



## COURSE OUTLINE SPRING 2009

CIV102  
Course Number

Surveying II  
Course Title

3  
Credits

2/3  
Lecture/Laboratory Hours

### COURSE DESCRIPTION

Application of the fundamentals and techniques achieved in elementary surveying to solve additional problems in vertical curves, horizontal curves, traversing computations and profiles. Computations include bearings and azimuths, latitudes and departures, areas and use of the planimeter. Applies AutoCAD and land development software, plus "Total Station" survey equipment for traversing, radial stakeout, and layout of horizontal curves.

Text (s):      **Reference Division Booklist**

Prerequisites: **CIV101 or permission of instructor**

Co-requisites:

**Course Coordinator: John Santosuosso**

**Latest Review: 2009**

## **I. METHOD OF PRESENTATION**

A lecture/discussion approach is used. Transparencies taken from the course test are used, as well as printed handouts made by the instructor. Class participation is emphasized by asking the students questions on their reading assignments, homework problems, or actual field experiences. Transparencies will also be used to review test problems.

SOFTDESK software will also be introduced. This software runs inside of AutoCAD and the student must have had or be taking DRA190. This software will be used to solve many of the problems that we will be solving by conventional methods in Units I, II, and III.

In addition, each student must purchase:

- A. 2-3 1/2" high-density floppy disks.

**NOTE:** The order of the units could be changed depending on whether the course is taught in the spring or fall semester (weather conditions).

## **II. GENERAL OBJECTIVES**

1. To develop further within the student the confidence and skill of a surveyor by using the techniques and fundamentals achieved in elementary surveying.
2. To use mathematics and drawings techniques to solve various types of highway and route surveying problems.
3. To enable the student to make the necessary office calculations using the calculator and digital computer to solve for areas, simple, compound and vertical curves; intersections, and traverse computations.
4. To understand the digital computer and its relative importance to surveying and other geometric engineering problems. SOFTDESK software with AutoCAD will be used.
5. To understand the responsibilities and problems of the surveying team when laying out horizontal curves.

## **III. SPECIFIC OBJECTIVES**

### **UNIT I (A) (2 1/2 weeks) TRAVERSE COMPUTATIONS**

The student will be able to:

1. Balance or adjust angles, computer bearings and azimuths for open and closed traverses.
2. Define and compute latitudes and departures for open and closed traverses.
3. Adjust a closed traverse by the compass rule and compute the perimeter, closure in latitudes, closure in departures, error of closure (closure), ratio of error, corrections in latitudes, and corrections in departures.
4. Define the "ratio of errors" for property surveys ranging from wasteland (1/500) to a metropolitan area (1/10,000).
5. Describe the coordinate system in traverses and will compute coordinates as well as the lengths and bearings of a traverse from latitudes and departures or coordinates.
6. List other methods of adjusting a closure traverse and also of the electronic computer and calculator programs that aid the surveyor in the solution of traversing problems.

### **UNIT I (B) (1 1/2 weeks) AREAS**

1. The student will be able to compute areas analytically and graphically.
  - a. Analytically by using four methods:
    1. Area by division into triangles
    2. Offsets from straight lines
    3. DMD (double meridian method)
    4. Coordinates
  - b. Graphically by: 1) computing areas with a planimeter and be aware of two other methods--stripping method and coordinate squares; and 2) computing areas using the digital computer.

### **UNIT II (3 weeks) VERTICAL CURVES**

The student will be able to:

1. Analyze vertical (parabolic) curves for equal and unequal tangent vertical curves using the tangent-offset method.
2. Use the equation of a parabola ( $y = ax^2 + bx + c$ ) to solve for vertical curves and alignment. In this equation, he will compute or obtain from given information:
  - a. y (elevation)
  - b. x (station)
  - c. a (sharpness of curve)
  - d. b (gradient)
  - e. l (length of curve)
  - f. e (external distance)
3. Compute the elevation and station of the high or low points of a vertical curve (if any).
4. If time permits, the student will also compute the data for a vertical curve which is to pass through a fixed point.
5. The student will also use the computer to check his work.

