New Jersey Institute of Technology
Department of Civil & Environmental Engineering

Short-Span Bridge Design /
CE 637-852 – Spring 2017

Faculty: Rima Taher, PhD, PE
Senior University Lecturer

- **Type of Course:**

  Graduate course - Lecture format – 3 credits – Online Instruction: http://moodle.njit.edu.

- **Course Overview:**

  The course covers the engineering process of short-span bridges from design to maintenance and rehabilitation. The various major forms of short-span bridges are presented with an emphasis placed on the most prevalent types and on highway bridges. The structure of a bridge, its superstructure and substructure members and other related elements such as abutments, foundations and retaining walls are discussed. Design procedures are covered based on the requirements of the AASHTO LRFD Bridge Design Specifications.

- **Prerequisites/ Required Skills:**

  Prerequisites: undergraduate courses in structural analysis, steel design and reinforced concrete design.

- **Required Text:**

  Bridge Engineering by Demetrios E. Tonias and Jim J. Zhao, 3rd Edition, published by McGraw Hill, 2012, ISBN 13 # 978-0-07-175249-7, ISBN 10 # 0071752498.

- **Reference Texts:**

  - ACI- Code for Reinforced Concrete Structures, 2014
  - Manual of Steel Construction, 14th Edition, American Institute of Steel Construction.

- **Course Requirements:**

  Students are required to submit two projects and to take a final exam during the final exam week. Moodle will be used to deliver the online course and to submit tests and assignments. The Moodle site is http://moodle.njit.edu . Students can login with their UCID and password.

  PDF files outlining the project assignments will be posted, and a link will be created on Moodle for the students to upload the project file by the due date and time. Students must have access to a scanner to scan their solution pages. All

pages must be combined in a single PDF and uploaded to Moodle. Students are not to post files in formats other than PDF. The instructor must be able to open and read the files. If the file is corrupt or illegible, and the instructor is unable to read the file for some reason, the student will receive an F grade for that assignment. Students are not to email the assignments directly to the instructor. The final exam will be given on Moodle during the final exam week between the hours of 6:30 pm and 9:30 pm. The date will be announced once the final exam schedule of NJIT becomes available.

This course requires the use of Respondus LockDown Browser and/or Respondus Monitor with a webcam for the online final exam only. Refer to the section below for more information regarding Respondus.

Students need to login a few minutes before the exam time, and will have 3 hours to solve and submit the exam. Students will not be permitted to email the test or any part thereof directly to the instructor. The student work must be all stored on Moodle and any emailed test files will be declined and deleted.

All students are expected to take the exam at the scheduled time. No make-up test or exam will be given to students who do not show up online as scheduled unless the student has a compelling and valid reason that can be substantiated. Proof of the student's hardship must be presented to the Dean of Students.

Students enrolled in this course are not to schedule vacation trips while the course is ongoing, and on dates that coincide with project due dates. The course will end after the final exam is given. Airline tickets must not be booked before the final exam date. The final exam week is from May 5 to May 11.

- **Using Respondus LockDown Browser and a Webcam for Online Exams**

Respondus LockDown Browser is a locked browser for taking assessments or quizzes in Moodle. It prevents you from printing, copying, going to another URL, or accessing other applications during a quiz. If a Moodle quiz requires that LockDown Browser be used, you will not be able to take the assessment or quiz with a standard web browser. You may be required to use LockDown Browser with a webcam (Respondus Monitor), which will record you during an online exam.

This course requires the use of Respondus LockDown Browser and/or Respondus Monitor with a webcam for online exams. The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this short video to get a basic understanding of LockDown Browser and the webcam feature. A student Quick Start Guide (PDF) is also available.

1. Download and install LockDown Browser from this link:
   http://www.respondus.com/lockdown/download.php?id=264548414

2. Once your download has finished, locate the "LockDown Browser" shortcut on the desktop and double-click it. (For Mac users, launch "LockDown Browser" from the Applications folder.)

3. You will be brought to the Moodle login page within the LockDown Browser, click "Login with your UCID" to log in with your NJIT UCID and password and then click Login.

4. Under "My courses", click on the course in which you have to take the exam that requires the LockDown Browser.

5. After you enter the course, find the exam and click on it.

6. A confirmation prompt will appear, click the "Start attempt" button. Once a quiz has been started with LockDown Browser, you cannot exit until the Submit all and finish button is clicked.

7. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

- **Grading Criteria:**

  Project 1: 30% - Concrete Slab Deck Design for a Slab-on-Stringer Bridge
  Project 2: 35% - Design of a Typical Composite Stringer for a Highway Bridge
  Final examination: 35% - During the final exam week
  Project due dates will be announced. All projects must be uploaded to Moodle by the due date and time.

- **Academic Integrity**

  The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

- **Instructor's Contact Information:**

  E-mail: taher@njit.edu
  The instructor could also be reached by phone at 973-253-6183.
  NJIT Office Phone: 973-596-3015.

- **Instructor's Office Number and Office Hours:**

  Office: Weston 521.
  Office Hours: Tuesday 1:15 to 2:15 pm and by appointment.

- **Websites:**

  http://moodle.njit.edu

- **Course Content and Weekly Schedule**

  Week 1:
  Introduction to the Course and Course Requirements – Introduction to Highway Bridge Structures: Use and Functionality, Typical Components, Bridge Terminology – Design Standards and Specifications

  Weeks 2 & 3:
  Design Loads: Permanent Loads, Temporary Loads, Deformation and Response Loads, Group Loading Combinations

  Weeks 4 & 5:
  Superstructure Types - Deck Types: Non-Composite and Composite Decks – Shored and Unshored Construction – Concrete Deck Slabs – Detailed Concrete Deck Design Example for a Slab-on-Stringer Bridge
  Project 1 Assigned.

  Week 6:
  Bridge Failures – Case Studies

  Weeks 7, 8:
  Design of Composite Steel Members - AASHTO LRFD Design Method: Design Truck or Tandem, Wheel Load Distribution Factors, Effective Flange Width, Dynamic Load Allowance, Placement of Design Truck on a Span, Composite Section Strength, Shear Capacity, Transformed Section, Shear Connector Design, Fatigue, Additional Constraints - Detailed Design Example of a Composite Steel-Concrete Stringer

  Week 9: 3/12 to 3/19: Spring Recess – No Class

  Weeks 10 & 11:
  Design of Composite Steel Members (Continued)
  Project 2 Assigned.

  Weeks 12 & 13:
  Continuous Bridges: Advantages and Disadvantages, Rolled Sections as Continuous Beams, Moment Distribution Method, Examples

  Weeks 14 & 15:
  Plate Girders: Elements of a Plate Girder (Flanges, Web, Stiffeners, Lateral Bracing), Hybrid Girders - Detailed Design Example of a Two-Span Continuous Plate-Girder Bridge

Week 16:

The Substructure Elements: Abutments, Foundations, Piers and Bearings - Protecting Steel Superstructures: Inspection, Rehabilitation and Maintenance Issues

Last Day of Class: May 2nd
Reading Day 1: May 3
Reading Day 2: May 4
Final Exam Week: May 5 to May 11