

Glendale College

Course Outline of Record Report

Course ID 010405
Revision - April 2025

ENGR122 : Engineering Graphics

General Information

Author:	<ul style="list-style-type: none"> Christopher Herwerth
Course Code (CB01) :	ENGR122
Course Title (CB02) :	Engineering Graphics
Department:	ENGR
Proposal Start:	Spring 2026
TOP Code (CB03) :	(0901.00) Engineering, General (requires Calculus) (Transfer)
CIP Code:	(14.0102) Pre-Engineering.
SAM Code (CB09) :	E - Non-Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	Yes
Course Control Number (CB00) :	CCC000603902
Curriculum Committee Approval Date:	04/23/2025
Board of Trustees Approval Date:	06/17/2025
Last Cyclical Review Date:	04/23/2025
Course Description and Course Note:	ENGR 122 presents the fundamental principles of graphical communication and drawing in the engineering design process using two professional computer aided design (CAD) packages. Students develop visualization and spatial acuity skills in practical applications of descriptive geometry through 2-D and 3-D CAD modeling. Topics include orthographic projection, glass box theory, auxiliary views, sectioning, dimensioning, and geometric dimensioning and tolerancing (GD&T).
Justification:	Mandatory Revision
Academic Career:	<ul style="list-style-type: none"> Credit
Mode of Delivery:	<ul style="list-style-type: none"> In-Person Online
Author:	No value
Course Family:	No value

Academic Senate Discipline

Primary Discipline:	<ul style="list-style-type: none"> Engineering
Alternate Discipline:	No value
Alternate Discipline:	No value

Last Course Offering

When was this course last offered (term and year)?

Spring 2025

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

C-ID	Area	Status	Approval Date	Comparable Course
ENGR	Engineering	Approved	09/03/2019	ENGR 150 - Engineering Graphics

Units and Hours

Summary

Minimum Credit Units (CB07)	3
Maximum Credit Units (CB06)	3
Total Course In-Class (Contact) Hours	90
Total Course Out-of-Class Hours	72
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	2	4
Laboratory Hours	3	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	36
Laboratory	54
Studio	0
Total	90
Course Out-of-Class Hours	
Lecture	72
Laboratory	0
Studio	0
Total	72

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

Prerequisites, Corequisites, Recommended Corequisites, and Recommended Preparation

Prerequisite

MATH110 - Precalculus and Trigonometry

Objectives

- Evaluate a trigonometric function at an angle whose measure is given in degrees and radians
- Simplify trigonometric expressions
- Solve trigonometric equations
- Apply the basic definitions of trigonometry to solve right triangle application problems
- apply the laws of sines and cosines to solve application problems
- convert between polar and rectangular coordinates

OR

Prerequisite

MATH101E - Algebra and Trigonometry for Calculus (in-development)

Objectives

- Evaluate a trigonometric function at an angle whose measure is given in degrees and radians.
- Simplify trigonometric expressions.
- Solve trigonometric equations.
- Apply various trigonometric identities.

Entry Standards

Entry Standards	Description
No value	No value

Course Limitations

Cross Listed or Equivalent Course	Description
No value	No value

Requisite Validation

Upload Statistical Validation and/or other documents (if necessary)
No Value

Specifications

Methods of Instruction	
Methods of Instruction	Lecture
Methods of Instruction	Laboratory
Methods of Instruction	Discussion

Methods of Instruction	Multimedia																				
Methods of Instruction	Demonstrations																				
Methods of Instruction	Presentations																				
Out of Class Assignments <ul style="list-style-type: none"> • Drawing (e.g., create pictorial drawing such as an isometric view drawing) • Project (e.g., design and build a pencil holder and then create engineering drawings of the item using Computer Aided Design) • Essay (e.g., write a brief summary of an industry organization such as the American Society of Civil Engineers (ASCE)) • Group Project (e.g., design a water filtration system and produce a complete set of engineering drawings using Computer Aided Design) 																					
Methods of Evaluation	Description of Activity/Interaction																				
Other	Drawings (e.g. create an engineering drawing of an object)																				
Exam/Quiz/Test	Quizzes																				
Project/Portfolio	Projects (e.g. reverse engineer an object of device and create engineering design drawings)																				
Exam/Quiz/Test	Final Exam																				
Textbook Rationale Engineering Graphics Principles with Geometric Dimensioning and Tolerancing is justified due to its strong content of industry standards such as American Society of Mechanical Engineers Y14.5 code.																					
Textbooks <table border="1"> <thead> <tr> <th>Author</th> <th>Title</th> <th>Publisher</th> <th>Date</th> <th>ISBN</th> </tr> </thead> <tbody> <tr> <td>David C. Planchard</td> <td>Engineering Graphics with SOLIDWORKS 2025</td> <td>SDC Publications</td> <td>2025</td> <td>978-1-63057-694-3</td> </tr> <tr> <td>Kirstie Plantenberg</td> <td>Engineeering Graphics Essentials with AutoCAD 2025 Instruction</td> <td>SDC Publications</td> <td>2024</td> <td>978-1-63057-657-8</td> </tr> <tr> <td>E. Max Raisor FIAE</td> <td>Engineering Graphics Principles with Geometric Dimensioning and Tolerancing</td> <td>SDC Publications</td> <td>2017</td> <td>978-1-63057-121-4</td> </tr> </tbody> </table>		Author	Title	Publisher	Date	ISBN	David C. Planchard	Engineering Graphics with SOLIDWORKS 2025	SDC Publications	2025	978-1-63057-694-3	Kirstie Plantenberg	Engineeering Graphics Essentials with AutoCAD 2025 Instruction	SDC Publications	2024	978-1-63057-657-8	E. Max Raisor FIAE	Engineering Graphics Principles with Geometric Dimensioning and Tolerancing	SDC Publications	2017	978-1-63057-121-4
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Other Instructional Materials (i.e. OER, handouts) No Value																					

