

CVET-434-01 Design of Highway Bridges *Spring 2022*

Instructor: **Dr. Amanda Bao, P.E.**

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Lecture: **M, W, F: 12:00-12:50pm, Room ENT-2165**

Office Hours: **M: 2:30-3:30pm; W: 2:00-3:00pm; F: 10:00-11:00am in ENT-3154**

Or through Zoom Video Conference: <https://rit.zoom.us/j/98242643431>

Topic: Dr. Bao's Office Hour-Zoom Meeting

Time: 2:30-3:30pm on Monday, 2:00-3:00pm on Wednesday, 10:00-11:00am on Friday

Join Zoom Meeting

<https://rit.zoom.us/j/98242643431>

Meeting ID: 982 4264 3431

One tap mobile

+16465588656,,98242643431# US (New York)

+13126266799,,98242643431# US (Chicago)

Text:

1. Design of Highway Bridges: An LRFD Approach, by Richard M. Barker and Jay Alan Puckett, 4th Edition, John Wiley & Sons, 2021 (ISBN: 978-1-119-64631-0)

References:

1. AASHTO LRFD Bridge Design Specifications, 5th Edition

Prerequisites:

Structural Analysis (CVET-332)

Structural Design – Steel (CVET-431) and/or Structural Design – Reinforced Concrete (CVET-432)

Intended Learning Outcomes:

After completing this course, you will be able to:

1. Calculate design loads on bridges and calculate live load distribution Identify vertical and lateral load paths in bridges.
2. Design bridge superstructure including prestressed concrete girders, steel girders and reinforced concrete deck per AASHTO LRFD code.
3. Design bridge substructure including abutment and foundation.
4. Prepare project design and construction documents such as structural plans, sections, details and project cost estimates.

Course Outline:

1. Introduction and types of bridges (3 lectures)
2. Bridge type selection and aesthetics (2 lectures)
3. Design loads on bridges (8 lectures)
4. Moving load analysis and live load distribution (5 lectures)
5. Reinforced concrete deck design (5 lectures)
6. Design of prestressed concrete girders using LEAP Bridge Concrete software (6 lectures)
7. Design of I-plate steel girders using MDX software (6 lectures)
8. Abutment design (2 lectures)
9. Bridge foundation design (2 lectures)
10. Tests (2 lectures)
11. Guest lecture or field trip (1 lecture)

Homework Assignments:

Homework assignment will be posted on the course website at <http://mycourses.rit.edu>.

✓ **Homework problems are due by 4pm on the assigned due date. Turn in the hard-copy or Scan and upload the electronic copy to the homework dropbox under the tab “Assignments” on myCourses. No late homework will be accepted or graded.**

✓ Calculations should be neat and organized. Sketches, assumptions, units, and references must be included, where appropriate. Show all works in details. Write on one side and highlight your solutions. All numerical values shall include the appropriate units. Points will be deducted from the assignment grade if this format is not followed.

✓ No point will be given for work that has been copied from other students or resources.

✓ **Solutions to the homework assignments will be posted on myCourses.**

Homework Assignments Schedule:

Homework #	Handout Date	Due date	Topic
1	Fri. 1/14/22	Fri. 1/28/22	Bridge types and selection
2	Fri. 1/28/22	Fri. 2/11/22	Design loads on bridges
3	Fri, 2/11/22	Fri, 3/4/22	Influence lines; Live load distribution
4	Fri. 3/4/22	Fri. 3/25/22	Reinforced concrete deck
5	Fri. 3/25/22	Fri. 4/8/22	Prestressed concrete girder
6	Fri. 4/8/22	Fri. 4/22/22	Steel girder
7	Fri. 4/22/22	Tue. 5/3/22	Abutment & pile design

Design Project

- A group design project will be assigned in this course and a formal design project report (including detailed design calculations) with CAD drawings is required.
- The design project will be carried out in a group of **3-4** students. Students are encouraged to form their own teams, and the names of the company and team members should be submitted to the instructor by **Friday, January 28th, 2022**.
- MS Excel spreadsheets/ Hand calculations are encouraged to use in the structural member design and strength check.
- Each team member is expected to put in equal amount of effort and must identify his/her portion of the design project report.
- Each team member will be required to make an oral presentation of their design project.
- To evaluate individual contributions to the team's effort, the members in each team will be required to submit peer reviews and evaluations within their group together with their design project report.
- The design project will be assigned group grades.

Conduct in Lectures:

Please be on time and conduct yourself in a respectful and professional manner in class, and follow RIT COVID-19 related policies. Cell phones should be set to silent mode.

Computer Usage:

STAAD.Pro will be used for structural analysis in the design project. Bentley LEAP Bridge Concrete and/or MDX software will be used to design bridge girders. AutoCAD, Revit or MicroStation will be used for plan production in the design project.

Course Web Site, Online Resources, and E-mail:

The course web site at <http://mycourses.rit.edu> will mainly be used to post handouts, homework and test information. STAAD.Pro, LEAP Bridge Concrete and MDX software instruction screencasts are available on the web site: <http://baoteachingcet.com>. (Screencasts Access: **Username: test, Password: 1234**). Girder design examples are also available on the YouTube teaching channel: https://www.youtube.com/channel/UC8i3Y2F9iDc6Y9ZB7j_dXtA. Some announcements relating to this course may be sent to you via e-mail. Synchronous online Zoom video conference will be used for office hours <https://rit.zoom.us/j/98242643431>.

Exams:

There will be **two** 50-min exams in this course, and the exams are open book and open notes. The design project oral presentation will be scheduled in the final's week. No final exam in this course.

Exams Schedule: (Exams are open book and open notes)

Exam #	Date	Covers HW #
1	Fri. 2/25/2022	1, 2
2	Fri. 4/8/2022	3, 4

Note: No make-up tests will be given except in **very extenuating** circumstances and only if the instructor is given prior notice. **The exams will not be returned** but you may look through your graded exam booklet in my office.

Grade Distribution:

Homework	= 20%
Two Mid-Term Tests@ 20% each	= 40%
Design Project Report/Presentation	= 40%

Letter Grades:

The letter grades in this course will be assigned as follows:

A	=	93-100
A-	=	90-92
B+	=	87-89
B	=	83-86
B-	=	80-82
C+	=	77-79
C	=	73-76
C-	=	70-72
D	=	60-69
F	=	Below 60