

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CIVIL ENGINEERING RAILWAY, BRIDGE AND TUNNEL ENGINEERING SUBJECT CODE: 2160603 B.E. 6<sup>th</sup> SEMESTER

**Type of course:** Compulsory

**Prerequisite:** Nil

**Rationale:** Railway is important mode of surface transportation. Railways are economic for the long distance transportation of passengers and freight on the land. India has the second largest Railway network in the world. At present in the India, the share of goods transportation in railway is reduced than the roadways. There is a very good scope of developing high speed trains and special corridors for freight transportation in India. Bridges and Tunnels are essential to provide safe and economic passage over/through obstructions to railway or road corridor. The study of this subject provides necessary knowledge of railway track, its component parts, geometric design, points and crossings, stations and yards, signaling and control system, maintenance, modern development and safety in railways. It also provides knowledge of types of bridges, bridge super structure and sub structure, loads acting on bridges, bridge hydrology, bridge maintenance, tunnel alignment, tunnel construction in different types of grounds, tunnel - ventilation, lining, safety and lighting.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
PA	ALA	ESE		OEP						
3	1	0	4	70	20	10	30	0	20	150

### Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, function and types of rails, rail sections, defects in rails, creep of rails, rail joints and welding of rails, sleepers – types, spacing and density, rail fixtures and fastenings, ballast, subgrade and embankment.	5	12
2	Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves.	5	13
3	Railway traction and track resistance, stresses in railway track – rails, sleepers, ballast. Points and crossings – turnouts, switches, crossings. Track junctions – types, splits, diamond, gauntlet, scissor crossovers. Railway stations - requirements, facilities, classifications, platforms,	6	15

	loops, sidings. Railway yards – types, required equipments in yards. Signalling and control system – objectives, classification, Interlocking of signals and points.		
<b>4</b>	Railway track - construction, drainage, maintenance. Recent developments in railways – high speed trains, modernization in track for high speed, Metro rails, Monorail, automation in operation and control. Safety in railways – accidents and remedial measures.	<b>4</b>	<b>10</b>
<b>5</b>	Bridges: Classification of bridges – with respect to construction materials, structural behavior of super structure, span, sub structure, purpose. Temporary and movable bridges. Factors affecting site selection. Various loads/stresses acting on bridges. Bridge hydrology – design discharge, water way, afflux, scour depth, economical span. Bridge components – foundation, piers, abutments, wing wall, approach, bearings, floor, girders, cables, suspenders. Methods of erection of different types of bridges. River training works and maintenance of bridges. Testing and strengthening of bridges. Bridge architect.	<b>14</b>	<b>30</b>
<b>6</b>	Tunnels: Necessity/advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel, Portals and Shafts, Methods of Tunneling in Hard Rock and Soft ground, Mucking, Lighting and Ventilation in tunnel, Dust control, Drainage of tunnels, Safety in tunnel construction.	<b>8</b>	<b>20</b>

**Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>15</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>15</b>	<b>10</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference 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.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Principles of Railway Engineering, Charotar Publishing House, Anand.
4. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi
5. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
6. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai

**Course Outcome:**

After learning the course the students should be able to:

1. Know about railway track components, their materials, size, function and importance
2. Carry out geometric design of railway track
3. Know about various components in diverging, merging and crossings of railway tracks, stations, yards, signaling, interlocking and control systems.
4. Know about requirements of railway track for high speed trains, safety aspects and maintenance.
5. Understand about different types of bridges, their components, loads/stresses acting on bridges, requirement and function of the components, hydrological design, methods of erection, maintenance of bridges.
6. Understand about importance, types, methods of construction, mucking, ventilation, lining and lighting in Tunnels.

**List of Tutorials:**

Field visit of - Railway station and yard, Bridge site, Tunnel site.

1. Geometric design of railway track
2. Bridge components' design using hydrological data of a selected river site.

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.