

B.E. (Civil) Semester: V

Subject Name: RAILWAY, BRIDGE AND TUNNEL ENGINEERING (CV505)

A. Course objective :

- Railway, Bridge and Tunnel engineering are the three important aspects of civil engineering.
- Civil engineer has to play a vital role in the design and construction of railway track and other associated structures for safe and efficient movement of the trains.
- All the three aspects have been dealt with extreme care, especially the tunnel engineering on which limited reference is available.

B. Teaching /Examination Scheme

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract/ Tut.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	02	00	05	05	03	70	30	20	30	150

C. Detailed Syllabus:

Module I : Railway engineering

1 Introduction

History, Indian Railways, recent developments, Importance of railways

2 Railway Track Gauge

Different gauges on Indian Railways, affecting factors, Uniformity of gauge loading gauge, construction gauge, Problems caused by change of gauge.

3 Alignment of Railway lines:

Importance, Basic requirements of an ideal alignment, selection of a good alignment ,Rack railway, Survey for track alignment

4 Track and Track stresses

Components, requirements, Cross section of permanent way, Track modulus Forces acting on Track, coning of wheels

5 Rails

Functions, requirement, types of rails, Standard rail sections, Causes of creep, Effects of creep, Measures to reduce creep, bulking, kinks, failure, wear

- 6 Sleeper**
Functions, requirements, types of sleepers, sleeper density and spacing of sleepers.
- 7 Ballast:**
Function, requirement, specifications of track ballast.
- 8 Track fittings**
Fittings and fastening
- 9 Geometric design of Track**
Necessity for geometric design, Details of geometric design of track, Track, Gradients, Grade compensation on curves. Curves and Super elevation
- 10 Resistance to Traction**
Resistance to-friction, wave action, speed, track irregularity, wind, gradient, curvature,
- 11 Points and crossings**
Functions, Turnout, points or switches, Crossings, Gauntleted track, triangle, double junctions, Single slip, double slip
- 12 Railway Stations and yards**
Purpose, selection of site, Facilities, Classification of station, Requirement and types of yard, Ash pit, Water Column, Turn table
- 13 Signaling and interlocking**
Objectives ,Classification, Interlocking

Module II : Bridge Engineering

- 1 General**
Selection of site, Data collection, Stages of investigation, waterway calculations, scours depth, afflux, Free board, Vertical clearance and economic span.
- 2 Classification**
Classification of superstructures with respect to structural behavior and material used, types of substructures, flooring joints, bridge bearings, movable bridges, temporary bridges.
- 3 Construction methods**
Methods of erection of various types of bridges, Superstructures and Substructures.
- 4 Maintenance**
Testing and strengthening of bridges

Module III : Tunnel Engineering

- 1 General**
Necessity/Advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel, Portals and Shafts, Problems in Tunneling
- 2 Tunneling in Hard Rock**
Sequence of operation ,Faces of attack, Methods of tunneling in hard rock

3 Tunneling in Soft Ground

Types and factors affecting the choice of method to sort ground, Methods of tunneling in soft rocks

4 Lighting, Ventilation and Dust control

Tunnel Lighting ,Ventilation of Tunnel, Methods of Ventilation, Dust control

5 Drainage and safety

Drainage of tunnel, Drainage system, Safety

D. Lesson Planning

Sr. No.	Title of the Unit	Minimum Hours	Weightage %
1	Introduction, Railway Track Gauge	2	5
2	Alignment of Railway lines	2	5
3	Track and Track stresses	2	5
4	Rails	2	5
5	Sleeper, Ballast, Track fittings, Resistance to Traction	4	10
6	Geometric design of Track	3	10
7	Points and crossings	3	5
8	Railway Stations and Yards	3	5
9	Signaling and interlocking	2	5
10	Bridge -General	3	10
11	Classification of Bridge	3	5
12	Construction methods	4	5
13	Maintenance	3	5
14	Tunnel-General	2	5
15	Tunneling in Hard Rock	2	5
16	Tunneling in Soft Ground	2	5
17	Lighting, Ventilation , Drainage and safety	3	5
		45	100%

E. List of Tutorial

1	Introduction, Railway Track Gauge, Alignment of Railway lines
2	Track and Track stresses, Rails, Sleeper,
3	Ballast, Track fittings, Geometric design of Track
4	Resistance to Traction, Points and crossings, Railway Stations and Yards, Signaling and interlocking
5	Bridge –General, Classification of Bridge
6	Construction methods, Maintenance
7	Tunnel-General, Tunneling in Hard Rock, Tunneling in Soft Ground, Lighting, Ventilation , Drainage and safety

F. Instructional method and pedagogy (Continuous Internal Assessment Scheme) (CIA)

- At the start of course, the course delivery pattern, prerequisite of the subject will be Discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms Carries Marks
- Internal exam of 30 marks will be conducted as a part of Mid semester evaluation.
- Experiments shall be performed in the field related to course contents.
- The course includes a practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

G. Students Learning Outcomes:

- The students will gain an experience in the implementation of Railway, Bridge and Tunnel Engineering on engineering concepts which are applied in field of Transportation Engineering.
- The students will get a diverse knowledge of Railway, Bridge and Tunnel engineering practices applied to real life problems.
- The students will learn to understand the theoretical and practical aspects of Railway, Bridge and Tunnel engineering engineering along with the design and management applications.

H. Recommended Study Materials

Text Books:

- 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.P.Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi
- 4 S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
- 5 D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai