

ENGR109 : Computer Aided Design AutoCAD I

General Information

Author:	<ul style="list-style-type: none">Christopher Herwerth
Course Code (CB01) :	ENGR109
Course Title (CB02) :	Computer Aided Design AutoCAD I
Department:	ENGR
Proposal Start:	Spring 2025
TOP Code (CB03) :	(0953.20) Civil Drafting
CIP Code:	(15.1304) Civil Drafting and Civil Engineering CAD/CADD.
SAM Code (CB09) :	Possibly Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000590759
Curriculum Committee Approval Date:	06/12/2024
Board of Trustees Approval Date:	07/16/2024
Last Cyclical Review Date:	06/12/2024
Course Description and Course Note:	ENGR 109 is an activity based course in two-dimensional computer-aided design using AutoCAD software. Students learn and practice tools to create and edit drawings in accordance with industry standards. Topics include object construction, object properties, layers, orthographic projections, auxiliary views, sectioning, parametric tools, basic dimensioning, templates, plotting and the application of geometric dimensioning and tolerancing.
Justification:	Mandatory Revision
Academic Career:	<ul style="list-style-type: none">Credit
Mode of Delivery:	
Author:	
Course Family:	

Academic Senate Discipline

Primary Discipline:	<ul style="list-style-type: none">Engineering Support (Surveying, engineering aides)
Alternate Discipline:	No value
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

Course is not a support course

General Education and C-ID

General Education Status (CB25)

Not Applicable

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

Units and Hours

Summary

Minimum Credit Units (CB07)	3
Maximum Credit Units (CB06)	3
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	54
Total Student Learning Hours	162

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

Variable Credit Course

Funding Agency Category (CB23)

Not Applicable.

Cooperative Work Experience

Education Status (CB10)

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	1.5	3
Laboratory Hours	4.5	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	27
Laboratory	81
Studio	0

Total 108

Course Out-of-Class Hours

Lecture	54
Laboratory	0
Studio	0
Total	54

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

ARCH101 - Drafting And Basic Design (in-development)

Objectives

- Describe the meaning of basic architectural vocabulary terms.
- Describe limited examples of the use of the International Building Code as it applies to residential construction.

OR

Prerequisite

ENGR101 - Engineering Drafting And Basic Design (in-development)

Objectives

- Demonstrate rules of orthographic projection by creating detailed multi-view drawings.
- Analyze an object and create auxiliary and section views of its features when necessary.
- Explain the glass box theory and the geometric relationships of orthographic views.

OR

Prerequisite

ENGR122 - Engineering Graphics

Objectives

- Apply the principles of orthographic projection to create complete multi-view engineering drawings.
 - Create pictorial drawings from three-dimensional objects and orthographic projections.
 - Create clear and concise auxiliary and section views of an object using industry standards.
 - Demonstrate proficiency in coordinate dimensioning and tolerancing of engineering drawings.
-

Entry Standards

Entry Standards

Course Limitations

Cross Listed or Equivalent Course

Specifications

Methods of Instruction

Methods of Instruction Lecture

Methods of Instruction Laboratory

Methods of Instruction Discussion

Methods of Instruction Multimedia

Methods of Instruction Collaborative Learning

Methods of Instruction Demonstrations

Methods of Instruction Presentations

Out of Class Assignments

- Essays (e.g. write a short summary of the activities of an industry organization such as the American Society of Civil Engineers, ASCE)
- Calculations (e.g. determine angles and distances between features in a drawing)
- Individual projects(e.g. create a complete engineering drawing that includes elements such as orthographic projection, sections, dimensions, title block, tolerances and notes, etc.)

Methods of Evaluation

Rationale

Exam/Quiz/Test

Quizzes

Project/Portfolio

Projects

Exam/Quiz/Test

Midterm

Exam/Quiz/Test

Final examination (e.g. the AutoCAD Certified User Exam is an optional industry certificate that can be administered as a final exam)

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Shih, Randy H.	AutoCAD 2024 Tutorial: First Level 2D Fundamentals	SDC Publications,	2023	978-1-63057-585-4

Other Instructional Materials (i.e. OER, handouts)

No Value

Materials Fee

No value

Learning Outcomes and Objectives

Course Objectives

Create a complete set of CAD drawings that communicates technical information for a complex geometric part or assembly.

Evaluate CAD designs to determine clarity and manufacturability.

Organize revised CAD drawings that document the iterative engineering design process.

Develop auxiliary and section views in drawings.

Organize drawings using the layers function to efficiently display features.

