Lok Jagruti Kendra University
University with a Difference

Diploma in Civil Engineering

LJ Polytechnic

Course Code:025050505

Railway & Bridge Engineering

Programme / Branch Name	Diploma in Civil Engineering					
Course Name	Railway & Bridge Engineering				**Course Code**	025050505
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ No prerequisites

3. Rationale

Railways are the principal mode of transportation for freight and passengers in India. Railways also make it possible to conduct many activities like business, sightseeing and pilgrimage along with transportation of goods over longer distances at less cost. Metro construction projects are also being initiated in many cities of our country. A bridge is a structure built to span a physical obstacle such as a body of water, valley, road or rail without blocking the way underneath. It is constructed for the purpose of providing passage over the obstacle, which is usually something that is otherwise difficult or impossible to cross. The development of railways and bridge is paramount for prosperity of our country. Developmental works in railway and bridge are taking place at a rapid pace due to increase in volume of material being transported within country as well as internationally. This syllabus provides basic information to the diploma holders with the designing, construction procedure, maintenance works, signalizing, interlocking of train systems, railway yards, classification, inspection and maintenance of bridges.

4. Objectives

- ✓ To understand the concept of railway track.
- ✓ To gain knowledge of various rail gauge, sleepers, ballast and rail joints.
- ✓ To get clear vision about railway station and railway yards.
- ✓ To know the importance of bridge and bridge components.
- ✓ To study different types of construction and erection procedure of bridge.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcomes	% Weightage	Hours
1.	**Railway Engineering- Introduction**	1.1. Introduction- History of Railway 1.2. Importance of Railway 1.3. Railway Track Gauge- Definition of Gauge of Track 1.4. Factors Affecting the Choice of a Gauges 1.5. Types of Gauges 1.6. Uniformity in Gauges 1.7. Surveys and Alignment of Railway Lines- Track Alignment 1.8. Importance of Track Alignment 1.9. Requirements of an Ideal Alignment 1.10. Railway Surveys 1.11. Railway Track, Traction & Stress- Components of Railway Track or Permanent Way 1.12. Requirements of an Ideal Permanent Way 1.13. Rails- Functions or Purposes of Rail 1.14. Requirements of an Ideal Rail 1.15. Types of Rail 1.16. Sleepers- Functions of Sleepers 1.17. Types of Sleepers 1.18. Requirements of an Ideal Material for Sleepers 1.19. Materials for Cross Sleepers 1.20. Ballast- Functions of Ballast 1.21. Requirements of an Ideal Material for Ballast 1.22. Materials used as Ballast or Types of Ballast 1.23. Track Fittings- Rail	• Basic Knowledge about Railway Track, Surveys and Alignments of Railway Line. • Learn about the Components of Railway Track. • Gain Detailed Knowledge of Types of Rails, Sleepers, Ballast and Rail Joints.	25	10

		Joints 1.24. Types of Rail Joins 1.25. Fastening for Rails			
2.	**Geometric Design of a Track and Points & Crossing**	2.1. Geometric Design of a Track- General 2.2. Necessity for Geometric Design of Track 2.3. Gradients 2.4. Transition Curves 2.5. Super Elevation or Cant 2.6. Factors Affecting Super elevation 2.7. Cant Deficiency & Negative Super elevation 2.8. Widening of Gauge on Curves 2.9. Points and Crossing- Purpose 2.10. Some Definition 2.11. Types of Crossings 2.12. Laying of Points and Crossings 2.13. Maintenance of Points and Crossings 2.14. Tandems or Double Turn Outs 2.15. Gathering Lines or Ladder Tracks	• Knowledge about Geometric Design of Railway Track. • Understand the Concepts of Points and Crossings.	20	8
3.	**Maintenance of Railway Track, Railway Stations and Yards**	3.1. Railway Station and Yards- General 3.2. Definition of Station 3.3. Purpose of Railway Station 3.4. Selection of Site for Railway Station 3.5. Facilities Required at Railway Station 3.6. Definition of a Yard 3.7. Types of Yards 3.8. Signaling & Interlocking- Objects of Signaling 3.9. Classification of Signals 3.10. Interlocking 3.11. Essential Principles of Interlocking 3.12. Methods of Interlocking	• Learn about Interlocking System and Maintenance of Railway Track. • Classify Railway Yards and Signals.	15	7

