Engineering Faculty Document No. 47-02
February 25, 2003

TO: The Faculty of the Schools of Engineering
FROM: The Faculty of the School of Civil Engineering
DATE: February 25, 2003
SUBJECT: New Undergraduate-Level Course

The Faculty of the School of Civil Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

CE 203 Principles and Practice of Geomatics

Sem. 1 and 2. Class 3, lab. 3, cr. 4.

Prerequisite: MA 165 and CGT164

Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in civil engineering.

Reason: The first course in surveying is a required core course in the civil engineering curriculum. The existing three-credit hour course (CE 200) will be replaced by this four-credit hour course that includes expanded applications of computer tools for civil engineering students.

Fred L. Mannering, Head
School of Civil Engineering

Supporting Documentation

1. Justification: The existing three-credit hour course, CE 200 Fundamentals of Surveying, currently includes applications of spreadsheets, Autocad graphics, and coordinate geometry (COGO) computation software. CE 200 will be replaced by a four-credit hour course that will incorporate additional computer applications for Mathcad, Matlab, and Arc View packages. The depth of coverage in geomatics topics that are prerequisites for further civil engineering course work will also benefit from the additional credit hour and computer applications.

2. Level: Undergraduate level

3. Prerequisites: MA 165 and CGT 164

4. Instructor: Steven D. Johnson

5. Course Objectives: At the conclusion of this course students should be able to:
   - Perform simple statistical analysis of measurement data.
   - Perform simple random error propagation for plane survey processes such as coordinate computation, trigonometric leveling, elevation closures, and angular closures.
   - Perform differential leveling using an engineer's level and record field notes.
   - Perform plane survey computations using field observations for differential leveling to determine adjusted elevations.
   - Perform observations for slope and horizontal distance using a tape and electronic distance measurement (EDM) and record field observations.
   - Perform observations for vertical and horizontal direction angles using a total station and record field notes.
   - Perform plane survey computations using field observations from a total station to determine adjusted traverse station coordinates.
   - Compute the area of closed polygon traverse.
   - Plot and interpret a plan and profile sheet representing project centerline survey.
   - Plot a map of planimetric and elevation features using field observations and typical COGO survey software and computer graphics software.
   - Interpret topographic maps to identify land forms, calculate ground slope, plot centerline profiles, and identify drainage patterns.
   - Compute a horizontal curve and stationing values.
   - Compute an equal tangent vertical curve and stationing values.
   - Identify aliquot parts of sections and write a description of the parcel in the Public Land Survey System.
   - Recognize important reference frames used in surveying and engineering, including geodetic datums, geodetic coordinates, and state plane coordinates,

6. Course outline:

Lectures	*Lecture topics*
4	Measurements and error theory, principle of error propagation Spreadsheet, Mathcad, Matlab applications
4	Datums and reference coordinate systems Geodetic computation tools
4	Observation of angles and direction computations
4	Observation of distances: taping, electronic distance measurement in terrestrial instruments and the global positioning system (GPS) Mathcad, Matlab applications
4	Observation of elevation
8	Traverse computations, adjustment, coordinates, line inverses, area COGO, Autocad, Mathcad, Matlab applications
4	Topographic maps: plotting, coordinates, contour interpolation and interpretation COGO and Autocad applications
3	Land surveying: US Public Land System, metes and bounds, subdivision
8	Route surveys: plan and profile sheets, grade lines, horizontal curves, vertical curves. Spreadsheet, Mathcad, Matlab applications
2	Introduction to Geographic information systems Arc View exercises

Lab Sessions	*Laboratory exercises*
1	Statistical analysis of measurements
5	Field observations: angle, distance, leveling, GPS position
3	Computation: Traverses, inaccessible point, benchmark elevation
1	Map compilation
1	Topographic map interpretation
1	Plan and profile sheet compilation
2	Horizontal and vertical curve computation
1	Geographic information system (GIS) analysis

7. Text: Surveying: Theory and Practice, 7th edition, Anderson and Mikhail, McGraw-Hill, 1998.