

California Polytechnic State University, San Luis Obispo

Construction Management Department

CM 239, Construction Surveying, Fall 2020

Instructor:	Dr. Bryan Knakiewicz
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Office Hours:	Zoom office hours and link: TBA
Class Days/Times:	TBA
Classroom:	Lecture: Virtual via Zoom Lab: In-person, meeting locations TBA
Prerequisite(s):	MATH 119 or equivalent

Course Description

Theory and practice of plane surveying with an emphasis on construction applications. Topics include property use and care of survey equipment and instruments, distance measurement, leveling, angular measurement, construction layout, basic roadwork, and as-built surveys.

3 lectures, 1 laboratory

Course Goals and Learning Outcomes

Course Goals:

As a result of this course, you should be able to:

- Understand surveying methods, procedures and calculations, especially as they pertain to construction.
- Understand different tools and techniques for layout of construction projects.
- Understand the construction layout process.
- Understand the integration of surveying data with software and BIM.
- Operate instruments including total station, theodolite, and laser level.

Course Learning Outcomes (CLOs):

1. Review of basic surveying principles and surveying equipment
2. Understand construction surveying and layout processes and principles.
3. Learn how, GPS, BIM, and laser surveying can be integrated
4. Apply construction layout process. This would include establishment of benchmarks, foundation layouts, embed locations, road stations, etc.

Student and Program Learning Outcomes (PLOs)

The American Council for Construction Education (ACCE) is the accrediting body for Cal Poly's construction management program. The ACCE requires achievement of 20 student learning outcomes (SLOs). The construction management program has identified 20 program learning outcomes (PLOs) that equal or exceed the ACCE SLOs and 5 additional idiosyncratic PLOs.

This course supports the following PLOs:

PLO 8: Analyze methods, materials, and equipment

PLO 11: Apply basic surveying techniques for construction layout and control.

A Method of Assessment gauges student achievement of each CLO. The Methods of Assessment for this course are:

1. Individual Homework/Exercise Assignments
2. Group Laboratory Exercises
3. In-Class Exams, consisting of multiple choice, shorts answer, and/or work problems.

An overview of content, course learning outcomes, program learning outcomes, instructional activities, and assessment measures, is listed in the table below.

Section	Topical Outline	CLOs	PLOs	Instructional Activities	Method of Assessment
Module I	Introduction to Surveying and Distance Measurement	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module II	Angles, Traverses, and Differential Leveling Intro	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module III	Differential Leveling and Closed Traverses	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module IV	Topographic Surveying	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module V	Photogrammetry, Midterm and Guest Presentation	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module VI	Building Pad Layout and Staking	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module VII	Horizontal and Vertical Curves	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module VIII	RTK, Road Design, and Volume Computations	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module IX	Final Surveys and Estimating	1 – 4	8, 11	Lecture Individual Assignment Group Laboratory Exercise	1, 2, 3
Module X	Course Wrap Up / Final(s) Take-Home Final Exam In-Class Final Exam	1 – 4	8, 11	Group Lab Exercise (optional) Exam	2, 3

Class Schedule

Week	Topic	Individual Assignment	Group Lab Assignment
1	Introduction to Surveying and Distance Measurement	TBA	Distance measuring- pacing, steel tape, fiberglass tape
2	Angles, Traverses, and Differential Leveling Intro	TBA	Differential Leveling- determine elevations of points, using electronic theodolite
3	Differential Leveling and Closed Traverses	TBA	Differential Leveling for Closed Traverse- field verify of control points using an electronic theodolite
4	Topographic Surveying,	TBA	Topo exercise- grid elevations, coordinates of control points, using total station with integration into AutoCAD Civil 3D
5	Photogrammetry, Midterm and Guest Presentation	TBA	Virtual lab- drone technology and surveying methods presentation from Hensel Phelps, with take-home lab activity (TBD)
6	Building Pad Layout and Staking	TBA	Construction site staking activity- building location layout, staking curb offsets, footings or batterboards, use of Berger Self-Leveling Horizontal Rotary Laser, theodolite or total station (see KSA lab manual)
7	Horizontal and Vertical Curves	TBA	Highway curves- horizontal curve (road intersection tangent/curve), using total station
8	RTK and Road Design Volume Computations	TBA	Road Design using Civil 3D, Stockpile Sites Activity- cross-section method and DTM method (see Oregon.gov document, p. 13)
9	Final Surveys, Site Management and Estimating	TBA	Site Drainage and Estimating Activity
10	Course Wrap Up / Final(s) Take-Home Final Exam In-Class Final Exam		GPS/GIS field procedures- locating roadway signage and station section elevations/profile (optional)
<i>*This schedule is subject to change, by instructor only.</i>			

Required Texts/Reading

Textbook

Required:

1. Surveying with Construction Applications, 8/e
Slattery, Diane K.; Kavanagh, Barry
ISBN 10: 0-13-276698-1
ISBN 13: 978-0-13-276698-2
2. Construction Surveying and Layout: A Step-By-Step Field Engineering Methods Manual (3rd Edition)
Crawford, Wesley G.
ISBN 10: 096474211X
ISBN 13: 9780964742116
3. Additional material will be posted on Canvas.

