BUTTE COLLEGE
COURSE OUTLINE

I. **CATALOG DESCRIPTION**

ENGR 3 - Plane Surveying I   3 Unit(s)

Prerequisite(s): MATH 20 or high school trigonometry
Recommended Prep: NONE

Transfer Status: CSU/UC
34 hours Lecture
51 hours Lab

The course applies theory and principles of plane surveying: office computations and design; operation of surveying field equipment; and production of engineering plans/maps. Topics include distances, angles, and directions; differential leveling; traversing; property/boundary surveys; topographic surveys/mapping; volume/earthwork; horizontal and vertical curves; land description techniques; and Global Positioning Systems (GPS). Extensive field work using tapes, levels, transits, theodolites, total stations, and GPS. (C-ID ENGR 180).

II. **OBJECTIVES**

Upon successful completion of this course, the student will be able to:
- A. Perform office computations and design for differential leveling; traversing; area calculations; property/boundary surveys; topographic surveys/mapping; volume/earthwork; horizontal and vertical curves; and error analysis.
- B. Operate survey equipment: tape, level, transit, theodolite, compass, total station, GPS.
- C. Reduce field notes using various mathematical techniques to generate meaningful records describing horizontal and vertical control of landforms.
- D. Plot plans and maps from field work data using manual and computer-aided drafting.
- E. Work effectively in groups during field surveying and engineering design project which involve problem solving, report writing, and oral presentations.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

Topics	Hours
1. Field Book, Equipment: Tapes; Levels; Transits; Theodolites; Total Stations, GPS	1.00
2. Distance Measurements, Stadia Theory	2.00
3. Differential Leveling	4.00
4. Angles and Directions; Compass	2.00
5. Traversing: Coordinates, Latitude/Departure, Land Area Calculation	4.00
6. Coordinate Geometry	2.00
7. Error Analysis	2.00
8. Property/Boundary Surveys; Metes and Bounds Descriptions	2.00
9. Topographic Surveys and Mapping	2.00
10. Volume/Earthwork	2.00
11. Horizontal and Vertical Curves	2.00
12. Issues in Professional Practice; Professional Engineer (PE) and Land Surveyor (LS) Licensing	2.00

13. Introduction to GPS	2.00
14. Manual and Computer-Aided Drafting of Plans	2.00
15. Introduction to Photogrammetry Theory/Viewing Aerial Photos	1.00
16. Introduction to Geographic Information System (GIS)	1.00
17. Construction Applications	1.00
Total Hours	34.00

Lab

Topics	Hours
1. Equipment: Tapes; Levels; Transits; Theodolites; Total Stations, GPS	3.00
2. Monument Referencing and Field Book	3.00
3. Distance Measurements	3.00
4. Differential Leveling	3.00
5. Profile Survey	3.00
6. Angles and Directions	3.00
7. Radial Survey	3.00
8. Closed Traverse	3.00
9. Closed Traverse Computation	3.00
10. Site Maps and Property Boundary	3.00
11. Site Maps and Property Boundary: Special Topic	3.00
12. Topographic Survey	3.00
13. Topographic Modeling and Manual Drafting	3.00
14. Topographic Map Project: Planning and Field Measurment	3.00
15. GPS	3.00
16. Civil 3D Computer-Aided Design (CAD) and Horizontal Curves	3.00
17. Error Analysis	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 section of your text on differential leveling and be prepared to discuss the theory of leveling, its benefits and limitations.
   2. Read the section of your text on error analysis and extra study materials provided by the instructor and be prepared to discuss the theory of errors in observations and the error propagation.
B. Writing Assignments
   1. The final entry in your surveying fieldbook will be a complete traverse of the quad, amphitheater, and tennis courts near the Butte College Quad. Be sure to include all bearings and distances, closures, and areas.
   2. Using your surveying fieldbook summarize all measurements taken in the field and calculate all closures in latitude and departure.
C. Out-of-Class Assignments
   1. Calculate northing and easting of assigned surveying points by hand and by use of a spreadsheet and calculate the area of an assigned closed traverse. Perform the appropriate arithmetic checks.
   2. Complete a set of differential leveling field notes and perform all the appropriate arithmetical checks.

VII. **<u>RECOMMENDED MATERIALS OF INSTRUCTION</u>**
   Textbooks:
      A. Kavanagh, B. F., Mastin, T. B. <u>Surveying Principles and Applications</u>. 9th Edition. Pearson Education, 2014.

   Materials Other Than Textbooks:
      A. Surveying Lab Manual, 2014 Edition.

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