

CCE 59700-EPE DIS: Curved Steel Bridge Design and Analysis

Fall 2026 – Francisco Javier Bonachera Martín

Course Information

- CCE 59700-EPE DIS: Curved Steel Bridge Design and Analysis
- CRN: 31515
- Instructional Modality: Distance learning, asynchronous.
- Course Credit Hours: 3.0
- Prerequisites: Familiarity with structural analysis principles and concepts used in bridge engineering, design of straight composite steel I-girders, and loadings used in the AASHTO LRFD Specifications.

Instructor Contact Information

- Name: Francisco Javier Bonachera Martín
- Office Location: HAMP 4121
- Office Phone Number: 765-494-5828
- Purdue Email Address: fbonache@purdue.edu
- Office Hours: TBD
- Communication by email or visiting during office hours are preferred

Course Description

This course emphasizes the practical analysis and design of horizontally curved and skewed steel girder bridges using Load and Resistance Factor Design (LRFD), reflecting methods and standards used in current engineering practice. Students develop an applied understanding of steel bridge behavior and learn to select appropriate analysis approaches, including approximate, two dimensional, and three dimensional methods commonly used in real world design and evaluation projects. The course focuses on the design of curved steel I girder and tub girder systems, including stability bracing requirements and considerations regarding fatigue, redundancy and detailing considerations. Fabrication and construction issues unique to curved steel bridges are integrated throughout the course to reinforce realistic design assumptions. Students gain hands on experience with finite element software used by

practicing bridge engineers. The course prepares students for immediate contribution in bridge engineering practice.

Learning Resources, Technology & Text

- American Association of State Highway and Transportation Officials (AASHTO). (2024). **AASHTO LRFD Bridge Design Specifications (10th ed.)**. Washington, D.C.: AASHTO:
<https://us.i2.saiglobal.com/management/display/version/8512292/1597189/-/736d4d4935586e654bb06494c3488ccd>
- Midas Civil NX, download and licensing instructions will be provided in Brightspace.
- Other resources and media will be provided throughout the semester.
- Updates will be communicated through email.
- The CE 597-EPE DIST portal in Brightspace will serve as a repository for lecture materials, assignments, etc.

Learning Outcomes

By the end of this course, students will be able to analyze and design horizontally curved and skewed steel girder bridges using LRFD principles and methods consistent with current engineering practice. They will demonstrate the ability to select and apply appropriate analysis techniques to design curved steel I-girder and tub girder systems considering. Students will also integrate fabrication and construction considerations into their designs and apply finite element tools to solve practical bridge engineering problems.

Assignments and Quizzes

Homework Assignments

- There will be a total of 6 take-home graded assignments.
- Each assignment will be due two weeks after it is issued.
- Each assignment will be worth a maximum of 20 points.
- If all 6 assignments are turned in, the best 5 assignments will be taken into consideration for the final grade computation. Missed assignments will be automatically graded as zero.
- Collaboration is encouraged for all take-home assignments. Refer to the academic integrity section for more information.

- Any tool, including AI, is acceptable. Refer to the academic integrity section for more information.

Quizzes

- There will be quizzes issued approximately every week.
- There will be a minimum of 10 quizzes.
- Each quiz will consist of five to ten multiple choice or short answer questions.

Other Assignments

- Reading assignments, videos, etc. may be provided at the end of each lecture in preparation for the next one or as additional interesting material. Performing these additional assignments is heavily encouraged; however, evaluation will be limited to the contents taught in class.

Exams

- There will not be any exams, evaluation is based on homework assignments and quizzes.

Score Computation

- The maximum possible score for the course is 100 points.
- 90% of the score is based on take-home graded assignments
- 10% of the score is based on weekly quizzes.

Grading Scale

Letter grades will be assigned according to the total accrued score throughout the semester as follows:

A+ 96.7 or above	B+ 86.7 – 89.9	C+ 76.7 – 79.9	D+ 66.7 – 69.9	F 59.9 or below
A 93.4 – 96.6	B 83.4 – 86.6	C 73.4 – 76.6	D 63.4 – 66.6	
A- 90.0 – 93.3	B- 80.0 – 83.3	C- 70.0 – 73.3	D- 60.0 – 63.3	

Attendance Policy

- Watching all lectures is expected.
- Completion of quizzes and homework serve to monitor attendance.
- If possible, communicate any expected absences or delays in turning in assignments ahead of time.

- For further information refer to:
<https://www.purdue.edu/odos/support/students/absences.php>

Course Schedule

The detailed course schedule will be provided at the beginning of the semester. A list of the main topical areas is provided below:

- 1) Review of LRFD fundamentals for steel girder design and analysis
- 2) Fundamentals and behavior of curved steel girder bridges
- 3) Structural analysis of curved steel girder bridges
- 4) Design of curved steel I-girder bridges
- 5) Design of curved steel tub girder bridges
- 6) Stability and design of cross-frames and diaphragms
- 7) Fabrication and construction of curved steel girder bridges
- 8) Redundancy in twin-tub girder systems

Academic Integrity

- Do not commit academic dishonesty, there will be zero-tolerance policy: automatic failing grade:
 - Plagiarism will NOT be tolerated.
 - Impersonation will NOT be tolerated.
- See <https://www.purdue.edu/odos/osrr/academic-integrity/index.php>
- Communicate potential breaches to integrity@purdue.edu or at 765-494-8778. Information may be submitted anonymously.

Use of Artificial Intelligence Tools

- Use of AI is encouraged, particularly for formatting, creating figures, etc.
- Review what the AI tool provides, do not turn in content without thoroughly checking.
- Be careful with the AI tool you use and the data you share.

Nondiscrimination Policy

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. For more information refer to https://www.purdue.edu/home/ea_eou_statement/

Accessibility

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in my class, you must release your Course Accommodation Letter to me. Instructions on sharing your Course Accommodation Letter can be found by visiting: <https://www.purdue.edu/drc/students/course-accommodation-letter.php> Additionally, you are strongly encouraged to contact me as soon as possible to discuss implementation of your accommodations.

Mental Health and Wellness

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try Therapy Assistance Online (TAO), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the TAO Connect website, or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools. If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions in West Lafayette with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect. Students in Indianapolis will find support services curated on the Vice Provost for Student Life website.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in West Lafayette or Indianapolis.