### **UNIT III (3 1/2 weeks) HORIZONTAL (CIRCULAR) CURVES**

1. Using the "arc definition," and given certain parameters for a simple horizontal curve, the student will be able to compute:
  - a. Tangent
  - b. Radius
  - c. External
  - d. Long Chord
  - e. Mid-Ordinate
  - f. Length of Curve
  - g. Degree of Curve
  - h. Chord Length
  - i. Arc Length
  - j. Deflection Angles
  - k. Stations

(cont'd)

2. The student will be able to lay out a simple and/or compound curve in the field by the deflection angle method. The student will know how to move the transit up on the curve, either deliberately or because of minor obstacles, and continue laying out the curve. He will be able to list other methods (chord offsets, middle ordinate, tangent offsets, ordinates from long chord) of laying out a curve.
3. Compound curves for horizontal alignment will be analyzed. For a rigid solution of compound curve, the student will know that at least four of the seven basic parts of the compound curve, including at least one angle and at least two lengths, are needed. He will then solve for the remaining parts by use of:
  - a. The Vertex Triangle Method
  - b. Basic Formulas listed in the recommended Solution Table handout.

#### **UNIT IV (4 1/2 weeks) FIELD PROCEDURES & I.B.M. APPLICATIONS**

The students will use the latest digital and total station theodolites along with E.D.M. to obtain traverse and radial stake out data. They will reduce this data using SOFTDESK and AutoCAD software. Three SOFTDESK software manuals will be used to assist in these solutions. Additional problems will be solved using the digital computer, including:

1. Areas
2. Adjust traverses
3. Simple curves
4. Compound curves
5. Vertical curves
6. Intersections
7. Coordinates
8. Bearings
9. Azimuths
10. Traversing

#### **IV. COMPUTATION OF FINAL GRADE**

- Quizzes, Homework, and Lab Assignments 20%
- 3 Exams 60%
- FINAL EXAM 20%

##### **Quizzes, Homework, Lab Assignments (20%)**

A quiz of approximately five minutes in length could be given every week. These quizzes will include the material covered in the homework and reading assignments. Homework assignments could be collected periodically and graded instead of giving a weekly quiz. There are no make-up quizzes.

All lab assignments must be completed (on time) for full credit. If a lab assignment is not handed in by the last day of classes, the student will receive a zero in lab until all work is handed in.

You have two weeks after grades have been posted to see the instructor concerning asterisk grades.

### **Exams (60%)**

Three exams will be given at the end of Units I, II and III. There are no make-up exams. If you miss one exam, the final exam grade will replace the exam you missed.

### **Final Exam (20%)**

It will include all the material covered throughout the semester and will be approximately 2-3 hours in length. If the final exam is higher than the lowest of the three exams it will also replace that lowest grade (of the three) when computing your final grade. The final exam will be completely done on the computer using AutoCAD and SOFTDESK software (unless notified otherwise).

## **V. REFERENCES**

1. Elementary Surveying, Brinker -- Harper-Collins
2. Surveying, Foote and Davis -- McGraw Hill
3. Surveying, Kissam -- McGraw Hill
4. Fundamentals of Surveying, Rayner and Schmidt -- Van Nostrand
5. Surveying, Bouchard and Moffitt -- International Textbook

### **Academic Integrity Statement:**

Students are expected to comply with the college-wide requirements for academic integrity. Mercer County Community College is committed to Academic Integrity—the honest, fair, and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work. Presenting another individual's work as one's own and receiving excessive help from another individual will qualify as a violation of Academic Integrity. The entire policy on Academic Integrity is located in the Student handbook and is found on the college website ([http://www.mccc.edu/admissions\\_policies\\_integrity.shtml](http://www.mccc.edu/admissions_policies_integrity.shtml)).

### **Special Needs**

Any student in this class who has special needs because of a disability is entitled to receive accommodations. Eligible students at Mercer County Community College are assured services under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973. If you believe you are eligible for services, please contact Arlene Stinson, the Director of Academic Support Services. Ms. Stinson's office is LB221, and she can be reached at (609) 570-3525.