Marwadi University
Marwadi Chandarana Group

Bachelor of Technology

Civil Engineering

Railway Bridge & Tunnel Engineering

01CI0512

Objective of the Course:

- To understand fundamentals of planning and design of railway cross section.
- To learn different types of load acting on truss and arch bridges in accordance to codal provisions.
- To explore the fundamentals of methods of tunneling.

Credit Earned: 03

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Identify the components of railway track: materials, sizes, function and importance.
2. Compare different methods of tunnelling.
3. Differentiate the theories, principles, and practices involved in bridge construction.
4. Examine the roles of components in diverging, merging, crossing, signaling and interlocking systems of railway tracks.
5. Design railway tracks using geometric principles for alignment, gradients, and curvature.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	00	03	50	30	20	25	25	150

Detailed Syllabus

Sr. No.	Title of the unit	Number of Hours
1	**Railway Engineering**	**20**
	Introduction: Development of railways in India, Permanent way and railway track components, different gauges in India. **Rail:** Function and types of rails, rail sections, conning of wheels, defects in rails, creep of rails, rail joints and welding of rails. **Sleepers:** Types of sleepers, spacing of sleepers and sleeper density, rail fixtures and fastenings, ballast.	

	Geometric design of railway track: Gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. **Points and crossings:** Turnouts, switches, crossings, track junctions, and its types: splits, diamond, gauntlet, scissor crossovers. **Railway stations & yards:** Requirements, facilities, classifications, platforms, and railway yards: their type, required equipment's in yards. **Signaling and control system:** Objectives, classification, interlocking of signals and points.	
2	**Bridge Engineering**	**16**
	Introduction: Classification of bridges, investigations and planning, choice and type of bridges, components of bridge, factors affecting site selection. **Bridge hydrology:** Design discharge, water way, afflux, scour depth, economical span, general design specifications, loads acting on bridges, live load specifications for road bridges as per IRC. **Methods of erection of different types of bridges:** River training works and maintenance of bridges. Testing and strengthening of bridges.	
3	**Tunnel Engineering**	**06**
	Introduction: Necessity and advantages of a tunnel, classification of tunnels, size and shape of a tunnel, alignment of a tunnel, portals and shafts. **Methods of Tunneling:** Tunneling in hard rock and soft ground, Mucking, lighting and ventilation in tunnel, dust control and drainage of tunnels.	
	Total	**42**

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	10%	35%	30%	15%	5%

Instructional Method and Pedagogy:

1. At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2. Lectures will be taken in class room with the use of multi-media presentations, white board– mix of both.
3. Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.

4. Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation
5. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
6. Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.

Recommended Study Material

1. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press, New Delhi.
2. S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons, New Delhi.
3. S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Principles of Railway Engineering, Charotar Publishing House, Anand.
4. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi.
5. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
6. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai.
7. IS 1893 (Part 1): 2002 - Criteria for Earthquake Resistant Design of Structures, Part 1: General Provisions and Buildings
8. IS 1367 (Part 3): 2002 - Technical Supply Conditions for Threaded Steel Fasteners, Part 3: Hexagon Head Bolts, Screws and Nuts of Product Grade C
9. IRS S-12: 2000 - Specification for 52 Kg, 90 UTS Rails
10. IRS S-23: 2018 - Specification for Fabricated Railway Turnouts and Special Trackwork
11. IRS T-11: 2018 - Specification for Wooden Sleepers for Broad Gauge and Meter Gauge
12. IRS T-39: 2018 - Specification for Elastic Rail Clips
13. IRS T-20: 2002 - Specification for Rail Screws and Fish Bolts and Nuts for Wooden and Concrete Sleepers
14. IRS T-29: 2000 - Specification for Steel Channel Sleepers
15. IRS T-45: 2006 - Specification for Design and Manufacture of Axles for Freight Stock
16. IRS T-48: 2018 - Specification for Fabricated Steel Fish Plates for Rails
17. IRS T-59: 2000 - Specification for Insulated Rail Joints
18. IRS M-30: 2018 - Specification for General Requirements for Rolling Stock Axles
19. RDSO/SPN/177: 2012 - Manual for Standards and Specifications for Railway Stations
20. RDSO/SPN/197: 2018 - Guidelines for Design and Construction of Private Sidings for Private Freight Terminals
21. IRC 78-2014: Standard Specifications and Code of Practice for Road Bridges, Section V - Bearings - applicable to railway bridges
22. IRS BG/T-13: 2011 - Specification for Prestressed Concrete Sleepers for Broad Gauge and Metre Gauge
23. IRS BG/T-46: 2010 - Specification for Design, Fabrication and Erection of Steel Girder Railway Bridges
24. IRS BG/T-57: 2011 - Specification for Fabrication and Erection of Plate Girder Bridges

25. IRS BG/T-43: 2010 - Specification for Fabrication and Erection of Steel Truss Railway Bridges
26. IRS BG/T-47: 2010 - Specification for Fabrication and Erection of Bowstring Girder Railway Bridges
27. RDSO/SPN/192: 2009 - Guidelines for the Design of Substructures of Railway Bridges and Other Structures
28. IRC 73-2015: Guidelines for the Design of Small Tunnels (up to 6m diameter)
29. IS 14481: 1997 - Tunnel Lighting
30. IS 15667: 2006 - Safety Provisions in Tunnels
31. IS 17131: 2018 - Code of Practice for Design and Construction of Tunnels in Rocks
32. IS 19024 (Part 1): 2018 - Earthquake Resistant Design and Construction of Buildings, Part 1: General Provisions and Buildings
33. RDSO/SPN/203: 2011 - Guidelines for the Construction of Tunnels through Rock and Soil