		3.13. Drainage 3.14. Maintenance, Accidents & Safety- General 3.15. Necessity for Maintenance of Track			
4.	**Bridge Engineering- Introduction**	4.1. Introduction- General 4.2. Importance of Bridge 4.3. Requirements of an Ideal Bridge 4.4. Selection of Bridge Site 4.5. Preliminary Data to be Collected for Bridge Project 4.6. Choice of Bridge Type 4.7. Components of Bridge 4.8. Economic Span of a Bridge 4.9. Afflux 4.10. Clearance and Freeboard 4.11. Linear Waterway of a Bridge 4.12. Sub Structure- General 4.13. Abutments 4.14. Piers 4.15. Wing Walls 4.16. Selectin Out for Piers & Abutment 4.17. Materials for Sub Structure	• Understand the Importance of Bridges. • Identify the Detailed Components of Bridges. • Basic Concepts for Materials Used for Bridge Construction.	25	10
5.	**Classification, Construction and Maintenance of Bridge**	5.1. History of Bridge Development 5.2. Classification of Bridge 5.3. Construction and Erection Methods of Bridge 5.4. Erection of Steel Girders 5.5. Erection of Suspension Bridge 5.6. Construction of Prestressed Concrete Super Structure 5.7. Erection of R.C.C. & Pre-stress Girder Bridge 5.8. Form Work for Arch Bridge 5.9. Inspection of Bridge	• Gain Detailed Knowledge about the Construction and Erection Procedure for Different Types of Bridge. • Identify the Steps for Inspection and Maintenance of the Bridges.	15	7

		5.10. Maintenance of the Bridges			
				Total Hours	**42**

6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Draw the components of railway track, cross section of a B.G. track in a sketchbook.	Knowledge of Components of Track	6
2.	Draw types of rail, sleepers, ballast sections, rail joints and turn outs in a sketchbook.	Knowledge of Rails, Sleepers, Ballast, Joints and Turn Outs	4
3.	Draw the components of bridge, abutments and piers in a sketchbook.	Knowledge of Detail Bridge Components	2
4.	Conduct a visit of railway track and prepared a detailed report on it.	Practical Concept of Railway Track	2
5.	Prepare a detailed report of the nearby bridge as per the given checklist after performing the visusal inspection.	Knowledge of Bridge Inspection	2
6.	Prepare a detailed report on types of bridge in India.	Microsoft Word Skill	2
7.	Conduct a visit to nearby existing or under construction bridge site and prepare a detailed report on it.	Practical Concept of Bridge Construction.	2
8.	Seminar- The topic of the seminar shall be given to a group of students.	Microsoft Power Point Skill	8
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Railway Engineering- Introduction	42	42	11	0	0	5
2.	Geometric Design of a Track and Points & Crossing	29	51	20	0	0	0
3.	Maintenance of Railway Track, Railway Stations and Yards	30	62	8	0	0	0
4.	Bridge Engineering- Introduction	22	52	26	0	0	0
5.	Classification, Construction and Maintenance of Bridge	21	46	33	0	0	0

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Railway and Bridge Engineering by Ketki B. Dalal, Charotar Publishers.

9. Reference Books

1) Road, Railway, Bridge & Tunnel Engineering by B L Gupta, Standard Publishers, Delhi
2) Road, Railway, Bridge & Tunnel Engineering by Ahuja & Birdi, Standard book house Delhi.
3) Element of Bridge Tunnel and Railway Engineering by S P Bindra & K Bindra, Dhanpat Rai& Sons Delhi.

10. List of Publications

1) Indian Railways Permanent Way Manual, June, 2020.
2) Indian Railways Code For The Engineering Department, 2012
3) Signal Engineering Manual Part 1 & 2.
4) IRC – 6: Standard Specifications and Code of Practice of Road Bridges.
5) IRC 112: Code of Practice for Concrete Road Bridges.

11. Open Sources (Website, Video, Movie)

1) www.nptel.ac.in
2) https://indianrailways.gov.in/railwayboard/uploads/directorate/prd/PR/IRPWM2020.pdf
3) https://pwd.mizoram.gov.in/uploads/attachments/312d7de9995fa30d436a0204dd1e07b3/irc-6-2000-standard-specifications-and-code-of-practice-for-road-bridges.pdf
4) LJP-Civil-Traffic Engineering (YouTube)