

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: RAILWAY ENGINEERING
(Code: 3346003)

Diploma Programmes In Which This Course Is Offered	Semester In Which Offered
Transportation Engineering	4 th Semester

1. RATIONALE

Railway engineering is one of the major components of transportation engineering. In India, railway is still the most popular and demanding mode of transport in the entire transportation system. Therefore, knowledge and understanding of railway engineering is very important for the engineers working at railway engineering projects in order to make Structures safe and serviceable. At diploma level, students are expected to study about various aspects of railway engineering so as to develop their understanding in order to apply their knowledge in construction industry.

2. COMPETENCIES

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competencies:

- Comprehend different parts of the rail track, their functions and its operation system with respect to construction and engineering applications
- Explain essential features and requirements of different types of crossings and signal system, maintenance of tracks and required procedures.

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Explain Components of Railway Track, different Railway Gauges
- ii. Design track Gradients as per given requirements
- iii. Discuss various Types of Track Turnouts
- iv. Describe purposes and facilities at Railway Stations
- v. Explain Interlocking and modern signal system
- vi. Describe Surface Defects on Railway Track and Their Remedial Measures

4. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme(In Hours)			Total Credits (L+T+P)	Examination Schedule				Total Marks
L	T	P		Theory Marks		Practical Marks		
2	0	2	4	ESE	PA	ESE	PA	150
				70	30	20	30	

Legends: L -Lecture; T -Tutorial/Teacher Guided Student Activity; P -Practical; C - Credit; ESE-End Semester Examination; PA - Progressive Assessment

5. DETAILED COURSE CONTAINTS

Unit	Major Learning Outcomes	Topic And Sub-Topics
Unit-I Introduction, Alignment of Railway Lines Rails, Track Fittings and Track Stresses	1a. Describe history and recent developments in railways 1b. Explain Components of Railway Track, different Railway Gauges 1c. Discuss requirements of an ideal alignment 1d. Comprehend the Standard Rail Sections 1e. Explain Causes and effects of Creep and Measures to Reduce Creep. 1f. Explain Fittings and Fastening and their Requirements. 1g. Discuss Forces Acting on Track and Coning of Wheels	1.1 History of Indian Railways, 1.2 Importance of Railways For Environment 1.3 Recent Developments. 1.4 Role of Civil Engineers In Construction And Maintenance, 1.5 Components of Railway Track 1.6 Definition of Railway Gauges, Types, Uniformity of Gauge. 1.7 Different Gauges on Indian Railways, 1.8 Cross- Section of Permanent Way as Per IRS 1.9 Problems Caused By Change of Gauge. 1.10 Basic Requirements and selection of An Ideal Alignment 1.11 Functions and Types Of Rails 1.12 Standard Rail Sections, 1.13 Causes and Effects Of Creep, 1.14 Measures To Reduce Creep. 1.15 Fittings and Fastening and their requirements . 1.16 Forces Acting On Track, 1.17 Coning Of Wheels
Unit- II Sleeper & Geometric Design of Track	2a. Describe Functions & Requirements of sleepers 2b. Explain Method of Fixing Rails with Pre-stressed Concrete and Wooden Sleepers, 2c. Explain the necessity and details of geometric design 2d. Design track Gradients as per given requirements	2.1 Functions & Requirements of sleepers 2.2 Types and Spacing of Sleepers, 2.3 Method Of Fixing Rails With Pre-stressed Concrete And Wooden Sleepers, 2.4 Function and Specifications of Track Ballast 2.5 Necessity and Details of geometric design of track 2.6 Design of track Gradients, 2.7 Grade compensation on curves. 2.8 Curves and Super elevation.

