

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

ENGINEERING 218 – PLANE SURVEYING

2 hours lecture, 6 hours laboratory, 4 units

Catalog Description

Use, care and adjustment of surveying instruments. Fundamental surveying methods, traverse measurements, and area computations. Introduction to horizontal and vertical curves, stadia, and construction layout. Introduction to topographic mapping. Earth work computations. *Also listed as SURV 218. Not open to students with credit in SURV 218.*

Prerequisite

“C” grade or higher or “Pass” in MATH 170 or MATH 176, or equivalent or concurrent enrollment

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Understand concepts related to trigonometric functions of any angle.
- 2) Solve applications involving right and oblique triangles.
- 3) Use the Law of Sines and the Law of Cosines to solve any triangle.

Course Content

- 1) Small scale regional mapping using pocket transit and triangulation.
- 2) Large scale detailed mapping using a theodolite and pace; determining average pace on various slopes.
- 3) Chaining: standardize a tape, correct for sag, tension, temperature, chaining on level and uneven ground. Tape surveys
- 4) Level work: adjustment, establishing elevation, differential and profile leveling, grade computation.
- 5) Plane table work: stadia computation, triangulation, topographic mapping.
- 6) Transit work: adjustment land surveys, route surveys; area by triangles, planimeter and double meridian distances; open and closed traverses; multiple angle measurement for long distance triangulation; map construction; cut and fill analysis, volume; determination of latitude and azimuth from solar observations.

Course Objectives

Students will be able to:

- 1) Apply the field techniques of plane surveying such as chaining, leveling, traverse, and topographic work.
- 2) Successfully solve a sequence of similar problems, first using older transits and pace methods, later refining results with theodolite instruments, and finally with standard tools of surveying.
- 3) Demonstrate the advantages, disadvantages, uses and adjustments of each piece of equipment used.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Field projects will be graded on the basis of neatness and accuracy. These results will provide a basis for judging the field skills of each student.

Special Materials Required of Student

- 1) Hand-held scientific calculator
- 2) Engineer's scale, protractor

Minimum Instructional Facilities

- 1) Classroom with writing board

Method of Instruction

Emphasis will be on the use of equipment and proficiency of the user. The lecture portion will deal with the science of surveying and topics related to the current laboratory problems. The laboratory will deal with the art of surveying, the development of good techniques, and the practice of taking clear and concise notes from field data. The following items are required as part of instructional tools:

- 1) Triangles, scales
- 2) Six construction levels with rods
- 3) Three transit outfits
- 4) Six stadia rods
- 5) Six Philadelphia Rods
- 6) 12 plumb bobs
- 7) Six 100-foot steel tapes
- 8) One planimeter
- 9) 18 looseleaf field books with pages
- 10) One hand level
- 11) 12 range poles
- 12) Ten metal stakes 18" long (3/4" pipe)
- 13) One 20-pound spring scale

Out of Class Assignments

- 1) Reading assignments
- 2) Projects

Texts and References

- 1) Required (representative example): Kavanagh and Mastin, *Surveying: Principles and Applications*. 9th edition. Prentice Hall, 2013.
- 2) Supplemental: None

Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

- 1) Demonstrate the proper care and use of surveying instruments.
- 2) Calculate the area of a closed figure using the double meridian and least squares method.
- 3) Demonstrate knowledge of the North American Datum (N.A.D. '83) co-ordinate system.
- 4) Understand the methods of differential and profile leveling.

Student Learning Outcomes

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

- 1) Demonstrate the field techniques of plane surveying such as chaining, leveling, traverse, and topographic work.
- 2) Solve a sequence of similar problems, using older transits and pace methods, refining results with theodolite instruments, and applying standard tools of surveying.
- 3) Demonstrate the advantages, disadvantages, uses and adjustments of standard surveying equipment.