



School of Engineering and Applied Science

Civil & Environmental Engineering Department

**CE209, Bridge Design, Summer Session 1, 2003, May 21 to July 2**

Meet in Phillips Hall, Room 640, on Tuesday/Thursday, from 6:10 pm – 8:40 pm

### **Tentative Course Outlines**

**Prerequisites:** CE207 "Prestressed Concrete Structures"

**Instructor:** Sameh S. Badie, Ph.D., PE

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Office hours: M & W, from 1:00 to 3:00 PM

**Text Book:** "Design of Highway Bridges, Based on AASHTO LRFD Bridge Design Specifications" by Richard Barker and Jay Puckett, John Wiley & Sons Inc., 1<sup>st</sup> Edition 1997, ISBN 0-471-30434-4.

### **References:**

1. AASHTO Standard Specifications for Highway Bridges, American Association of State Highway and Transportation Officials, AASHTO, 16<sup>th</sup> Edition 1996, with 1997, 1998, 1999, 2000, and 2002 interims. <http://www.aashto.org>
2. AASHTO LRFD Bridge Design Specifications, American Association of State Highway and Transportation Officials, AASHTO, 2<sup>nd</sup> Edition 1998, with 2000, 2001 and 2002 interims. <http://www.aashto.org>
3. Publications of the Precast/Prestressed Concrete Institute (PCI), Chicago, IL: PCI Journal, PCI-Bridge Design Manual (PCI-BDM), PCI Design Hand Book. <http://www.pci.org>
4. Publications of the Portland Cement Association PCA. <http://www.portcement.org>
5. Publications of the Post-tensioning Institute (PTI). <http://www.post-tensioning.org>

6. Moments, Shear, and Reactions for Continuous Highway Bridges, American Institute of Steel Construction (AISC), New York, 1966.
7. "Design of Modern Concrete Highway Bridges" by Narendra Taly, McGraw-Hill Companies, Inc., 1<sup>st</sup> Edition 1998.
8. "Bridge Engineering Handbook," by Wai-Fah Chen and Lian Duan, CRC Press, 1<sup>st</sup> Edition 1999.
9. Bridge Design Manuals of state agencies: <http://www.wsdot.wa.gov/othertransportation.htm>
  - Florida Department of Transportation, <http://www11.myflorida.com/structures/default.htm>
  - Washington DOT, <http://www.wsdot.wa.gov/eesc/bridge/index.cfm>
  - Nebraska Department of Roads (NDOR), 2003. <http://www.dor.state.ne.us/design/bridge/>
  - Texas DOT, <http://www.dot.state.tx.us/brq/>

### **Course Objectives:**

The purpose of the course is to develop the student's ability to comprehend and apply basic design procedures to reinforced and prestressed concrete bridges. After completion of the course, the student should be able to recognize various types of concrete bridges, design superstructure bridge elements (deck slab, girders, bearing pads), and develop the superstructure details. The course will use the AASHTO LRFD Specifications as the design tool.

### **Tentative Course Content:**

1. General Introduction
2. Introduction of Slab and Girder Bridges
3. Introduction of Box, Cable Stayed, Post-tensioned, and Arch Bridges
4. Loads and Load Distribution (STD and LRFD Spec.)
5. Load Effects (Shear and Moment) by Influence Lines, Design Charts, and Computer Programs
6. Design of Reinforced Concrete Slab Bridge

7. Review of Prestressed Concrete: flexure, shear, and deflection in view of the AASHTO LRFD Specifications
8. Design of Simple Span slab/I-girder Bridges
9. Design of Continuous Span slab/I-girder Bridges (Joint-less Bridges)
10. Design of Post-tensioned slab/I-Girder Bridges
11. Design of cast-in-place and stay-in-place deck slabs for I-girder Bridges
12. Bearing Devices

### **Course Operation:**

1. Homework problems will be assigned in class.
2. Homework must be done on engineering paper, utilizing pencil and straight edges for sketches. It must be turned in before the announced deadline. No late homework can be accepted for grading.
3. One technical report and three projects will be assigned to each student. Each student will be responsible for submitting a project report. If time allows, each student will deliver a 20-minutes summary presentation on the last class period about one of the three projects.

|                                          |                  |     |
|------------------------------------------|------------------|-----|
| <b><u>Components of Final Grade:</u></b> | Homework         | 20% |
|                                          | Technical report | 10% |
|                                          | Project #1       | 20% |
|                                          | Project #2       | 25% |
|                                          | Project #3       | 25% |

### **Tentative Letter Grades:**

|    |              |
|----|--------------|
| A  | ≥ 95%        |
| A- | ≥ 90%, < 95% |
| B+ | ≥ 87%, < 90% |
| B  | ≥ 83%, < 87% |
| B- | ≥ 80%, < 83% |
| C+ | ≥ 77%, < 80% |
| C  | ≥ 74%, < 77% |
| C- | ≥ 70%, < 73% |
| F  | < 70%        |

**GWU BlackBoard Website:** under development (will be available in Fall 2003)