RAILWAY INFRASTRUCTURE

(Professional Elective-1)

I Semester

Course Code: 19CE2150	**L**	**P**	**C**
	3	**0**	**3**

Prerequisite: Transportation Engineering

Course Outcomes:

At the end of the Course, the Student will be able to:

CO1 Describe the Zoning, Gauges, Permanent Way, Track Resistance and Hauling Capacity.
CO2 Explain Rails, Sleepers, Ballast & Rail Fastening.
CO3 Design Geometry & Turnout.
CO4 Explain Track Junction, Signals & Interlocking of Track.
CO5 Recognize the concepts of High Speed Tracks, Railway Station and Yards.

UNIT-I: (10 Lectures)

INTRODUCTION TO RAILWAY ENGINEERING

Importance of Transportation-History of Indian Railways-Zoning System-Comparison with road transport

Gauges & Permanent Way

Gauges-Classification on Indian Railways- Specific Gauge, Permanent Way; Wheels, Axles, Coning of Wheels: Wheel and axle arrangement-Track Capacity-Coning of Wheels-Adzing of Sleepers

Track Resistances & Hauling Capacity

Traction-Comparison-Resistances to Traction-Train Resistances, Hauling Capacity-Tractive Effort-Classification of locomotives; Track Modulus & Stresses in Track: Track Modulus-Relief of Stresses;

Stresses in track: Static loading condition; Dynamic effects; Stresses in Component of Track: Stresses in Rail-Sleeper-Ballast-Formation

Learning outcomes:

1. Design Track Resistance and Hauling Capacity(L2)
2. Illustrate Permanent Way and its components(L4)
3. Appraise various stresses in track components

UNIT-II: (10 Lectures)

RAILS

Functions of Rails-Types-Selection-Length of rail-Tests on rails-Rail Deformation & Defects; Creep in Rails -Effect of creep-Theories of creep-Creep Indicator-Methods to reduce creep; Wear & Failures in Rails: Wear in rails-Classification of wear-Effects of rail wear Permissible Limits-Remedial Measures; Jointed or Welded Rails: Rail Joints- Welding of Rails-Advantages of Welded rails-Short Welded Rails-Long Welded Rails

SLEEPERS, BALLAST & FASTENING:

Sleeper: Functions-Requirements-Types-Sleeper Density-Spacing Ballast: Definition-Requirements-Types-Ballast Cushion Specifications, Rail Fastening- Fastening Types

Learning outcomes:

1. Discuss about Sleepers, Ballast and Fastenings(L2)
2. Illustrate about Rails Functions, Types, Test and Defects(L4)
3. Compare various creep theories in rails (L6)

UNIT-III: (10 Lectures)

GEOMETRIC DESIGN

Horizontal Profile-Vertical Profile-Speed on track-Necessity of geometric design-Alignment Selection Horizontal Curve and Superelevation: Curves-Degree of curve-field setting-Superelevation Design-Negative Superelevation; Speeds on Track: Speed and its effect-Safe Speed-Equilibrium Speed-Maximum permissible speed-Computation of speed and cant; Transition Curve, Widening of track, Vertical Curve-Summit Curve-Valley Curve, Gradients, Turnout-Types-Components of a turnout-Points & Switches; Crossing Working of a turnout-Angle of Crossing and its measurement-Design of turnout

Learning outcomes:

1.Design Horizontal Alignment, Superelevation, Curves(L5)
2.Design Curve Widening and Vertical alignment(L5)
3.Design of turnout(L5)

UNIT-IV: (10 Lectures)

TRACK JUNCTIONS AND DESIGNS

Track Junctions/Crossover-Design

SIGNALS Signals-Objectives-Classification; Train Control Systems: Basic Objectives-Non-Block and Block System

INTERLOCKING OF TRACK

Interlocking-Principles-Standards-Methods-Devices

Learning outcomes:

1.Discuss about Signals, Interlocking of Tracks(L2)
2.Illustrate Track Junctions(L4)
3. Compare various types of Signals(L6)

UNIT-V: (10 Lectures)

HIGH SPEED TRACKS

High Speed Tracks-Traction-Modernization of Track-Effects of High Speed-Limitations of Super High Speed-Concepts of Super High Speed ; Dedicated Freight Corridor.

RAILWAY STATION AND YARDS

Station-Purpose-Selection of Site-Features of railway station-Types of station; Yard-Types

Learning outcomes:

1.Visualize Concepts of High Speed Tracks and Dedicated Freight Corridor(L1)
2. Discuss about Railway Stations and Yards (L2)
3.Examine the limitations of Super High Speed (L4)

Text Books:

1. Mundrey J.S, *Railway Track Engineering*, McGraw Hill Publications, 4th Edition, 2010.

2. Satish Chandra, Agarwal M. M, Railway Engineering, 1st Edition, Oxford University Press, 2007.

References:

1. Chandola, S.P. *Railway Engineering - A Text book of Transportation Engineering*, S. Chand & Co. Ltd. 2001.

2. Rangwala.S.C, *Railway Engineering*, 23rd Edition, Charoatar Publishing House Pvt.Ltd, 2012

3. Saxena S.C and Arora S.P, *Railway Engineering*, Dhanpat Rai Publications, 6th Edition, 2004.

4. Rajat Rastogi, *Transportation Engineering-II*, NPTEL Videos.