

CADD - 43 - Design Process and Concepts

COURSE OUTLINE OF RECORD

VIII. General Course Information

Subject:*

CADD

Course Number:* 43

Descriptive Title:* Design Process and Concepts

Course Disciplines:*

Drafting

Division:

Industry and Technology

Department:*

Computer Aided Design/Drafting

Catalog Description:*

This advanced design and drafting course addresses the processes of product design, from concept through final production drawings. Documentation requirements for each step include: design requirements definition, conceptual design, design evaluation/refinement, preliminary design, detail design and final production documentation. Industry practices are stressed throughout the course as students develop skills in conceptual sketching, orthographic projection, dimensioning and tolerancing and drawing notes. Research, planning and sketching are done manually, while formal drawings are prepared on a personal computer utilizing appropriate Computer Aided Design/Drafting (CADD) software.

Conditions of Enrollment:

Prerequisite:

Computer Aided Design/Drafting 7 or Computer Aided Design/Drafting 28 or Computer Aided Design/Drafting 31 with a minimum grade of C in prerequisite or equivalent

**Recommended
Preparation:**

**Enrollment
Limitation:**

Course Length: Full Term

**Hours Lecture (per
week):** 3

**Hours Laboratory (per
week):** 5

Outside Study Hours:* 6

Total Hours:* 144

Course Units:* 4.5

Grading Method: Letter Grade only

Credit Status: Credit, degree applicable

Transfer CSU: Yes
 No

Effective Date: 05/16/2011

Transfer UC: Yes
 No

Effective Date: Fall 2011

**General Education
ECC:**

Term:

Other:

CSU GE:

Term:

Other:

IGETC:

Term:

Other:

IX. Outcomes and Objectives

A. Student Learning Outcomes SLOs (The course student learning outcomes are listed below.)

Student Learning Outcomes:**SLO #1 Design Team**

Given sufficient design requirement definition, the student shall be able to plan, sketch and create complete engineering drawing packages of sample products work individually as well as functioning effectively as a member of a design team.

SLO #2 Product Definition Packages

Given sufficient design requirement definition, the student will be able to plan, sketch and create complete two dimensional engineering drawing packages of sample products.

SLO #3 Design Team

Given sufficient task definition, the student will be able to function as a member of a design team charged with planning and creating a complete two dimensional engineering drawing package of a simple product.

B. Course Objectives (The major learning objectives for this course are listed below.)**Course Objectives:**

1. Formulate and explain a list of terms and definitions relating to drafting and product design concepts. Include items relating to orthographic projection and standard drawing line types as well as phases of the design process (requirements definition, preliminary design, etc.).
2. Select materials and processes for typical industrial product definition documents in the form of general notes and lists of material. Describe the level of detail required for these selections at each step of the design process.
3. Work as a member of a design team to research, plan and execute a design project from a given set of requirements beginning with initial task definition and going through final production drawings.
4. Evaluate several design proposals and select one for full development. List the document types appropriate for each stage of your selection's design process.
5. Describe the level of dimensioning and tolerancing detail required at each stage of the design process.

X. Outline of Subject Matter

(Topics should be detailed enough to enable an instructor to determine the major areas that should be covered to ensure consistency from instructor to instructor and semester to semester.)

Example:**I. Main Topic (3 hours, lecture)****A. Sub topics****B. Sub topics****1. Super sub topic****2. Super sub topic**

Major Topics:

I. OVERVIEW OF THE ENGINEERING DESIGN PROCESS (2 hours, lecture)

1. Design requirements
2. Conceptual design
3. Preliminary design
4. Detail design

II. DRAWING FUNDAMENTALS (16 hours, lecture)

1. Alphabet of lines
 1. Visible (object)
 2. Hidden
 3. Center
 4. Phantom
 5. Extension
 6. Dimension
 7. Section
2. Orthographic projection
 1. Principal views and viewing planes
 2. Section views and cutting planes
 3. Auxiliary views
 4. Detail views
 5. Feature depiction
 1. Threads and thread relief
 2. Countersinks
 3. Counterbores
 4. Blind holes
3. Dimensioning and tolerancing
 1. Conventional
 2. Geometric

