

CE 497 BRIDGE ENGINEERING

Elective Course

Fall 2008

Instructor: Name: Cem Yalçın

Office Hours: MW 34

Course Data: Hours: TTT 678, Room: M2171

Course Description (Catalog):

CE497 Bridge Engineering (3+0+0)3

Introduction to bridge engineering. Historical background of bridges and types. Bridge aesthetics and proportioning. Design process. Review of applicable design codes. Loads on bridges and force distribution. Bridge geometry. Conceptual design. Analysis tools for highway and pedestrian bridges. Concrete and steel deck design. Design of substructures such as foundations with or without piles; abutments, retaining walls and wing walls; columns and cap beams; bearings. Introduction to reinforced concrete and prestress concrete principles.

Prerequisite: Consent of the instructor

Course Objectives (Learning Outcomes):

To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.

To help the student develop an intuitive feeling about the sizing of bridge elements, ie. develop a clear understanding of conceptual design.

To understand the load flow mechanism and identify loads on bridges.

To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

Textbook: There will be no textbook assigned for this course. Class notes and handouts will sufficient.

Reference Books:

Design of Highway Bridges, Richard M. Barker, Jay A. Puckett / John Wiley & Sons, Inc. 1997

Design of Modern Concrete Highway Bridges / Conrad P. Heins, Richard Lawrie / Wiley, 1984

ASSHTO and CANBAS bridge design codes

Curricular Context

This required course constitutes a transition from fundamental math and science topics to specific applications within the context of structural mechanics and engineering. It provides the foundation for advanced design and bridge analysis courses. Estimated design content of the course is 80%.

Laboratory and Computer Usage: N/A

Class Policies:

Assignments. 20% of the course grade.

Midterm exam: One exam, 20% of the course grade.

Final exam: 20% of the course grade.

Project: Design project, 40% of the course grade.

Contribution of the Course to Program Outcomes:

(a) An ability to apply knowledge of mathematics, science and engineering

(c) An ability to design a system, component, or process to meet desired needs such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(e) An ability to identify, formulate and solve engineering problems

(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Course Assessment:

Course will be assessed based on the evaluations/responses from the students.

Week	Topics	Objectives
1 Sep. 23	Introduction to Bridge Engineering	Definition of a bridge, historical development, bridge types
2 Sep. 30	No Class – Şeker Bayramı	
3 Oct. 7	Design process and bridge aesthetics. General design considerations	Process of design coupled with aesthetics. Allowable stress design and limit state design approaches. Safety index and load combinations
4 Oct. 14	In-class presentation	Presentation on general design aspects by a professional practicing engineer
5 Oct. 21	Materials. Review of design codes. Loads on bridges	Materials used in bridges. Various design codes such as AASHTO LRDF, AREMA, CHBDC and EUROCODE. Loads on bridges. Design criteria
6 Oct. 28	Analysis tools	Force distribution. Strut-and-tie method incorporating force distribution. Other methods such as influence lines, cross method, matrix methods and finite element methods
7 Nov. 4	Bridge geometry	Setting up the bridge coordinates and geometry. Scribed elevations. Highway curves
8 Nov. 11	In-class presentation	Presentation on general design aspects by a professional practicing engineer
9 Nov. 18	Concrete bridge deck design	Reinforced concrete and prestressed concrete deck design principles. Applications to various cross-sections such as beams, continuous slabs, rigid frames and culverts
10 Nov. 25	Steel bridge deck design	Steel deck design principles. Applications to various cross-sections such as beams and composite slabs
11 Dec. 2	Design of foundations	Reinforced concrete spread and pile foundation designs
12 Dec. 9	No Class – Kurban Bayramı	
13 Dec. 16	Design of abutments	Reinforced concrete abutment, wing wall and retaining wall designs
14 Dec. 23	Design of columns	Reinforced concrete and steel column designs, and cap beam designs
15 Dec. 30	Design of deck supports	Selection and design of bearings