



**Birla Institute of Technology & Science, Pilani**  
Hyderabad Campus

**FIRST SEMESTER 2019-2020**

Course Handout Part II

01-08-2019

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CE F420  
Course Title : Introduction to Bridge Engineering  
Instructor-in-Charge : P N Rao

**Scope and Objective of the Course:**

Bridges are inseparable part of any communication network as they are the key elements in roadways and Highways network. This course intends to impart skills for planning and analysis & design of different types of bridge structures at basic level.

**Course Outcomes:** At the end of this course, the students will be able to:

- CO1. Select suitable site for the best type of bridge for given site conditions.
- CO2. Analyze and design of minor bridges like RCC pipe and box culverts
- CO3. Analyze and design super and substructure of a RCC slab bridges.
- CO4. Learn Construction and maintenance methods.

Student Learning Outcomes (SLOs) assessed in this course – (a), (b), (c), (d), (e), (f), (h), (j), and (k).

**Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.



**Textbook:**

1. Johnson Victor, D. (2010), “Essentials of Bridge Engineering”, 6<sup>th</sup> Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

**Reference books:**

1. Bakht, B. and Jaegar, L.G. (1985), “Bridge Analysis Simplified,” McGraw-Hill, New Delhi.
2. Raina, V. K. (2010), ‘Concrete Bridges: Handbook’, Galgotia Publication, New Delhi.
3. Krishna Raju, N, (2018) “Design of Bridges”. Oxford & IBH Publishing Co. Pvt, Ltd, New Delhi.
4. Ponnuswamy, S, (2017) “Bridge Engineering”, 3rd edition, McGraw-Hill Pub., New Delhi.
5. IRC: 5-2015, “Standard Specifications and code of Practice for road bridges: section I-General features of Design”, Indian Road Congress.
6. IRC: 6-2017, “Standard Specifications and code of Practice for road bridges: section II-Loads and Stresses”, Indian Road Congress.
7. IRC: 21-2000, “Standard Specifications and code of Practice for road bridges: section III-Cement Concrete (Plain and Reinforced), Indian Road Congress.
8. IRC: 40-2002, “Standard Specifications and code of Practice for road bridges: section IV-Brick, and Stone and block Masonry, Indian Road Congress.
9. IRC: 78-2017, “Standard Specifications and code of Practice for road bridges: section VII-Foundation and Substructures”, Indian Road Congress
10. IRC: 83-2015, “Standard Specifications and code of Practice for road bridges: section IX (Part I)-Metallic Bearings, (Part II)-Elastomeric Bearings and (Part III)-Pot, Pot-Cum-PTFE, Pin and metallic guide Bearings, Indian Road Congress

**Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO
1-3	Introduction	Importance of Bridge, Components of bridges, Classification of bridges, conceptual bridge design	Ch-1	a, c
4-6	Investigation for Bridges	Selection of bridge site, preliminary data and drawings, discharge design, economical span, choice of bridge type.	Ch-2	a, c
7-10	Bridge Loading standards	Emphasis on IRC loadings, Impact factors	Ch-3&4	
11-16	Design of culverts	Design of (i) slabs spanning in one direction (slab culverts), (ii) cantilever slabs (in T-beam bridges), and (c) slabs spanning in two-directions using Pigeaud’s Method, Design of slab culverts	Ch-6	a, c, e
17-22	RCC Bridges	Load distribution in longitudinal girders using Courbon’s method, Guyon and Massonet method and Hendry-Jaegar method, Design of simply supported Tee-beam bridges	Ch-7	a, c, e



23-28	substructure	Types of piers and abutments; Loads to be considered on piers and abutments; Stability analysis of pier and abutment, wing walls and approach slabs, features of wing walls	Ch-12	a, c, e
29-34	Bridge Foundations	Types of Bridge foundations, design aspects of Pile and well foundations	Ch.- 13	a, c, e
35-39	Bearings and joints	Necessity of bearings, types of bearings, design of steel bearings, designs of elastomeric bearings, necessity and types of expansion joints.	Ch-14	a, c, e
40-42	Construction and Maintenance	Construction methods and quality assurance, inspection, bridge management system	Ch-15	a, k

### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Semester Test	90 Min	25%	3/10; 1.30 to 3.00 PM	CB
Comprehensive Exam	180 Min	35%	10/12 FN	CB
Assignments	-	15%	-	OB
Project	-	25%		OB

**Chamber Consultation Hour:** To be announced in the class

**Notices:** Concerning this course will be displayed on CMS/ Notice Board of Civil Engineering Department

**Make-up Policy:** Make-up would be granted only for genuine cases with prior permission.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**

**CE G616**