III. DRAFTING PROJECTS (30 hours, lab)

1. Standard orthographic views
2. Section views
3. Auxiliary views
4. Detail views
5. Assembly drawings

IV. DESIGN PROCESS (16 hours, lecture)

1. Requirements definition
 1. Chosen

2. Customer-imposed

2. Conceptual design

1. Initial proposals
2. Refinement

3. Preliminary design

1. Research
2. Trade studies

4. Detail design and parts count

5. Production design

1. Part definition
2. Assembly requirements
3. Installation/support requirements

V. DESIGN DOCUMENTATION (20 hours, lecture)

1. Design requirements documentation

1. Physical criteria
2. Performance criteria
3. Cost/schedule criteria
4. Regulatory compliance criteria

2. Conceptual design documentation

1. 'Possibility' sketches
2. Comparisons and decision matrix

3. Preliminary design documentation

1. Design layout
2. Bill of Materials (BOM)
3. Cost/schedule criteria

4. Detail design documentation

1. Detail part drawings
2. Assembly drawings
3. Tolerance studies
4. BOM

5. Production documentation

1. Shop drawings
2. Assembly drawings
3. Installation/support drawings

VI. DESIGN PROJECTS (60 hours, lab)

1. Individual

- 1. Project selection
- 2. Document package
 - 1. Requirements document
 - 2. Conceptual design and refinement
 - 3. Preliminary design and layout
 - 4. Detail design
 - 1. Fabrication drawings
 - 2. Assembly drawings

2. Team

- 1. Project selection
- 2. Document package
 - 1. Requirements document
 - 2. Conceptual design and refinement
 - 3. Preliminary design and layout
 - 4. Detail design
 - 1. Fabrication drawings
 - 2. Assembly drawings

Total Lecture Hours: 54

Total Laboratory Hours: 90

Total Hours: 144

XI. Primary Method of Evaluation and Sample Assignments

A. Primary Method of Evaluation (choose one):

Primary Method of Evaluation

2) Problem solving demonstrations (computational or non-computational)

B. Typical Assignment Using Primary Method of Evaluation

Typical Assignment Using Primary Method of Evaluation:

Prepare a proposal package consisting of detailed drawings and 3D CAD models to support a buy decision for the given set of performance and cost criteria. Submit detailed drawings to the instructor and submit 3D CAD models online via Canvas.

C. College-level Critical Thinking Assignments

Critical Thinking Assignment 1: Create a design project consisting of requirement documents, conceptual design, preliminary design and detail design containing sufficient detail to support a prototyping effort for the given basic proposal package. Submit detailed drawings to your instructor and submit 3D CAD models online via Canvas.

Critical Thinking Assignment 2: In a group of four to five students, prepare a design project consisting of requirement documents, conceptual design, preliminary design and detail design containing sufficient detail to support a prototyping effort for the given basic proposal package. Submit detailed drawings to your instructor and submit 3D CAD models online via Canvas.

D. Other Typical Assessment and Evaluation Methods

Other Evaluation Methods:

If Other:

XII. Instructional Methods

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

Instructional Methods:

If other: Internet Presentation/Resources

XIII. Work Outside of Class

Work Outside of Class

If Other: Research (market and material)

XIV. Texts and Materials

A. Up-to-date Representative Textbooks: (Please use the following format: Author, Title, Edition, Publisher, Year. If you wish to list a text that is more than 5 years old, please annotate it as a “discipline standard”.)

Up-To-Date Representative Textbooks: Jerry W. Craig, AN INTRODUCTION TO ENGINEERING DESIGN, Schroff Development Corporation, 1995, INDUSTRY STANDARD, ISBN: 978-1-887503-01-3

B. Alternative Textbooks: (Please use the following format: Author, Title, Edition, Publisher, Year. If you wish to list a text that is more than 5 years old, please annotate it as a “discipline standard”.)