Practice clear and concise dimensioning techniques.

Demonstrate use of line techniques.

SLOs

Construct engineering drawings using AutoCAD commands while employing timesaving strategies to operate the software efficiently.

Expected Outcome Performance: 70.0

ILOs Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
ENGR Civil Engineering	Apply knowledge of mathematics, science and engineering; identify, form and solve engineering problems
	Demonstrate introductory skills using modern engineering tools necessary for engineering practice.
ENGR Engineering Technology - CAD & Design Drafting	Demonstrate skills in the production of working drawings of engineering structures
	Demonstrate techniques to accomplish drawings and 3D models utilizing different various computer aided design (CAD) software
ENGR Engineering Entrepreneurship Skill Award	Learn hands-on skills and problem solving techniques for businesses related to engineering design, installation, manufacturing, testing, technical sales, maintenance, and other such topics in engineering technology.
	Learn the engineering design process and how technical products are made, assembled, and integrated into complex systems.
ENGR Electrical Engineering A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
ENGR Computer Engineering AS	demonstrate appropriate technical written, verbal, drawing, and communication skills;
	design a system, component, or process with supervision of a licensed engineer to meet desired needs.
ENGR Mechanical Engineering - A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
Employ AutoCAD software to create, manipulate, edit and modify engineering drawings. Expected Outcome Performance: 70.0	
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	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
ENGR Civil Engineering	Apply knowledge of mathematics, science and engineering; identify, form and solve engineering problems
	Demonstrate introductory skills using modern engineering tools necessary for engineering practice.
ENGR Engineering Technology - CAD & Design Drafting	Demonstrate skills in the production of working drawings of engineering structures
	Demonstrate techniques to accomplish drawings and 3D models utilizing different various computer aided design (CAD) software
ENGR Engineering Entrepreneurship Skill Award	Learn hands-on skills and problem solving techniques for businesses related to engineering design, installation, manufacturing, testing, technical sales, maintenance, and other such topics in engineering technology.
	Learn the engineering design process and how technical products are made, assembled, and integrated into complex systems.
ENGR Electrical Engineering A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
ENGR Computer Engineering AS	demonstrate appropriate technical written, verbal, drawing, and communication skills;
ENGR Mechanical Engineering - A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;

Prepare clear, concise and unambiguous engineering drawings that include all required industry standard elements such as title block, dimensions, views, annotations and notes. Expected Outcome Performance: 70.0

<i>ILOs</i> Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
<i>ENGR</i> Civil Engineering	Apply knowledge of mathematics, science and engineering; identify, form and solve engineering problems
	Demonstrate introductory skills using modern engineering tools necessary for engineering practice.
<i>ENGR</i> Engineering Technology - CAD & Design Drafting	Demonstrate skills in the production of working drawings of engineering structures
	Demonstrate techniques to accomplish drawings and 3D models utilizing different various computer aided design (CAD) software
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	Learn the engineering design process and how technical products are made, assembled, and integrated into complex systems.
<i>ENGR</i> Electrical Engineering A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
<i>ENGR</i> Mechanical Engineering - A.S. Degree Major	demonstrate appropriate technical written, verbal, drawing, and communication skills;
<i>ENGR</i> Computer Engineering AS	demonstrate appropriate technical written, verbal, drawing, and communication skills;

Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No

Is this proposal submitted in response to learning outcomes assessment data?

No

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Introduction (2 hours)

- Brief history of computer aided design
- Computer aided engineering
- Computer aided drafting
- Development of computer geometric modeling
- Overview of AutoCAD
- Additional AutoCAD modules
- AutoCAD certified user examination

AutoCAD Screen Layout (2 hours)

- Application menu and toolbars
- Layout and drawing area
- Command prompt area
- Input tools; mouse and keyboard
- Online help
- Exiting AutoCAD, files and creating a CAD file folder

Fundamental Operational Commands (2 hours)

- Drawing units and area setup
- Line command, points and circles
- Snap mode and grid
- CAD database
- User coordinate system
- Cartesian and polar coordinate systems
- Absolute and relative coordinates
- Object construction
- Dynamic input
- Snap and Grid intervals
- World coordinate system
- Tangent circles and polygon construction
- Erase and trim commands
- Calculator for distances and angles
- Accelerator keys

Geometric Construction and Editing Tools (2 hours)

- CAD method for geometric construction
- Fillet, extend, and explode commands
- Creating offsets
- Tangent, Tangent, Radius circles

Object Properties and Organization (2 hours)

- Multiline, object snap toolbar
- Modeling
- Layers
- Layer visibility, adding layers
- Moving objects between layers
- Layer properties

