



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

ACADEMI

C – GRADUATE STUDIES AND RESEARCH DIVISION
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD
CAMPUS

SECOND SEMESTER: 2021-22

Course Handout (Part-II)

Date: 15/01/2022

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 G616

Course Name : Bridge Engineering

Instructor-in-Charge : Dr. Shivang Shekhar (shivangshekhar@hyderabad.bits-pilani.ac.in)

1. Course Description

Purpose of bridge; classification of bridges; characteristics of each bridge; loads stresses and combinations; design of RC bridges; design of non-composite and composite bridges; prestressed bridge; continuous spans, box girders, long span bridges; substructure design for bridges.

2. Scope and Objective

Bridges are the key elements of roadways and transportation networks and play an essential role in the sustained economic growth and social development of any country. This course intends to impart skills for planning, analysis & design of different types of bridge structures at basic as well as at advance level.

3. Text Books

T1: Johnson Victor, D. (2010), “Essentials of Bridge Engineering”, 6th Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. Reference Books

4. Reference Books

R1: Krishna Raju, N, (2018) “Design of Bridges”. Fifth Edition, Oxford & IBH Publishing Co. Pvt, Ltd, New Delhi.

R2: Ponnuswamy, S, (2017) “Bridge Engineering”, 3rd edition, McGraw-Hill Pub., New Delhi.



R3: IRC: 5-2015, “Standard Specifications and code of Practice for road bridges: section I- General features of Design”, Indian Road Congress.

R4: IRC: 6-2017, “Standard Specifications and code of Practice for road bridges: section II- Loads and Stresses”, Indian Road Congress.

R5: IRC: 22-2015, “Standard Specifications and code of Practice for road bridges: section III- Cement Concrete (Plain and Reinforced)”, Indian Road Congress.

R6: IRC:18-2000, “Design criteria for Pre-Stressed Concrete Road Bridges (post-tensioned concrete)”, Indian Road Congress.

R7: IRC: 24-2015, “Standard Specifications and code of Practice for road bridges: section V- Steel Road Bridges”, Indian Road Congress.

R8: IRC:78-2017, “Standard Specifications and code of Practice for road bridges: section VII- Foundation and Substructures”, Indian Road Congress.

R9: IRC:83-2018, “Standard Specifications and code of Practice for road bridges, Section IX Bearings; (Part I): Roller & Rocker Bearings, (Part II): Elastomeric Bearings and (Part III): POT, PIN, Metallic Guide and Plane Sliding Bearings”, Indian Road Congress.

R10: IRC:112-2011,” Code of Practice for Concrete Road Bridges”, Indian Road Congress.

R11: Priestley, M. N., Seible, F., & Calvi, G. M. (1996). Seismic design and retrofit of bridges. John Wiley & Sons.

5. Course Plan

Lecture No.	Learning objectives	Topics to be covered	References
1-3	Introduction	Importance of Bridges, Components of bridge, classification of bridges, Failure of bridges	T1, R1
4-9	Bridge Loading Standards	IRC design standards, Loads on bridges, Impact factors, Loading for Indian railway bridges, Introduction to international bridge design codes	T1, R1, R4
10-15	RCC Bridges	Design of culverts, Slabs spanning in two directions using Pigeaud’s method, Load distribution in longitudinal girders using Courbon’s method, Design of simply supported T-beam bridges	T1, R1
16-18	Prestressed Concrete Bridges	Analysis of prestressed section, design aspects of pre-stressed concrete girders	T1, R1
19-21	Bearings and Expansion Joints	Necessity of bearings, types of bearings, design of steel bearings, designs of elastomeric bearings, necessity and types of expansion joints.	T1, R1
22-26	Bridge Substructures	Types of piers and abutments; Loads to be considered on piers and abutments; Stability analysis of pier and abutment, wing walls and	T1, R1



		approach slabs, features of wing walls	
27-29	Bridge Foundations	Types of bridge foundations, design aspects of pile and well foundations	T1, R1
30-34	Design of Bridges for Earthquake Loading	Failure of bridges in past earthquakes, Seismic design philosophy, Earthquake resistant design of bridge components, Seismic retrofitting of bridges	R4, R11
35-36	Introduction to different types of Bridges	Continuous bridges; Composite bridges; Steel truss bridges, Rigid frame bridges; Cable-stayed bridges	T1, R1
37-42	Finite Element Modelling of Bridges	Grillage analysis of superstructure; Moving load analysis; Modelling techniques for different bridge components – piers, bearings, abutments, and foundations; Introduction to bridge analysis and design software	R11

6. Evaluation Scheme

SNo.	Evaluation Component	Duration (Minutes)	Weightage (%)	Date & Time	Remarks
1	Midsemester Exam	90	30	As per Timetable	OB/CB
2	Viva	10	5	To be announced later in the class	OB
3	Assignments, Project and Seminar	-	30	Continuous evaluation	OB
4	Comprehensive Exam	120	35	As per Timetable	OB/CB

7. Chamber Consultation Hour

Doubt/clarifications should be raised using BITS official email ID. Specific time for online consultation will be announced in the first class of the semester.

8. Notices

Notices concerning this course will be displayed on CMS and Department Notice Board. If Google Classroom is followed, it shall be informed in advance accordingly.

9. Make up policies

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



10. 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.

(SHIVANG SHEKHAR)
Instructor-in-charge
CE G616