

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**PDDC - CIVIL ENGINEERING**  
**Semester: III**

Subject: **Railway, Bridges And Tunnels**

**(A) Railway**

| <b>Sr. No.</b> | <b>Course content</b>                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <b>1.</b>      | <b>Introduction:</b><br>History, Indian Railways, recent developments.                                                                                                                                                                                                                                                                                                                                                 |
| <b>2.</b>      | <b>Gauge:</b><br>Definition, types-Broad gauge, meter gauge, narrow gauge, loading gauge, construction gauge .Problems of change of gauge.                                                                                                                                                                                                                                                                             |
| <b>3.</b>      | <b>Alignment</b><br>Definition, importance, factors, requirements of an ideal alignment.                                                                                                                                                                                                                                                                                                                               |
| <b>4.</b>      | <b>Permanent way:</b><br>Definition, requirements.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>5.</b>      | <b>Rails:</b><br>Functions, types, flat footed rail, coning of wheels, creep, causes of creep, Effects of creep, Measures to reduce creep.                                                                                                                                                                                                                                                                             |
| <b>6.</b>      | <b>Sleeper:</b><br>Functions, requirements, types-concrete, wooden, C.I.,Steel, spacing, sleeper density, examples.                                                                                                                                                                                                                                                                                                    |
| <b>7.</b>      | <b>Ballast:</b><br>Function, specifications.                                                                                                                                                                                                                                                                                                                                                                           |
| <b>8.</b>      | <b>Track fittings:</b><br>Fittings and fastening                                                                                                                                                                                                                                                                                                                                                                       |
| <b>9.</b>      | <b>Geometric design</b><br>Necessity & parameters of geometric design, gradient-definition, purpose, types-ruling, pusher helper, momentum gradient, gradient in station & yards, grade compensation, examples curves-necessity, degree of curve (radius of curve), relationship-versine of a curve & radius, maximum permissible speed on fully transitioned curve, super elevation(Cant), cant deficiency, examples. |

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| <b>10.</b> | <b>Resistance to Traction:</b><br><br>Resistance to-friction, wave action, speed, track irregularity, wind, gradient, curvature, starting and accelerating. Stress in rails, sleepers, ballast and formation,                                                                                                                                                |
| <b>11.</b> | <b>Points and crossings:</b><br><br>Functions, various terms, track layouts and sketches of turn out, diamond crossing, gauntleted track, triangle, double junction, cross over-between two parallel tracks with intermediate straight, scissors cross over, single slip, double slip, gatherings line, examples                                             |
| <b>12.</b> | <b>Stations and yards:</b><br><br>Purpose, facilities required at railway stations. requirements of station yard, classification as per function, wayside (crossing) station layout. Types of yards- definition, layout, functions, principles followed, various types, marshal yard. Layout of wayside stations, junctions and terminals, marshalling yards |
| <b>13.</b> | <b>Signaling and interlocking:</b><br><br>Objects, classification, electronic signaling. System,                                                                                                                                                                                                                                                             |

#### **(B) Bridge**

| <b>Sr. No.</b> | <b>Course Content</b>                                                                                                                                                                                                 |
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| <b>1.</b>      | <b>General:</b><br><br>Site investigation, waterway calculations, scours depth, afflux, economic Span.                                                                                                                |
| <b>2.</b>      | <b>Classification :</b><br><br>Classification of superstructures with respect to structural behavior and material used, types of substructures, flooring joints, bridge bearings, movable bridges, temporary bridges. |
| <b>3.</b>      | <b>Construction methods:</b><br><br>Methods of erection of various types of bridges, Superstructures and substructures.                                                                                               |
| <b>4.</b>      | <b>Maintenance:</b><br><br>Testing and strengthening of bridges.                                                                                                                                                      |

**(C) Tunnels:**

| <b>Sr. No.</b> | <b>Course Content</b>                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.</b>      | <b>General:</b><br><br>Definition, advantages and disadvantages of tunnel, uses of tunnel, survey, various shape, size and sketches of tunnel for roads and railways, selection of route. Tunnel lining. |
| <b>2.</b>      | <b>Tunneling in soft ground:</b><br><br>Methods of fore-poling and needle beam, shield and use of shield plenum process, transferring centerline.                                                        |
| <b>3.</b>      | <b>Tunneling in hard rock:</b><br><br>Methods of tunneling, tunnel Boring Machine, drilling.                                                                                                             |
| <b>4.</b>      | <b>Lighting and Ventilation:</b><br><br>Dust control, control of water, safety measures.                                                                                                                 |

**Term Work**

Term work shall be based on the above mentioned course content.

**Field Visit:**

Field visits based on course content are suggested.

**Reference Books:**

1. Railway Engineering by Saxena S.C. and Arora S. P.
2. Principles and practice of bridge engineering by Bindra S. P.
3. Tunnel engineering by Saxena S.C.
4. Railway Engineering by Satish Chandra and Agrawal M.M.

