



Course Outline

2026-2027 Catalog

ENGR 4 - Plane Surveying II

Catalog Description

Transfer Status: CSU/UC

Prerequisite: ENGR 3

Unit(s): 3.00

Lecture: 34.00 Contact hours/68.00 Out of class hours/102.00 Total hours/2.00 Unit(s)

Lab: 51.00 Contact hours/0.00 Out of class hours/51.00 Total hours/1.00 Unit(s)

Total: 85.00 Contact hours/68.00 Out of class hours/153.00 Total hours/3.00 Unit(s)

Course Description: This course introduces students to civil engineering design standards, concepts and procedures related to transportation engineering and construction management. Topics include the standards and design of horizontal curves, vertical curves and earthwork related to transportation projects in addition to survey staking, state plane coordinates, geographic information systems and Global Positioning Systems (GPS) related to project surveying. The laboratory portion of the course includes the application of 3-dimensional graphic modeling software requiring creativity in design, development of construction plans, and operation of modern surveying equipment, such as total stations and GPS.

Objectives

Upon successful completion of this course, the student should be able to:

1. Collect and analyze survey point data (raw field data).
2. Design proposed alignments in accordance with Department of Transportation and local municipality standards.
3. Compute earthwork quantities, material takeoffs and cost estimates for projects.
4. Produce sets of design plans and specifications for a variety of civil improvement projects.
5. Understand how to design vertical and horizontal curve alignments for a variety of situations.

Course Content

Topic Titles / Suggested Time Topic

Lecture

<u>Topics</u>	<u>Lec Hrs</u>
Introduction	2.00
Horizontal curves	6.00
Vertical curves	4.00
Earthwork and volumes	4.00
Construction survey and staking	6.00
Municipal street construction	2.00
Pipeline construction	1.00
Pipeline survey and staking	1.00
Culvert and bridge construction	1.00
Site plans for residential	2.00
Building construction surveys	2.00
Building construction.	1.00
Professional Engineers Act	2.00

Total Hours: 34.00

Lab

<u>Topics</u>	<u>Lab Hrs</u>
Review terrain modeling and introduction to project	3.00
Terrain model of existing grade	3.00
Horizontal alignment	3.00
Profile with vertical alignment	3.00
Vertical curves	3.00
Volume calculations	3.00
Radial staking	3.00
Roadway design plan	3.00
Alignment staking	3.00

Topics	Lab Hrs
Slope staking	3.00
Municipal improvement plan: brainstorm and planning.	3.00
Municipal improvement plan: field measurements and data collection	6.00
Municipal improvement plan: data analysis computations	3.00
Municipal improvement plan: drawings	3.00
Residential site improvement plan: brainstorm and plan	3.00
Residential improvement plan: computations and drawings	3.00
Total Hours:	51.00

Methods of Instruction

- A. Collaborative Group Work
- B. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
- C. Instructor Demonstrations
- D. Lecture
- E. Multimedia Presentations
- F. Problem-Solving Sessions

Methods of Evaluation

- A. Exams/Tests
- B. Quizzes
- C. Projects
- D. Homework
- E. Lab Projects
- F. Final Examination

Examples of Assignments

Reading Assignments

1. Read the chapter on volumes and be prepared to discuss methods to calculate earthwork.
2. Read the chapter on horizontal alignment and be prepared to discuss horizontal alignment methods for design and staking.

Writing Assignments

1. Setup your field-book with a 500 ft horizontal curve of radius 1600 feet starting at station 5 + 65.12 and curving to the right.
2. Given a digital terrain on Civil 3D software, design a horizontal curve and the plan for staking it, for a class I bike path according to CalTrans regulations.

Out-of-Class Assignments

1. Create a digital terrain model of existing surface. Be prepared to present your model to the class.
2. Design a sewer storm drain and underground utilities to service residential areas.

Recommended Materials of Instruction

Kavanagh, B. F., Mastin, T. (2014). Surveying: Principles and Applications. *Pearson Education*, 9th. 978-0137009404.

Other Learning Materials

Transportation Planning, Surveying and Graphics Lab manual, 2014. (CSU, Chico)

Minimum Qualifications

Engineering (Masters Required)

Created/Revised by: Bryant, Jennifer

Date: 10/17/2022