ Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:
   Similar courses at CSU, Fresno(ME 26), Cal Poly San Luis Obispo (ME 151), and UC, Davis (ENGR 4)require at least this level of course. Algebra is required for admission into the engineering programs at each school.