Learning Outcomes

Course Objectives

Apply the principles of orthographic projection to create complete multi-view engineering drawings.

Create pictorial drawings from three-dimensional objects and orthographic projections.

Use computer aided design software to create 2D engineering drawings, including working, production, and assembly drawings.

Use computer aided design software to create 3D models, assemblies, exploded views and engineering drawings.

Create clear and concise auxiliary and section views of an object using industry standards.

Demonstrate proficiency in coordinate dimensioning and tolerancing of engineering drawings.

Demonstrate geometric dimensioning and tolerancing (GD&T) as applied to an engineering design drawing.

Apply the engineering design process and demonstrate its steps in a design project.

SLOs

Apply the standards of orthographic projection in computer aided designs to efficiently communicate detailed drawing information by creating completely defined drawings without excess information. 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.
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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.
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<i>ENGR</i> Civil Engineering	Apply knowledge of mathematics, science and engineering; identify, form and solve engineering problems
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	Demonstrate introductory skills using modern engineering tools necessary for engineering practice.
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<i>ENGR</i> Engineering Technology - CAD & Design Drafting	Demonstrate skills in the production of working drawings of engineering structures
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	Demonstrate techniques to accomplish drawings and 3D models utilizing different various computer aided design (CAD) software
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	Discuss how the design process and design/drawing techniques are used with other engineering processes to create a finished product.
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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.

ENGR
Mechanical Engineering - A.S.
Degree Major
demonstrate appropriate technical written, verbal, drawing, and communication skills;

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.

Evaluate engineering design needs and use judgement to include proper dimensioning and tolerances in a CAD design for efficient manufacturing of the part, construction or machine. 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
Mechanical Engineering - A.S.
Degree Major
analyze engineering problems and make appropriate decisions with the supervision of a licensed engineer;
use science and mathematical skills required for occupational needs;

ENGR
Electrical Engineering A.S. Degree
Major
analyze engineering problems and make appropriate decisions with the supervision of a licensed engineer;
use science and mathematical skills required for occupational needs;

ENGR
Computer Engineering AS
analyze engineering problems and make appropriate decisions with the supervision of a licensed engineer;

Demonstrate the engineering design process in a computer aided drafting and design project. 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.

<p><i>ENGR</i> Engineering Technology - CAD & Design Drafting</p>	<p>Demonstrate techniques to accomplish drawings and 3D models utilizing different various computer aided design (CAD) software</p>
<p><i>ENGR</i> Engineering Entrepreneurship Skill Award</p>	<p>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.</p>
<p><i>ENGR</i> Electrical Engineering A.S. Degree Major</p>	<p>analyze engineering problems and make appropriate decisions with the supervision of a licensed engineer; 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. use science and mathematical skills required for occupational needs;</p>
<p><i>ENGR</i> Mechanical Engineering - A.S. Degree Major</p>	<p>analyze engineering problems and make appropriate decisions with the supervision of a licensed engineer; demonstrate appropriate technical written, verbal, drawing, and communication skills; design a system, component, or process with supervision of a licensed engineering to meet desired needs. use science and mathematical skills required for occupational needs;</p>
<p><i>ENGR</i> Computer Engineering AS</p>	<p>design a system, component, or process with supervision of a licensed engineer to meet desired needs.</p>

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)

- Definition of engineering graphics
- Industry uses and history of drafting
- Evolution of computer aided design (CAD) software
- Engineering drawing types
- Visualization skills

Lettering and Review of Geometric Construction (2 hours)

- Lettering fonts
- Mark-ups and field notes
- Geometric construction practice
- Bisecting lines and arcs
- Tangencies
- Circles and curves

Lines and Line Types (2 hours)

