

BUTTE COLLEGE

COURSE OUTLINE

I. CATALOG DESCRIPTION

ENGR 4 - Plane Surveying II

3 Unit(s)

Prerequisite(s): ENGR 3

Recommended Prep: NONE

Transfer Status: CSU/UC

34 hours Lecture

51 hours Lab

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.

II. OBJECTIVES

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

- A. Collect and analyze survey point data (raw field data).
- B. Prepare a digital terrain model with Civil 3D software of existing surface and site conditions.
- C. Design proposed alignments in accordance with Department of transportation and local municipality standards.
- D. Use Civil 3D software for computing earthwork quantities, material takeoffs and cost estimates for projects.
- E. Produce sets of design plans and specifications for projects such as Class I bike path, residential cul-de-sac.
- F. Stakeout projects in field, document fieldwork and discuss proposed project alignments specifying vertical and horizontal curves.

III. COURSE CONTENT

A. Unit Titles/Suggested Time Schedule

Lecture		
<u>Topics</u>		<u>Hours</u>
1. Introduction		2.00
2. Horizontal curves		6.00
3. Vertical curves		4.00
4. Earthwork and volumes		4.00
5. Construction survey and staking		6.00
6. Municipal street construction		2.00
7. Pipeline construction		1.00
8. Pipeline survey and staking		1.00
9. Culvert and bridge construction		1.00
10. Site plans for residential		2.00
11. Building construction surveys		2.00

12. Building construction.	1.00
13. Professional Engineers Act	2.00
Total Hours	34.00

Lab

<u>Topics</u>	<u>Hours</u>
1. Review terrain modeling and introduction to project	3.00
2. Terrain model of existing grade	3.00
3. Horizontal alignment	3.00
4. Profile with vertical alignment	3.00
5. Vertical curves	3.00
6. Volume calculations	3.00
7. Radial staking	3.00
8. Roadway design plan	3.00
9. Alignment staking	3.00
10. Slope staking	3.00
11. Municipal improvement plan: brainstorm and planning.	3.00
12. Municipal improvement plan: field measurements and data collection	6.00
13. Municipal improvement plan: data analysis computations	3.00
14. Municipal improvement plan: drawings	3.00
15. Residential site improvement plan: brainstorm and plan	3.00
16. Residential improvement plan: computations and drawings	3.00
Total Hours	51.00

IV. METHODS OF INSTRUCTION

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

V. METHODS OF EVALUATION

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

VI. EXAMPLES OF ASSIGNMENTS

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

C. Out-of-Class Assignments

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

VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

- A. Kavanagh, B. F., Mastin, T. Surveying: Principles and Applications. 9th Edition. Pearson Education, 2014.

Materials Other Than Textbooks:

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

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Date: 02/23/2015