Multiview Drawings (2 hours)

- Orthographic projection
- Using mitre line technique
- Object lines
- Construction lines
- Object information using list and properties commands

Dimensioning and Notes (2 hours)

- Hidden lines and center lines
- Dimensioning commands
- Dimension toolbar and style manager
- Linear, angular, radius and diameter dimensioning
- Center mark

Geometric Dimensioning and Tolerancing (GD&T) (3 hours)

- Creating tolerances
- GD&T annotation
- Datums and true position
- Mathematical tolerance analysis
- ASME Y-14.5 and industry standards

Templates and Plotting (2 hours)

- Layout of Borders and title block
- Creating template files
- Viewport properties
- Dimension scale
- Plot/print commands
- Print sizes
- File management

Parametric Drawing Tools (3 hours)

- Parametric modeling
- Rough sketches
- Unconstrained, under constrained and fully constrained definitions
- Geometric and dimensional constraints

- Display of constraints
- Mirror
- Grips command

Auxiliary and Section Views (3 hours)

- Setting up principal views
- Using offset for auxiliary projection
- Polar tracking option
- True size and shape
- Cutting plane line
- Adding section lines or hatching

Assembly Drawings (2 hours)

- Loading multiple drawings
- Exploded views
- Digital drawings

Total Hours: 27

Laboratory/Studio Content

Introduction (6 hours)

- Brief history of computer aided design
- Computer aided engineering
- Computer aided drafting
- Development of computer geometric modeling
- Overview of AutoCAD
- Additional AutoCAD modules
- AutoCAD certified user examination

AutoCAD Screen Layout (6 hours)

- Application menu and toolbars
- Layout and drawing area
- Command prompt area
- Input tools; mouse and keyboard
- Online help
- Exiting AutoCAD, files and creating a CAD file folder

Fundamental Operational Commands (9 hours)

- Drawing units and area setup
- Line command, points and circles
- Snap mode and grid
- CAD database
- User coordinate system
- Cartesian and polar coordinate systems
- Absolute and relative coordinates
- Object construction
- Dynamic input
- Snap and Grid intervals
- World coordinate system
- Tangent circles and polygon construction
- Erase and trim commands
- Calculator for distances and angles
- Accelerator keys

Geometric Construction and Editing Tools (6 hours)

- CAD method for geometric construction
- Fillet, extend, and explode commands
- Creating offsets
- Tangent, Tangent, Radius circles

Object Properties and Organization (7 hours)

- Multiline, object snap toolbar
- Modeling
- Layers
- Layer visibility, adding layers
- Moving objects between layers
- Layer properties

Multiview Drawings (7 hours)

- Orthographic projection
- Using mitre line technique
- Object lines

- Construction lines
- Object information using list and properties commands

Dimensioning and Notes (7 hours)

- Hidden lines and center lines
- Dimensioning commands
- Dimension toolbar and style manager
- Linear, angular, radius and diameter dimensioning
- Center mark

Geometric Dimensioning and Tolerancing (GD&T) (7 hours)

- Creating tolerances
- GD&T annotation
- Datums and true position
- Mathematical tolerance analysis
- ASME Y-14.5 and industry standards

Templates and Plotting (6 hours)

- Layout of Borders and title block
- Creating template files
- Viewport properties
- Dimension scale
- Plot/print commands
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Parametric Drawing Tools (7 hours)

- Parametric modeling
- Rough sketches
- Unconstrained, under constrained and fully constrained definitions
- Geometric and dimensional constraints
- Display of constraints
- Mirror
- Grips command

Auxiliary and Section Views (7 hours)

- Setting up principal views
- Using offset for auxiliary projection
- Polar tracking option
- True size and shape
- Cutting plane line
- Adding section lines or hatching

Assembly Drawings (6 hours)

- Loading multiple drawings
- Exploded views
- Digital drawings

Total Hours: 81

Additional Information

Is this course proposed for GCC Major or General Education Graduation requirement? If yes, indicate which requirement in the two areas provided below.

No

GCC Major Requirements

No Value

GCC General Education Graduation Requirements

No Value

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Resources

Did you contact your departmental library liaison?

No

If yes, who is your departmental library liaison?

No Value

Did you contact the DEIA liaison?

No

Were there any DEIA changes made to this outline?

No Value

If yes, in what areas were these changes made:

No Value

Will any additional resources be needed for this course? (Click all that apply)

No Value

If additional resources are needed, add a brief description and cost in the box provided.

No Value