Engineering Faculty Document No. 48-02
October 1, 2003

MEMORANDUM

TO: The Faculty of the Schools of Engineering
FROM: The Faculty of the School of Civil Engineering
DATE: October 1, 2003
RE: CE 303: Change in course title and course description

The Faculty of the School of Civil Engineering has approved the following changes to CE 303. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From:

CE 303 Route and Construction Surveying

Sem. 2. Class 2, lab. 3, cr. 3.

Prerequisite: CE 200 or equivalent.

Horizontal alignment, simple horizontal curves, spiral easement curves, vertical alignment, vertical parabolic curves, earthwork volumes, and location surveys; construction layout surveys for buildings, bridges, pipelines, mines, offshore dredging; optical tooling alignment; and industrial surveying.

To:

CE 303 Engineering Surveying

Sem. 2. Class 2, lab. 3, cr. 3.

Prerequisite: CE 203 or equivalent.

Horizontal and vertical control surveys on site and route projects for engineering design and construction layout. Geometric design of horizontal circular curves, spiral easement curves, and vertical parabolic curves. Earthwork volume computation and balancing. Use of coordinate geometry (COGO) design software including terrain and design surface modeling. Methods and tools used for construction layout, as-built surveys, and industrial measurements.

Reason: The course title and description are changed to reflect the current course content and to better define the function of the course as an elective in the Civil Engineering and Construction Engineering and Management curriculums. The course is required in the Land Surveying Engineering curriculum. The course prerequisite is updated to the new introductory course in surveying.

Fred L. Mannering, Head
School of Civil Engineering

Supporting Documentation

1. Justification: The revised course title and catalog description convey the breadth of topics covered in this course. This course emphasizes analytic geometry computations used to solve design problems encountered in surveying and engineering. Hand calculations and coordinate geometry (COGO) software solutions are both used to solve a wide variety of problems in route alignment and subdivision lot layout. At the end of the course, students should be able to use COGO software to compute engineering designs. Fundamental horizontal and vertical curve design is covered with an emphasis on satisfying geometric constraints and sight distance requirements. Students use topographic maps, profiles, and cross sections to make grading plans and compute earthwork quantities. Applications of global positioning system (GPS) and laser scanning in site and construction surveys are discussed.

2. Level: Undergraduate level

3. Prerequisites: CE 203 or equivalent. CE 203 is a new introductory course that will replace CE 200 in the Land Surveying Engineering, Civil Engineering, and Construction Engineering and Management curricula.

4. Instructor: Steven D. Johnson

5. Course Objectives: At the conclusion of this course students should be able to
   - Use COGO software to solve problems used in route and subdivision design computations.
   - Compute all geometric and stakeout information for horizontal and vertical curves.
   - Design horizontal and vertical curves to satisfy geometric constraints and sight distance constraints.
   - Use triangulated irregular network (TIN) modeling software to make surface models for contour mapping and extraction of profiles and cross sections.
   - Interpolate and interpret terrain contours.
   - Draw graded contours and compute slope intercept for route projects and site development.
   - Compute earthwork quantities by borrow pit, graded contours, and cross section methods.
   - Use data collectors with total stations to capture field survey data and to layout construction surveys.
   - Stake out horizontal curves, building lines, grade lines, and slope stakes.

5. Course outline:

Lectures	*Lecture topics*
2	Traverse computation, analytic geometry solutions using COGO, intersection problems, resection
2	Alignment and curve design
5	Horizontal circular curve geometry and layout methods
5	Vertical parabolic curve geometry and layout methods
2	Superelevation, spiral curves used with horizontal circular curves
2	Sight distance on horizontal circular and vertical parabolic curves
2	Volume computations and mass diagrams
2	Grading plans
4	Control surveys for mapping and project layout, GPS applications in construction.
2	Industrial metrology, laser scanners.

Lab Sessions	*Laboratory exercises*
1	Traverse computations with COGO
1	Intersection problems, horizontal resection
2	Horizontal circular curve geometry and design
1	Stake out horizontal curve
2	Vertical parabolic curve geometry and design
1	Sight distance on horizontal circular and vertical parabolic curves
1	Superelevation, spiral curves used with horizontal circular curves
1	Data collectors and construction surveys
1	Cross section leveling
1	Slope staking
2	Terrain surface modeling using triangulated irregular networks (TIN)
1	Volume computations and mass diagrams

6. Text: Surveying: Theory and Practice, 7th edition, Anderson and Mikhail, McGraw-Hill, 1998.
   or
   Kavanagh, Barry F., "Surveying with Construction Applications", 4th edition, Prentice-Hall, 1997.