Other Equipment/Material Requirements

- Laptop computer (PC or Mac with Bootcamp) with 2 button mouse (w/ wheel)
- Calculator
- Flash drive
- Waterproof surveying field book (one per group)
 - Example: https://www.engineersupply.com/sokkia-field-book-815260.aspx?VariantId=ES1251&gclid=EAlalQobChMI79H5wP3_6glVJRh9Ch0_-wtQEAQYBSABEgJaW_D_BwE
- PC software: Autodesk AutoCAD Civil 3D

Classroom Protocol

As a student, you are responsible for the following:

- A protective mask is always required to be worn during Friday lab sessions and group meetings.
- Always have a change of shoes and proper apparel for Friday lab sessions, in case of inclement weather or mud in the fields.
- Since the Friday labs will be held outside, be aware that if you have outdoor allergies- plan ahead.
- Group work is to be done in your own groups, without sharing data with other groups; procedural assistance from other groups is permitted.
- Attend virtual lectures at the designated times; therefore, a reliable Wi-Fi network is required.
- Always bring your laptop to lab sessions.
- Back-up all electronic work.
- Include all members of your group in every lab exercise.

Assignments and Exams

The following assignments and their associated point values are subject to change by the instructor as needed.

Description	Percent
Individual assignments	30%
Group lab assignments (<i>subject to deductions due to lack of participation</i>)	30%
Midterm	20%
Final Exam	20%
TOTAL	100%

Late/Missed Work and Make-Up Policy

- **Individual assignments:** 30% deduction if submitted late, with a maximum of one week beyond deadline. After one week, late individual assignments will not be accepted or graded, unless permission is granted by instructor.
- **Group assignments:** Late work will not be accepted, unless permission is granted by instructor.
- **Exams:** Late work will not be accepted, unless permission is granted by instructor.

Grading Policy

Listed below is the grading scale for this course.

Letter Grade	Percentage	Performance	Definition
A	93 – 100%	Excellent Work	Superior Attainment of Course Learning Outcomes
A-	90 – 92%	Mostly Excellent Work	
B+	87 – 89%	Very Good Work	Good Attainment of Course Learning Outcomes
B	83 – 86%	Good Work	
B-	80 – 82%	Mostly Good Work	
C+	77 – 79%	Very Acceptable Work	Acceptable Attainment of Course Learning Outcomes
C	73 – 76%	Acceptable Work	
C-	70 – 72%	Mostly Acceptable Work	
D+	67 – 69%	Mostly Poor Work	Poor Attainment of Course Learning Outcomes
D	63 – 66%	Poor Work	
D-	60 – 62%	Very Poor Work	
F	0 – 59%	Failing Work	Non-Attainment of Course

University Policies

Participation and Attendance

1. Attendance: Students are **required to attend the virtual class sessions and Friday lab sessions**, unless permission from the instructor.
2. All laboratory group members are required to participate in the **field work and data analysis**.
 - Anonymous surveys of member participation will be distributed at the end of the course.

Add/Drop Policy

Students are responsible for knowing the University policies, procedures, and schedule for dropping or adding classes. See this link on [Add/Drop Policy](#) provided on the university website.

Academic Integrity

Students are responsible for knowing the [Academic Honesty Policy](#).

Students with Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resource Center, Building 124, Room 119, at (805) 756-1395, as early as possible in the term, as accommodations may take several weeks to arrange. If you are a student with a disability, please consider discussing your needs and possible accommodations with me as soon as possible, and visit the [DRC Website](#) for additional information.

SensusAccess

SensusAccess is a self-service, alternate media solution made available by Kennedy Library to automatically convert files into a range of alternate media including audio books (MP3 and DAISY), e-books (EPUB, EPUB3 and Mobi) and digital Braille. The service can also be used to convert inaccessible files such as image-only PDF files, JPG pictures and Microsoft PowerPoint presentations into more accessible and less tricky formats. This service is available at no charge for all Cal Poly students, faculty, staff and alumni. For additional information, visit [SensusAccess at the Kennedy Library](#).

Diversity and Inclusion

Cal Poly considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Cal Poly expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events. For more information on resources related to diversity and inclusion, please visit the Office of University Diversity & Inclusivity website at diversity.calpoly.edu.

Technical Support and Contact Information

Support is available for troubleshooting and access issues for PolyLearn. Please visit the [PolyLearn Student Support Web Site](#) for further information.

Campus Resources to Support Student Learning

Cal Poly offers programs and resources that are available to assist students during your academic studies, such as the [Cal Poly Student Academic Services Web Site](#).