- Solid, hidden, center lines and center marks
- Construction lines, fold lines and references
- Line thickness and quality
- Hand drawing versus CAD tools for lines

Measurement Tools (3 hours)

- Engineering scales
- Architecture scales
- Calipers and micrometers
- CAD software measurement tools for distance, mass and density

Orthographic Projection (4 hours)

- Glass box concept
- Vocabulary of drawing concepts
- Visualization of 3D objects
- Third angle and first angle projection
- 2D CAD software for orthographic projection
- Using layers in AutoCAD for line types
- Multiview drawings by hand and in CAD software
- 2D and 3D construction and editing tools

Pictorials (4 hours)

- Visualization of 3D objects
- Axonometric projection
 - Isometric views
 - Dimetric views
 - Trimetric views
- Oblique Projection
- Perspective View
- Selecting views in CAD

Auxiliary Views (4 hours)

- Determining the need for an auxiliary view
- Descriptive geometry
- True size and shape
- Creating auxiliary views in CAD

Section Views (3 hours)

- Types of sections
- Full and half sections
- Revolved sections
- Fasteners and standard notation of threaded fasteners
- Cutting planes

Dimensioning and Tolerancing (3 hours)

- Coordinate dimensioning and tolerancing
- Arrow heads, callouts, leader lines
- Placement of dimensions
- Dimensioning and tolerancing in CAD
- Design judgement for complete dimensioning and tolerance selection

Geometric Dimensioning and Tolerancing (3 hours)

- Feature control frames
- Maximum and least material condition
- Using engineering or design judgement to determine tolerance
- Manufacturability and cost and quality considerations
- Working with technicians and technologists for efficient designs

Types of Drawings (3 hours)

- Detail, shop and assembly drawings
- Production drawings
- Assembly drawings in CAD
- Exploded views
- 3D project modeling, building information management (BIM)
- File maintenance and conversion
- Electronic documentation of large engineering projects

Engineering Design Process (3 hours)

- Steps in the engineering design process
- Design, prototyping and iteration
- Efficiency in CAD design

Total Hours: 36**Laboratory/Studio Content****Introduction (1 hour)**

- Definition of engineering graphics
- Industry uses and history of drafting
- Evolution of computer aided design (CAD) software
- Engineering drawing types
- Visualization skills

Lettering and Review of Geometric Construction (3 hours)

- Lettering fonts
- Mark-ups and field notes
- Geometric construction practice
- Bisecting lines and arcs
- Tangencies
- Circles and curves

Lines and Line Types (3 hours)

- Solid, hidden, centerlines, and center-marks
- Construction lines, fold lines, and references
- Line thickness and quality
- Hand drawing versus CAD tools for lines

Measurement Tools (4 hours)

- Engineering scales
- Architecture scales
- Calipers and micrometers
- CAD software measurement tools for distance, mass, and density

Orthographic Projection (8 hours)

- Glass box concept
- Vocabulary of drawing concepts
- Visualization of 3D objects
- Third angle and first angle projection
- 2D CAD software for orthographic projection
- Using layers in AutoCAD for line types
- Multiview drawings by hand and in CAD software
- 2D and 3D construction and editing tools

Pictorials (6 hours)

- Visualization of 3D objects
- Axonometric projection
 - Isometric views
 - Dimetric views
 - Trimetric views
- Oblique Projection
- Perspective View
- Selecting views in CAD

Auxiliary Views (6 hours)

- Determining the need for an auxiliary view

- Descriptive geometry
- True size and shape
- Creating auxiliary views in CAD

Section Views (5 hours)

- Types of sections
- Full and half sections
- Revolved sections
- Fasteners and standard notation of threaded fasteners
- Cutting planes

Dimensioning and Tolerancing (6 hours)

- Coordinate dimensioning and tolerancing
- Arrow heads, callouts, leader lines
- Placement of dimensions
- Dimensioning and tolerancing in CAD
- Design judgement for complete dimensioning and tolerance selection

Geometric Dimensioning and Tolerancing (6 hours)

- Feature control frames
- Maximum and least material condition
- Using engineering or design judgement to determine tolerance
- Manufacturability and cost and quality considerations
- Working with technicians and technologists for efficient designs

Types of Drawings (2 hours)

- Detail, shop, and assembly drawings
- Production drawings
- Assembly drawings in CAD
- Exploded views
- 3D project modeling, building information management (BIM)
- File maintenance and conversion
- Electronic documentation of large engineering projects

Engineering Design Process (4 hours)

- Steps in the engineering design process
- Design, prototyping, and iteration
- Efficiency in CAD design

Total Hours: 54

Additional Information

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Is it possible this course will have a material fee?

No

I have contacted my library liaison (<https://campusguides.glendale.edu/faculty/liasons>):

Yes

What term(s) will this course be offered?

Fall/Spring

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

- No

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

No Value