

# Glendale College

## Course Outline of Record Report

Course ID 010403  
Revision - April 2025

### ENGR180 : Surveying

#### General Information

Author:	<ul style="list-style-type: none"> <li>Christopher Herwerth</li> </ul>
Course Code (CB01) :	ENGR180
Course Title (CB02) :	Surveying
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) :	CCC000603904
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 180 covers the theory, principles, and practice of plane surveying and includes office computations and design, operation of surveying field equipment, and production of engineering plans and maps. Topics include measurement of distances, angles, and directions, differential leveling, traversing, property and boundary surveys. Students learn topographic surveying and mapping, volume and earthwork calculations, horizontal and vertical curves, land description techniques and global positioning system (GPS). Students may transfer this course to a university civil engineering program or apply it toward a technical career as a land surveyor.
Justification:	Mandatory Revision
Academic Career:	<ul style="list-style-type: none"> <li>Credit</li> </ul>
Mode of Delivery:	<ul style="list-style-type: none"> <li>In-Person</li> <li>Hybrid</li> <li>Online</li> </ul>
Author:	No value
Course Family:	No value

#### Academic Senate Discipline

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

### Last Course Offering

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

Not offered yet

### 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 CSU only

**Transferability Status**

Approved

C-ID	Area	Status	Approval Date	Comparable Course
ENGR	Engineering	Approved	09/03/2019	ENGR 180 - Surveying

### Units and Hours

**Summary**

<b>Minimum Credit Units (CB07)</b>	3
<b>Maximum Credit Units (CB06)</b>	3
<b>Total Course In-Class (Contact) Hours</b>	90
<b>Total Course Out-of-Class Hours</b>	72
<b>Total Student Learning Hours</b>	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**

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

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.

**OR**

**Prerequisite**

MATH102+ - Trigonometry with Support

**Objectives**

- Identify special triangles and their related angle and side measures.
- Evaluate the trigonometric function of an angle in degree and radian measure.
- Manipulate and simplify a trigonometric expression.
- Solve trigonometric equations, triangles, and applications.
- Convert between polar and rectangular coordinates and equations.
- Graph polar equations.

**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

<b>Methods of Instruction</b>	Multimedia			
<b>Methods of Instruction</b>	Collaborative Learning			
<b>Methods of Instruction</b>	Demonstrations			
<b>Methods of Instruction</b>	Presentations			
<b>Out of Class Assignments</b>				
<ul style="list-style-type: none"> <li>• Hand drawings (e.g., draw a topographical map)</li> <li>• Calculations (e.g., calculate the distance between two points with appropriate precision)</li> <li>• Projects (e.g., calculate and report on error analysis of a set of data)</li> </ul>				
<b>Methods of Evaluation</b>	<b>Description of Activity/Interaction</b>			
Activity (answering journal prompt, group activity)	Field work (e.g., operating field equipment safely and effectively)			
Writing Assignment	Field book (e.g., organized, clear and accurate notes written in a field book)			
Exam/Quiz/Test	Quizzes			
Project/Portfolio	Projects [e.g., create a plot plan or map using computer aided design software (CAD)]			
Exam/Quiz/Test	Final exam (e.g., written and practical demonstration exam)			
<b>Textbook Rationale</b>				
No Value				
<b>Textbooks</b>				
<b>Author</b>	<b>Title</b>	<b>Publisher</b>	<b>Date</b>	<b>ISBN</b>
Charles D. Ghilani	Elementary Surveying: An Introduction to Geomatics	Pearson	2021	9780136822806
<b>Other Instructional Materials (i.e. OER, handouts)</b>				
No Value				

## Learning Outcomes

### Course Objectives

Perform office computations for area calculations, traversing, property and boundary surveys, topographic surveys and mapping, volume and earthwork, horizontal and vertical curves, and error analyses.

Reduce field notes using various mathematical techniques to generate records describing horizontal and vertical control of landforms.

Create plots, plans, and maps from field work data using manual and CAD drafting.

Describe professional practice issues including professional ethics in land surveying.

Discuss the technical activities and responsibilities of professional engineers (PE) and land surveyors (LS) including licensing requirements.

Demonstrate appropriate safety practices such as personal protection equipment (PPE) during field work training.

### SLOs

**Operate surveying related equipment such as tape, level, transit, theodolite, compass, total station, and GPS safely and efficiently.**

Expected Outcome Performance: 70.0

*ILOs* Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to  
 Core solve unique problems.  
*ILOs*

**Work effectively in groups during field surveying and engineering design activities and communicate with written reports and oral presentations of problem solutions.**

Expected Outcome Performance: 70.0

*ILOs* Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to  
 Core solve unique problems.  
*ILOs*

Practice ethical and responsible behavior within personal, academic, professional, social, and societal contexts; recognize and welcome diverse lifestyle choices that promote physical, intellectual, psychological, and social well-being.

**Organize data from field notes to create meaningful and useful records.**

Expected Outcome Performance: 70.0

*ILOs* Communicate clearly, ethically, and creatively; listen actively and engage respectfully with others; consider situational, cultural, and personal contexts  
 Core within or across multiple modes of communication.  
*ILOs*

Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.

