

CV4104 Bridge Engineering

[Lectures: 26 hrs; Tutorials: 13 hrs; Pre-requisites: CV3011; Academic Unit: 3.0]

Learning Objective

The objective is to equip the students with a thorough understanding of the behaviour and design of bridges. Various applied loads, such as truck load, impact, horizontal braking/centrifugal forces, wind and seismic loads are discussed thoroughly. Background to design equations for different types of bridges and relevant modern research will also be discussed to provide the students with solid understanding of the topics covered.

Course Content

Introduction to history of bridge-building, including types of bridges, aesthetics, and materials for modern bridges; Loadings on bridges including standard truck and lane loading, impact loads, longitudinal and centrifugal forces, wind and seismic loads, thermal loads; Serviceability criteria including deflection and fatigue; Design of reinforced concrete bridges, slab bridges, concrete slab with steel stringer bridges, T-beam or plate girder bridges, box girder bridges, and prestressed concrete bridges; Bridge maintenance including inspection and rehabilitation.

Course Outline

S/N	Topic
1	History of bridge-building; types of bridges; Materials for modern bridges
2	Loads on bridges – standard truck and lane loading; Impact loads; Longitudinal and centrifugal forces; Wind and seismic loads; Thermal loads
3	Serviceability criteria – deflection and fatigue
4	Reinforced Concrete Bridges
5	Slab bridges – longitudinally reinforced bridges
6	Concrete Slab-Steel Stringer Bridge Design; Non-composite vs Composite Design. T-Beam. Design Aids
7	Plate Girder Bridges – general approach
8	Prestressed Concrete Bridges. Box girder bridges
9	Optimum Bridge Proportioning
10	Bridge Aesthetics, Inspection, Rehabilitation

Learning Outcome

The students are expected to be able to understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads. They should be able to design short and medium span bridges, with confidence using existing codes of practice, taking into account of the structural strength, service life and durability. It is also expected that the student would know the limitations of the design methods used.

Textbooks/References

1. Ponnuswamy, S. "Bridge engineering", Tata McGraw-Hill, 2008 [TG145.P797].
2. Bangash, M. Y. H. "Prototype bridge structures: analysis and design", Thomas Telford, 1999 [TG300.B216].
3. Bennett, David, "The architecture of bridge design", Thomas Telford, 1997 [TG300.A674].
4. Xanthakos, Petros P, "Bridge substructure and foundation design", Prentice Hall, 1995 [TG320.X2].