

Bridge Engineering

Code	Credit Hours	Category
CE-812	3	Elective

Course Description:

Bridges are common structural elements of civil engineering structures, and their study, both from theoretical and analysis points of view, is fundamental to the understanding of the behavior of such structures. The course on bridge engineering will equip our structural engineering students with in-depth understanding of the mechanics, design, and construction of bridges. This course offers an in-depth understanding of bridge engineering, focusing on the design, construction, and maintenance of various bridge types. It covers the fundamental components of bridges, the importance of different bridge types, and the aesthetic considerations. The course includes detailed discussions on AASHTO specifications, service and strength limit states, structural analysis, resistance and capacity checks, and the behavior of steel and concrete bridges. Additionally, students will learn about materials, design considerations, seismic design, and construction techniques, along with an introduction to bridge design software tools like CSi Bridge.

Text Book:

Design of Highway Bridges, by Richard M Barker and Jay A. Puckett

Reference Books:

Bridge Engineering Handbook, by Chen Wai Fah and Lan Duan

Conceptual Design of Bridges, by X. Haifan

Prerequisites:

CE 804: Pre-stressed Concrete Structures

CE 807: Steel Structures Design

Assessment System

Component	Percentage Range
Quizzes	10-15%
Assignments	10-15%
Mid Terms	20-30%
ESE	40-50%
Project (optional)	10-15%

Teaching Plan:

Week No	Topic
1	Introduction/Overview: Bridge Components, types of bridges, aesthetics
2	AASHTO Specification and Limit States. Cross-sectional area and centroids, moments of inertia, section moduli.
3	Loads and stress calculations, structural analysis, resistance and capacity checks.
4	RC bridges and its types, flexural resistance, shear resistance, design and detailing
5	RC piers and columns, abutments and retaining structures
6	Shallow and deep foundations, bridge bearings, expansion joints
7	Shallow and deep foundations, bridge bearings, expansion joints
8	Introduction to Precast and Prestress Bridges such as Box shape and U Girder Bridges, design and detailing
9	Mid Term Exam/ OHT, (As per NUST Exam Policy)
10	Introduction to Precast and Prestress Bridges such as Box shape and U Girder Bridges, design and detailing
11	Composite Steel Bridges
12	Composite Steel Bridges
13-14	Seismic design of RC, Composite and Prestress bridges
15-16	Introduction to CSI Bridge module, MIDAS and STAAD
17	Presentations for Term-project
18	ESE

Software: CSI Bridge