# SCHEME OF COURSE WORK

**Course Details:**

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| **Course Title** | **: Railway Infrastructure** | | |
| **Course Code** | **:** 19CE2150 | **L P C** | **: 3 0 3** |
| **Program:** | **:M. Tech.** | | |
| **Specialization:** | **: Infrastructure Engineering and Management** | | |
| **Semester** | **: I** | | |
| **Prerequisites** | **: None** | | |
| **Courses to which it is a prerequisite** | **: None** | | |

**Course Outcomes (COs):**
At the end of the course, the student will be able to:

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| 1 | Describe the Zoning, Gauges, Permanent Way, Track Resistance & Hauling Capacity. |
| 2 | Explain Rails, Sleepers, Ballast & Rail Fastening |
| 3 | Design Geometry & Turnout |
| 4 | Explain Track Junction, Signals & Interlocking of Track |
| 5 | Summarize the concepts of High Speed Tracks, Railway Station and Yards |

**Program Outcomes (POs):**
Post graduates will be able to:

1. Synthesize existing and new knowledge in various sub areas of infrastructural engineering.
2. Analyse complex engineering problems critically with adequate theoretical background for practical applications.
3. Evaluate a wide range of feasible and optimal solutions after considering safety and environmental factors.
4. Demonstrate the ability to pursue research by conducting experiments and extract the relevant information through literature surveys.
5. Use state –of- the- art of modern tools for interpreting the behavior and modeling of complex engineering structures.
6. Attain the capability to work in multi-disciplinary teams to achieve common goals.
7. Demonstrate the knowledge to perform the projects efficiently in multi-disciplinary environments after consideration of economical and financial matters.
8. Communicate effectively on complex engineering activities to prepare reports and make presentations.
9. Engage in life-long learning independently to improve knowledge.
10. Understand the responsibility of carrying out professional practices ethically for sustainable development of society.
11. Examine critically and independently one's actions and take corrective measures by

**Course Outcome versus Program Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
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| **CO-1** | S | | M | | | M | | | | M | M | M |
| **CO-2** | M | S | S | M | | M | | | | M | M | M |
| **CO-3** | M | S | M | M | | M | | | | M | M | M |
| **CO-4** | S | M | | S | | M | | | | M | M | M |
| **CO-5** | S | S | S | M | S | M | | M | | M | M | M |

*S - Strongly correlated, M - Moderately* correlated, *Blank - No correlation*

| **Assessment Methods:** | Assignment / Seminar / Mid-Test / End Exam |
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## Teaching-Learning and Evaluation

| Week No. | TOPIC / CONTENTS | Course Outcomes | Sample questions | TEACHING-LEARNING STRATEGY | Assessment Method & Schedule |
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| 1 | Importance of Transportation-History of Indian Railways-Zoning System-Comparison with road transport | CO-1 | Explain the importance of transportation. | ◊ Lecture<br>◊ Demonstration | Assignment -1 |
| 2 | Gauges-Classification on Indian Railways-Problems of Multi-Gauge System-Uni-gauge Policy on Indian railways-Specific Gauge- Permanent Way; Wheels,Axles, Coning Of Wheels: Wheel and axle arrangement-Track Capacity-Coning of Wheels-Adzing of Sleepers | CO-1 | Discuss various gauge used in India | ◊ Lecture / Discussion | Mid-Test 1 (Week 9) |
| 3 | 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 | CO-1 | What is Track Modulus? | ◊ Lecture<br>◊ Discussion | |
| 4 | 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 | CO-2 | Explain the creep in rails | ◊ Lecture / Discussion | |

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| | Welded Rails: Rail Joints- Welding of Rails-Advantages of Welded rails-Short Welded Rails-Long Welded Rails | | | | |
| 5 | Sleeper: Functions-Requirements-Types-Sleeper Density-Spacing Ballast: Definition-Requirements-Types-Ballast Cushion-Specifications, Rail Fastening-Fastening Types | CO-2 | What are the requirements of good ballast? | ◊ Lecture / Discussion | |
| 6 | Horizontal Profile-Vertical Profile-Speed on track-Necessity of geometric design-Alignment Selection Horizontal Curve and Super elevation: Curves-Degree of curve-field setting-Super Elevation Design-Negative Super elevation; | CO-3 | What is the necessity of geometric design? | ◊ Lecture / Discussion | |
| 7 | 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 | CO-3 | What is Cant? | ◊ Lecture<br>◊ Problem solving | Quiz-1 |
| 8 | Turnout-Types-Components of a turnout-Points & Switches; Crossing-Working of a turnout-Angle of Crossing and its measurement-Design of turnout | CO-3 | What are the components of turnout? | ◊ Lecture<br>◊ Problem solving | |
| **9** | **MID TEST – I** | | | | |
| 10 | Track Junctions/Crossover-Design | CO-4 | Explain the design procedure of Track Junction | ◊ Lecture<br>◊ Discussion | Mid-Test 2 (Week 18) |
| 11 | Signals-Objectives-Classification; Train Control Systems: | CO-4 | How the signal are classified? | ◊ Lecture / Discussion | Assignment 2 |
| 12 | Basic Objectives-Non-Block & Block System | CO-4 | What the objectives of Block System? | ◊ Lecture / Discussion | |
| 13 | Interlocking-Principles-Standards-Methods-Devices | CO-4 | What the principles of interlocking? | ◊ Lecture / Discussion | |
| 14 | High Speed Tracks-Traction-Modernization of Track- | CO-5 | What are various High speed tracks? | ◊ Lecture / Discussion | |
| 15 | Effects of High Speed-Limitations of Super High Speed-Concepts of Super High Speed | CO-5 | What are the limitations of High speed tracks? | ◊ Lecture / Discussion | |
| 16 | Station-Purpose-Selection of Site | CO-5 | How the site is selected for Station? | ◊ Lecture / Discussion | Quiz-2 |

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| 17 | -Features of railway station-Types of station; Yard-Types | CO-5 | What is Yard? What is the purpose of it? | ◊ Lecture / Discussion | |
| **18** | **MID TEST – II** | | | | |
| **19/20** | **END EXAM** | | | | |