

Tennessee Technological University  
Department of Civil & Environmental Engineering  
CEE 4380 (5380) – Bridge Design  
Elective  
(Not taught 2007-2008)

- 2007 Catalog Data: CEE 4380 (5380). Bridge Design. Lecture 3. Credit 3. Design of structural steel and reinforced concrete bridges. Prerequisite: CEE 4310.
- Textbook: *AASHTO LRFD Bridge Design Specifications*, AASHTO, Third edition, 2004.
- Reference: *Design of Highway Bridges*, Barker and Puckett, John Wiley & Sons, 1997.  
*Bridge Design Manual*, PCI, 1<sup>st</sup> edition, 2002.
- Coordinator: X. Huo, Associate Professor of Civil Engineering
- Goal: The goal of CEE 4380 (5380) “Bridge Design” is to introduce the students to the basic structural design principles and procedures of highway bridges.

Course learning objectives:

1. The student is to develop a basic understanding of design traffic loads of highway bridges, different types of bridge systems, and influence line analysis.
2. The student is to learn the fundamental principles necessary for structural analysis and design of highway bridges.
3. The student is to develop basic design procedures to bridge members in a manner which ensures the safety and utility of the bridges.

Course measurable outcomes:

Students will be expected to:

1. understand how to determine influence coefficients due to a moving unit load;
2. understand the design live load (truck, tandem, and lane loads) and load combinations specified in AASHTO LRFD Specifications;
3. determine the live load moments and shears using influence coefficient tables;
4. perform the design of bridge deck slab with the main reinforcement perpendicular to traffic direction;
5. determine the flexural strength of composite steel bridge beams of compact section;
6. determine the shear strength of steel bridge beam with or without transverse stiffeners;
7. design bearing stiffeners in steel bridge girders;
8. design transverse stiffeners in steel bridge girders; and
9. understand the design procedure of prestressed concrete bridge members.

Topics covered: (Three lecture classes per week, 55 minutes each)

1. Introduction to bridge design; historical background, and types of bridges (2 classes)
2. Influence lines and influence coefficients of simple beam and continuous beam (4 classes)
3. Design specifications and design loads of highway bridge (4 classes)
4. Design of concrete bridge deck slab (6 classes)
5. Live load distribution factor for a beam using the AASHTO LRFD method (2 classes)
6. Design of composite steel beam bridge (12 classes)
7. Design of prestressed concrete bridge (8 classes)
8. Project presentations (2 classes)
9. Tests (2 classes)

Contribution of the course to meeting professional component:

This is a part of engineering topics of the curriculum. It is a design elective with significant design content.

ABET category content as estimated by faculty member who prepared this course description:

Engineering Science: 0 credits or 0%  
Engineering Design: 3 credits or 100%

Relation of course to program outcomes:

- Outcome 1: The graduates will have a broad understanding of the relevant principles of mathematics, science, and engineering.  
Outcome 2: The graduates will have a general comprehension of four technical areas appropriate to civil engineering.  
Outcome 4: The graduates will be capable of design activities and have the ability to identify, formulate, and solve civil engineering problems.  
Outcome 5: The graduates will have effective communication skills.  
Outcome 8: The graduates will have the ability to use techniques, skills, and modern engineering tools needed for engineering practice.

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                     | 5 |
| (3e) Identify, formulate, and solve engineering problems       | 5 |
| (3g) Effective communication                                   | 3 |
| (3i) Need for life-long learning                               | 2 |
| (3k) Techniques, skills, modern tools for engineering practice | 4 |

Program Criteria

Bloom's Level of Achievement

- |  |   |
|--|---|
| 1. Apply knowledge of math and sciences  | 3 |
| 2. Apply knowledge of four technical areas appropriate to civil engineering          | 4 |
| 3. Design a system, component, or process in more than one civil engineering context | 5 |

Computer usage:

1. Structural computer software is utilized by the student as an aid in the analysis of bridge systems.

Laboratory projects: None

Prepared by: X. Huo

Date: September 2007