

Tennessee Technological University
Department of Civil & Environmental Engineering
CEE 4640 (5640) – Highway Engineering
Elective
Spring Semester 2008

- Catalog Data: CEE 4640 / 5640 – Highway Engineering. Lecture 3. Credit 3. Theory and practice of highway geometric design; highway plans; construction practices; computer applications to highway design. Prerequisite: CEE 3610
- Textbook: *A Policy on Geometric Design of Highways and Streets, 2004 Edition*, The American Association of State Highway and Transportation Officials, Washington, DC, 2004.
- Reference: *Roadside Design Guide, 2002 Edition*, The American Association of State Highway and Transportation Officials, Washington, DC, 2002.
- Coordinator: S. Click, Assistant Professor of Civil Engineering
- Goal: The goal of CEE 4640 / 5640 – Highway Engineering is to introduce students to the theory and practice of roadway design.

Course learning objectives:

1. Students should be familiar with the “Green Book” and able to use it as a reference for determining appropriate controls for the design of streets and highways.
2. Students should understand sight distance, including methods for determining the sight distance needed for stopping, passing, and avoiding an obstacle.
3. Students should understand the process for designing vertical curves, and be able to determine the layout of a vertical curve by calculating the location of critical points like the PVC, PVI, PVT, stations within the curve, and the high/low point on the curve.
4. Students should understand the process for designing horizontal curves, and be able to determine the layout of a horizontal curve by calculating the location of critical points like the PC, PI, PT, and stations within the curve.
5. Students should understand the process for designing roadway cross-sections, including both roadway and roadside elements.
6. Students should understand the process for intersection design, and be able to determine the layout of intersection elements like curb lines, stopbar locations, and required widths.
7. Students should be familiar with different types of interchanges, and understand the process for selection of an interchange type given expected conditions.
8. Students should be familiar with other design issues, such as determination of cut and fill, evaluation of drainage needs, and the design of parking facilities.

Course Measurable outcomes:

Students should be able to:

1. use the “Green Book” to determine appropriate design standards for highways;
2. calculate key parameters associated with the design of horizontal and vertical curves;
3. prepare basic CADD drawings and station reference documents for vertical and horizontal curves;
4. prepare basic CADD drawing for roadway cross sections and intersection edge-of-pavement designs;
5. choose appropriate interchange types for given conditions; and
6. identify key design issues related to cut and fill, drainage, and parking.

Topics covered: (Two lecture classes per week, 80 minutes each)

1. Introductory Topics – Introduction, Factors Influencing Design, Sight Distance (3 classes)
2. Roadway Design – Vertical Curves, Horizontal Curves, Cross Sections (8 classes)
3. Design of Intersections and Interchanges: (4 classes)
4. Other Design Issues – Parking Lots, Drainage, Earthworks (3 classes)
5. Special Topics – Professional Registration, Continuing Education, Invited Speakers (3 classes)

6. Group Design Projects and Presentations (5 classes)
7. Exams (2 classes)

Contribution of the course to meeting professional component:

One and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study

ABET Category Content as estimated by faculty member who prepared this course description:

Engineering Design: 2.0 credits or 67%
 Engineering Science: 1.0 credits or 33%

Relation of course to program outcomes:

- Outcome 2: The graduates will have a general comprehension of four technical areas appropriate to civil engineering.
- Outcome 3: The graduates will be prepared to begin the professional registration.
- Outcome 4: The graduates will be capable of design activities and have the ability to identify, formulate, and solve engineering problems.
- Outcome 5: The graduates will have effective communication skills.
- Outcome 6: The graduates will be capable of functioning on multi-disciplinary teams.
- Outcome 8: The graduates will have the ability to use techniques, skills, and modern engineering tools needed for engineering practice.
- Outcome 10: The graduates will have an understanding of the need to continue their education through life-long learning.

Relation of course to ABET Criteria:

General Criteria

Bloom's Level of Achievement

(3a) Knowledge of math, science, engineering	3
(3c) Design a system, component, or process	4
(3d) Multi-disciplinary teams	3
(3e) Identify, formulate, and solve engineering problems	3
(3g) Effective communication	3
(3i) Need for life-long learning	2
(3k) Techniques, skills, modern tools for engineering practice	3

Program Criteria

Bloom's Level of Achievement

1. Apply knowledge of four technical areas appropriate to civil engineering	3
2. Design a system, component, or process in more than one civil engineering Context	4
3. Explain the importance of professional licensure	2

Computer usage:

1. Course Management Software: Students are required to interact with web-based course management software.
2. Microstation: Microstation is a computer aided design software package which is used extensively in the transportation design process. Students are introduced to Microstation through one lecture and use it throughout the semester on their five design projects.

Laboratory projects: None

Prepared by: S. Click

Date: January 2008