

**Cv Eng 001 Fundamentals of Surveying**

Professor: Richard L. Elgin, PhD, PS, PE  
Office: Room 133, CE Building  
Office Hours: TBA

Prerequisites: Preceded or accompanied by Math 8

Text: "Surveying Principles and Applications"  
6th Edition  
Kavanagh & Bird

Format: 3 credit hour course: 2 lecture 1 lab per week.

**CATALOG DESCRIPTION**

Surveying fundamentals: Leveling, directions, angles, distances, errors, traverse calculations and basic adjustments. Fundamentals of horizontal curves. Lab exercises include leveling, traversing, horizontal circular curve layout, and building layout.

**COURSE OBJECTIVES**

This is a fundamentals course in surveying, covering the traditional measurement subjects of differential and trigonometric leveling and distance and angle measurement. The directions of lines then traverse calculations, to include traverse adjustments are discussed. Area calculations, coordinates, the basis for directions are also included. The fundamentals of horizontal curves are covered: curve part nomenclatures, curve equations, and curve layout. Differential leveling, angle and distance measuring, surveyed traverses and laying out horizontal circular curves and buildings are explained then practiced in laboratory exercises. Through the lecture portion of this course, the application of surveying to the broad fields of civil and architectural engineering practice is explained and illustrated.

**GOALS**

Upon successful completion of this course, the student will:

- 1.) Have more advanced plane trigonometry skills.
- 2.) Be familiar with the units of measurements and their conversion.
- 3.) Be able to define and distinguish the difference between a mistake, a systematic error and a random error.
- 4.) Be able to define and distinguish the difference between accuracy and precision.
- 5.) Be able to define, use and make calculations involving stationing.
- 6.) Be able to define and make calculations of grade, gradient, slope, etc. in the various applicable units.
- 7.) Be able to define and use the terminology of leveling.
- 8.) Know the effect of curvature and refraction on leveling.
- 9.) Be familiar with procedures and noteforms for measuring profiles.
- 10.) Know the sources of errors in leveling.

- 11.) Know the fundamentals of construction surveying terminology and building layout.
- 12.) Know the positive attributes of a reference meridian.
- 13.) Define and recognize the different possible meridians, their advantages and disadvantages.
- 14.) Define and be able to make calculations for directions using azimuths and bearings.
- 15.) Be able to define and make calculations involving variation.
- 16.) Be able to make calculations related to horizontal closed traverses.
- 17.) Be able to compute traverse closure and the precision ratio using raw field data for a traverse that closes on itself.
- 18.) Know the nomenclature for horizontal circular curves.
- 19.) Know the equations to compute the various parts of a horizontal circular curve.
- 20.) Know how to apply stationing to a horizontal circular curve.
- 21.) Be able to accomplish coordinate-based calculations on horizontal circular curves.
- 22.) Know the calculation procedures for construction staking a horizontal circular curve.
- 23.) Be able to measure the difference in elevation between points using differential leveling techniques and an automatic level and be able to keep field notes employing the standard noteform.
- 24.) Be able to accurately measure the horizontal distance between points using a steel tape and plumb bobs.
- 25.) Be able to accurately measure the horizontal distance and difference in elevation between points using an electronic digital total station.
- 26.) Be able to accurately measure the horizontal or vertical angle between any two points using an electronic digital total station.
- 27.) Be very comfortable using an automatic level, a steel tape and an electronic digital total station.
- 28.) Be familiar with the various ways of keeping surveying notes for leveling, angle and distance measurements, traverses and laying out horizontal circular curves.

# Outline of Lab Exercises

Prior to the lab, pre-read the lab's handout and also, from the textbook, pre-read the paragraphs noted below.

<u>Lab Number</u>	<u>Title</u>	<u>Pre-read These Paragraphs in Book</u>
1	Peg Test	3.11, 3.15, 3.16 & 3.17
2	Introductory Level Loop - Schuman Park	Same as above.
3	Closed Level Loop - Around the Library	Same as above.
4	Transfer an Elevation - Stonehenge to Tau Beta Pi Bent	Same as above.
5	Taping - Around a Quadrilateral	2.5, 2.6.1, 2.6.2 & 2.7
6	Profile Your Quadrilateral Perimeter	3.9
7	Angle Measuring	5.3
8	Closed Traverse, Angles	6.4
9	Distance Measuring - EDM	None
10	Traverse That Closes on Itself	6.4, 6.5 & 6.6
11	Topographic/Site Survey	8.5 & 8.6
12	Horizontal Circular Curve Layout	13.4 & 13.5
13	Horizontal Circular Curve Layout No. 2	Same as above.