## 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)

- History of land surveying
- Definition of surveying and geomatics
- Technological evolution of land surveying equipment
- Professionalism and licensing of land surveyors and professional engineers
- Relevant industries and uses of surveying skills and services
- Governmental involvement in surveying and mapping

#### Units Systems and Measurements (2 hours)

- International system of units (SI) and US customary units
- Unit conversion
- Significant figures
- Rounding numbers
- Accuracy and precision
- Units of measurement: distance, angles, area, volume

#### Field Notes (2 hours)

- Writing field notes
- Types of notes and organizing field book entries
- Electronic data collection and devices
- File management and field notes reduction

#### Distance Measurements (2 hours)

- Methods of linear measurements
- Taping, pacing odometer, optical rangefinders, tacheometry (stadia), subtense bars, electronic distance measurement (EDM), satellite systems.
- Total station instruments

#### Leveling (3 hours)

- Differential leveling
- Equipment setup
- Observer and rod-person duties
- Notes, calculations, and precision
- Types of leveling: circuit, reciprocal, profile, and three wire leveling
- Errors in leveling

#### Angles and Directions (3 hours)

- Units of angle measurement
- Azimuths and bearings
- Compass and the earth's magnetic field

- Calculating azimuths and bearings

**Traversing (6 hours)**

- Coordinates
- Computations such as zenith, bearing, latitude, departure, and coordinates of a line utilizing field data
- Departures and latitude closure
- Land area calculations
- Determination of rotation angle
- Computation of final distance
- Area for balanced traverse
- Error analysis

**Coordinate Geometry (2 hours)**

- Coordinate forms of equations of lines and circles
- Perpendicular distances
- Intersections of lines and circles

**Property and Boundary Surveys (2 hours)**

- Categories of land surveys
- Metes and bounds descriptions
- Retracement, subdivisions, partitioning land, registration of title
- History
- Sources of error in boundary surveys

**Topographic and Mapping Surveys (2 hours)**

- Basic methods
- Map scales
- Contours and location methods
- Field methods for locating topographic details such as using total station, stadia, grid method

**Volume and Earthwork (4 hours)**

- Average end area formula
- Calculating slope intercepts
- Prismoidal formula
- Contour-area method

**Horizontal and Vertical Curves (2 hours)**

- Degree of circular curve
- Definitions and derivation of circular curve formulas
- Equations of vertical parabolic curve
- High and low point
- Staking a vertical parabolic curve

**Equipment (2 hours)**

- Tapes, levels, transits, theodolites, total stations, GPS
- Computers and manual and computer aided drafting of plans

**Additional Topics (2 hours)**

- Introduction to GPS
- Introduction to photogrammetry theory/viewing
- Aerial photos
- Stadia theory
- Construction applications

**Total Hours: 36**

**Laboratory/Studio Content****Introduction (2 hours)**

- History of land surveying
- Definition of surveying and geomatics
- Technological evolution of land surveying equipment
- Professionalism and licensing of land surveyors and professional engineers
- Relevant industries and uses of surveying skills and services
- Governmental involvement in surveying and mapping

**Units Systems and Measurements (4 hours)**

- International system of units (SI) and US customary units
- Unit conversion
- Significant figures
- Rounding numbers
- Accuracy and precision
- Units of measurement: distance, angles, area, volume

**Field Notes (4 hours)**

- Writing field notes
- Types of notes and organizing field book entries
- Electronic data collection and devices
- File management and field notes reduction

**Distance Measurements (4 hours)**

- Methods of linear measurements
- Taping, pacing odometer, optical rangefinders, tacheometry (stadia), subtense bars, electronic distance measurement (EDM), satellite systems.
- Total station instruments

**Leveling (6 hours)**

- Differential leveling
- Equipment setup
- Observer and rod-person duties
- Notes, calculations, and precision
- Types of leveling: circuit, reciprocal, profile, and three wire leveling
- Errors in leveling

**Angles and Directions (5 hours)**

- Units of angle measurement
- Azimuths and bearings
- Compass and the earth's magnetic field
- Calculating azimuths and bearings

**Traversing (6 hours)**

- Coordinates
- Computations such as zenith, bearing, latitude, departure, and coordinates of a line utilizing field data
- Departures and latitude closure
- Land area calculations
- Determination of rotation angle
- Computation of final distance
- Area for balanced traverse
- Error analysis

**Coordinate Geometry (4 hours)**

- Coordinate forms of equations of lines and circles
- Perpendicular distances
- Intersections of lines and circles

**Property and Boundary Surveys (4 hours)**

- Categories of land surveys
- Metes and bounds descriptions
- Retracement, subdivisions, partitioning land, registration of title
- History
- Sources of error in boundary surveys

**Topographic and Mapping Surveys (4 hours)**

- Basic methods
- Map scales
- Contours and location methods
- Field methods for locating topographic details such as using total station, stadia, grid method

**Volume and Earthwork (4 hours)**

- Average end area formula
- Calculating slope intercepts
- Prismoidal formula
- Contour-area method

**Horizontal and Vertical Curves (2 hours)**

- Degree of circular curve

- Definitions and derivation of circular curve formulas
- Equations of vertical parabolic curve
- High and low point
- Staking a vertical parabolic curve

**Equipment (2 hours)**

- Tapes, levels, transits, theodolites, total stations, GPS
- Computers and manual and computer aided drafting of plans

**Additional Topics (3 hours)**

- Introduction to GPS
- Introduction to photogrammetry theory/viewing
- Aerial photos
- Stadia theory
- Construction applications

**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>):**

No

**What term(s) will this course be offered?**

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