Prerequisites: Exposure to undergraduate steel and concrete design and determine and indeterminate structural analysis courses.

Objectives: This course will present a modern approach to highway bridge analysis, design and evaluation based on the American Association of State Highway and Transportation Officials LRFD Bridge Design Specification, 2007 edition (with '08, '09 and possibly '10 interims). Course topics are planned to include: Types of Bridges, Site Design Overview, Highway Bridge Loading, Bridge Analysis, Bridge Deck Slabs, Steel Bridge Design, Prestressed Concrete Bridge Design, Substructure Design, Fatigue and Bridge Rating.


American Concrete Institute, Analysis and Design of Reinforced Concrete Bridge Structures, ACI Committee 343 Report, Detroit, 1988.


ADDITIONAL TEXTS ADDED AS NEEDED
The Pennsylvania State University  
CE 549 – Bridge Engineering I  
Spring Semester 2011  
T R 04:15P - 05:30P 169 WILLARD

Instructor: Dan Linzell (dlinzell@ engr. psu. edu, 3-8609)  
231L Sackett Building (Mailbox 216 Sackett)

Office Hours: T R 10:30 a.m. to 12:30 p.m. or by Appointment

Tentative Schedule:

| I.       | Types of Bridges                                      | 1 class |
| II.      | Site Design                                          | 1 class |
| III.     | Bridge Loading                                       | 2 classes|
| IV.      | Bridge Analysis                                      | 6 classes|
| V.       | Deck Slabs                                           | 3 classes|
| VI.      | Steel Bridges                                        | 6 classes|
| VII.     | Prestressed Concrete Bridges                         | 4 classes|
| VIII.    | Substructure Design                                  | 2 classes|
| IX.      | Fatigue                                              | 1 class |
| X.       | Project Presentations                                | 1 class |

Grading:

Design Project Interim/Final Reports (2 @ 25%) 50%
Midterm Exam (2/28/2011, Location/Time TBA) 25%
Final (Date/Location/Time TBA) 25%
100%
Tentative Outline (relevant AASHTO/Barker and Puckett reading shown in parentheses):

I. Types of Bridges (AASHTO Sections 1 & 2; B&P Chs. 1, 2, 3)
   - Introduction to Bridge Engineering
   - Historical Perspective
   - Bridge Types and Utilization
   - Cross Sections

II. Site Design (AASHTO Sections 1 & 2; B&P Chs. 1, 2, 3)
   - Site Selection
   - Hydraulics and Scour

III. Bridge Loading (AASHTO Sections 3.1-3.6, 3.11, 3.12; B&P Chs. 4 & 5)
   - Bridge Loads
   - Load Combinations
   - Load Dynamics
   - Design Lane

IV. Bridge Analysis (AASHTO Section 4; B&P Chs. 5 & 6)
   - Influence Lines for Statically Determinate/Indeterminate Structures
   - Influence Surfaces
   - Moment and Shear Envelopes
   - Methods and Tools
   - AASHTO Approximate Methods

VI. Deck Slabs (AASHTO Sections 9.1-9.7; B&P Ch. 7.10)
   - AASHTO Slab Design Criteria and Example

VI. Steel Bridges (AASHTO Sections 6.1-6.5, 6.7, 6.10, App. C6; B&P Chs. 8.1-8.4, 8.7-8.10)
   - AASHTO Steel Plate Girder Design Criteria
     - Composite Compact and Noncompact
     - Noncomposite Compact and Noncompact
   - Design Example

VII. Prestressed Concrete Bridges (AASHTO Sections 5.1-5.5, 5.7-5.9, 5.10.1-5.10.8, 5.10.10; B&P Ch. 7)
   - AASHTO Prestressed Girder Moment and Shear Design Criteria
     - Prestress Losses
     - Steel/Concrete Stress Limits
     - Ultimate Strength
   - Design Example
VIII. Substructure Design (AASHTO Sections 10.1-10.7, App. A5.5)
- Abutment Types
- Loading and Load Combinations
- Design Example

IX. Fatigue (AASHTO Section 6.6; B&P Ch. 8.3)
- Fatigue Loading
- Fatigue Critical Details
- Design Example.

X. Bridge Rating
- Evaluation and Rating of Existing Bridges

Academic Integrity:

From the PSU web site ([http://www.psu.edu/ufs/policies/](http://www.psu.edu/ufs/policies/)):

49-20 Academic Integrity
Definition and expectations: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University’s Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

To protect the rights and maintain the trust of honest students and support appropriate behavior, faculty and administrators should regularly communicate high standards of integrity and reinforce them by taking reasonable steps to anticipate and deter acts of dishonesty in all assignments (Senate Policy 44-40: Proctoring of Examinations). At the beginning of each course, it is the responsibility of the instructor to provide students with a statement clarifying the application of University and College academic integrity policies to that course.
Attendance (in class):

Attendance at all lectures is expected and should you have an unexcused absence your final grade will be affected.

Attendance (out of class):

Out of class activities are planned, some during the class hour and some not. If the activity is planned for class time the attendance policy discussed above holds. All attempts will be made to schedule additional activities around the majority of your class schedules and attendance at those activities is highly encouraged.

Design Projects:

Two design projects will be assigned during the semester. The design projects will be completed in groups and will be graded on written content, completeness, and technical accuracy. Late submittals WILL NOT be accepted under any circumstance except in extreme hardship. Each group will present one of the two projects at the end of the semester. Names will be drawn to choose which project you will present - presentations will be equally divided between the two projects. More details about the projects, presentation requirements and grading will be handed out in class.

Exams:

A midterm exam and a final exam are scheduled. The exams are of equal weight. NO make-up exams will be given except as required by University policy. See the instructor at least 24 hrs. prior to any anticipated absence.