

CEE 6528 – INTRODUCTION TO BRIDGE ENGINEERING

Fall 2021, MW 12:30 – 1:45, College of Computing 52

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Textbook: Grubb, M.A. et al. (2010). *Analysis and Design of Skewed and Curved Steel Bridges with LRFD*, FHWA-NHI-10-087, December (PDF file) + various supplementary materials

References: AISC (2021). *Navigating Routine Steel Bridge Design*, American Institute of Steel Construction.
AASHTO (2020). *AASHTO LRFD Bridge Design Specifications*, 9th Ed, available for download from the Georgia Tech library

Prerequisites: CEE 4510, Structural Steel Design, or equivalent

Learning Outcomes:

- Evaluate the response of various girder bridge components and structural systems
- Describe the analysis, design, fabrication and construction processes for skewed and horizontally curved steel I-girder superstructures and for horizontally curved steel box-girder superstructures. These structure types constitute a major portion of the steel bridge market in the United States.
- Summarize the unique considerations for the design of skewed and/or curved bridge superstructures
- Apply fundamental concepts along with the AASHTO LRFD Specifications to the design and analysis of skewed and curved steel bridge superstructures, including erection and construction considerations

Outline:

- I. Introduction
- II. Fundamentals
 1. System and Girder Behavior in Combined Flexure and Torsion
 2. Loads and Force Effects
 3. Influence Lines
 4. Influence Surfaces
- III. Structural Analysis
 1. General Considerations
 2. Analysis of Thermal Expansion, Articulation and Design of Bridge Bearings
 3. Line-Girder Based Methods of Analysis
 4. Grid Methods of Analysis
 5. 3D Finite Element Analysis
 6. Proper Selection of Analysis Methods
- IV. Design
 1. Layout Considerations in Preliminary Design
 2. Girder Selection and Proportioning in Preliminary Design
 3. Design for Constructability
 4. Service Limit State Design
 5. Design for Fatigue Resistance
 6. Composite I-Girder Flexural Resistance in Negative Bending
 7. Composite I-Girder Flexural Resistance in Positive Bending
 8. I-Girder Shear Resistance
 9. Shear Connector Design
 10. Design of Cross-Frame Members
 11. Design of Bolted Splices
 12. Bearing Design
 13. Bridge Deck Design
 14. Box (Tub) Girder Design
- V. Fabrication and Construction
 1. Fabrication of Curved I-Girders
 2. Detailing of Cross-Frames
 3. Shop-Fit and Assembly Considerations
 4. Construction Plans

Grading:

Mid-Term Exam (Wk 11, Wednesday, Nov. 3) 35%
Individual Assignments 30%

Team Project Assignments 35 %