

# SECOND SEMESTER 2019-2020

Course Handout Part II

06-01-2020

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.

1. an ability to apply knowledge of mathematics, science and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. 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
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. 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”, 6th 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:

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| **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, Design of simply supported  Tee-beam bridges | Ch-7 | a, c, e |

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| 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 | Necessity of bearings, types of bearings, design of  steel bearings, designs of elastomeric bearings | 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:**

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| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Mid Semester Test | 90 Min | 25% | 5/3, 3.30 - 5.00 PM | CB |
| Comprehensive Exam | 180 Min | 35% | 11/05 FN | CB |
| Quiz | 50 Min | 10% |  | CB |
| Assignments( minimum 3 No’s) | continuous | 15% | - | OB |
| Mini Project | continuous | 15% |  | 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 F420**