Alternative
Textbooks:

C. Required Supplementary Readings

**Required
Supplementary
Readings:** ASME Y14.5 - 2018, Dimensioning and Tolerancing
Extensive online reference material organized on the class Canvas website

D. Other Required Materials

Other Required
Materials:

XV. Conditions of Enrollment

A. Requisites (Course Prerequisites and Corequisites) Skills needed without which a student would be highly unlikely to succeed.

Requisite

Category

Requisite course: Computer Aided Design/Drafting-7 or Computer Aided Design/Drafting-28 or Computer Aided Design/Drafting-31

Requisite and Matching skill(s):
Bold the requisite skill. List the corresponding course objective under each skill(s).

Ability to create and edit 3D models using wireframe and surfaces.

- CADD 7 - Construct and manipulate 3D models using Inventor Pro modeling software.
- CADD 28 - Create and manipulate complex 3D models with SolidWorks.
- CADD 31 - Utilize CATIA software to create and manipulate 3-D CAD models of geometrically simple objects.
- CADD 28 - Apply functional dimensions to 3D models with SolidWorks.
- CADD 7 - Move, rotate and scale 3D geometry using keyboard and mouse input.

The ability to create and edit 3D solid models based on sketch planes.

- CADD 7 - Construct and manipulate 3D models using Inventor Pro modeling software.
- CADD 28 - Create and manipulate complex 3D models with SolidWorks.
- CADD 28 - Apply functional dimensions to 3D models with SolidWorks.
- CADD 7 - Move, rotate and scale 3D geometry using keyboard and mouse input.
- CADD 31 - Utilize each of the CATIA menu functions as appropriate to the creation of 3-D solid models based on sketches.

The ability to create and edit 3D assemblies of models.

- CADD 31 - Manage the visibility of elements within a CATIA model using visible and invisible space.
- CADD 7 - Convert 3D solid models to orthogonal and isometric views to carry the geometric, dimensional and other pertinent data that describe a manufactured part.
- CADD 31 - Move, rotate, and scale 3-D geometry using appropriate menu items and mouse input.
- CADD 28 - Create presentation views and animation of assemblies with SolidWorks.
- CADD 28 - Manage assemblies within a product structure.

The ability to create and edit parametric solid models.

- CADD 7 - Construct and manipulate 3D models using Inventor Pro modeling software.
- CADD 28 - Analyze and assign tolerances to dimensioned model features.
- CADD 7 - Formulate solutions for commonly encountered modeling problems.
- CADD 28 - Create 2D constrained sketches.
- CADD 31 - Employ the constraint tools to define and control sketched geometry.
- CADD 31 - Plan and execute the interactions of part bodies through the use of Boolean operations.

B. Requisite: (Non-Course Prerequisite and Corequisites) Skills needed without which a student would be highly unlikely to succeed.

Requisite: equivalent experience

Requisite and Matching skill(s):
Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable

C. Recommended Preparations (Course) (Skills with which a student's ability to succeed will be
Page 9 of 10

Requisite course:

**Requisite and
Matching skill(s):
Bold the requisite
skill. List the
corresponding course
objective under each
skill(s).**

D. Recommended Preparation (Non-Course) (Skills with which a student's ability to succeed will be strongly enhanced.)

Requisite:

**Requisite and
Matching skill(s):
Bold the requisite
skill. List the
corresponding course
objective under each
skill(s). if applicable**

E. Enrollment Limitations

**Enrollment
Limitations and
Category:**

**Enrollment
Limitations Impact:**

Course Created by: Rick Hughes

Date: 10/15/2015

Board Approval Date: 05/16/2011

**Last Board Approval
Date:** 05/21/2018

**Last Reviewed and/or
Revised by:** Doug Glenn

Date: 11/08/2019