Unit- III Resistance to Traction, Points And Crossings	3a. Describe resistance to-friction 3b. Explain stress in rails 3c. Explain Necessity of Points & Crossing 3d. Draw Track Layouts And Sketches of Turn Out, 3e. Discuss various Types of Track Turnouts	3.1 Resistance to-friction, wave action, speed, track irregularity, wind, 3.2 Resistance to gradient, curvature, starting and accelerating. 3.3 Stress in rails, sleepers, ballast and formation 3.4 Necessity of Points & Crossing 3.5 Track Layouts And Sketches of Turn Out, 3.6 Types Of Crossing 3.7 Types of Track Turnouts
Unit-IV Railway Stations and Yards	4a. Describe purposes and facilities at Railway Stations. 4b. Explain Station Yard	4.1. Purposes 4.2. Facilities Required at Railway Stations. 4.3. Requirements Of Station Yard, 4.4. Classification Of Railway Stations, 4.5. Types Of Yards
Unit-V Signaling And Interlocking	5a. Describe objectives of signaling 5b. Explain Interlocking and modern signal system	5.1 Objectives of signaling 5.2 Classification of signals 5.3 Types and working of Interlocking 5.4 Modern signal system
Unit-VI Maintenance Of Railway Track	6a. Explain various types of railway track Maintenance 6b. Describe Surface Defects and Their Remedial Measures	6.1. Introduction of Maintenance Programme. 6.2. Monsoon, Pre-Monsoon & Post- Monsoon Maintenance. 6.3. Causes For Maintenance, 6.4. Routine Maintenance 6.5. Tools For Railway Track Maintenance & Their Functions. 6.6. Surface Defects And Their Remedial Measures

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution Of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction, Alignment Of Railway Lines Rails, Track Fittings And Track Stresses	07	06	05	04	15
II	Sleeper & Geometric design of Track	06	06	06	03	15
III	Resistance to Traction, Points And Crossings	07	05	05	07	17
IV	Railway Stations And Yards	02	02	02	03	07
V	Signaling And Interlocking	03	02	02	04	08
VI	Maintenance of Railway Track	03	02	03	03	08
	Total	28	23	23	24	70

Legends: R = Remember; U= Understand; A= Apply and above Levels (Bloom's Revised 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.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise	Approx. Hrs. Required
1	I, II, III	The Student Shall Draw The Dimensional Sketches(Along with Brief Note)of Different gauges(as per IRC), different rail sections, sleepers, track fittings, points and crossings	10
2	III, IV	Visit to an Existing railway station and yard having all Features and prepare a brief report of the Visit.	8
3	-	Seminar on the Select Topic from above Topics or Sub-Topics Student are required to submit and Present/Defend the Seminar in the Presence of Students and Teacher	6
4	V	Visit to nearby railway crossing for signaling and locking system and student shall be required to submit a brief report of the Visit.	4
Total Hrs			28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Students may be asked to collect photographs from internet which is related to field application of various topics.
- ii. Students may visit nearby railway station and nearby rail track under construction if any.

9. SPECIAL INSTRUCTIONAL STRATEGIES

Unit No.	Topic / Sub Topic	Instructional strategies
I	Gauges of Railway	PPT/Transperancy
II	Rails, Track fittings, sleepers	Model or PPT
II	Geometric Design	Site Visit to Rail under construction or Existing track
III to VI	Points & crossing, Stations& yards	Site Visit to Rly station, yards, Vedio/animation films
ALL	Tutorials and Assignments	Handouts

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No	Title Of Book	Author	Publication
1.	Railway Engineering,	Satish Chandra and M.M. Agrawal,	Oxford University Press, New Delhi
2.	A Text Book of Railway Engineering	S.C. Saxena and S. P. Arora	Dhanpat Rai & Sons, Delhi
4.	Roads, Railways, Bridges & Tunnel Engineering	T.D.Ahuja & G.S.Birdie	-
6.	Transportation Engineering Vol. I & Ii	Vazirani & Chandola	-

B. List of Major Equipment/Instruments/Materials Not Applicable

C. List of Software/Learning Websites

- i. [www. Railway. Wikipedia](http://www.Railway.Wikipedia)
- ii. [www. Indian rail. com](http://www.Indian.rail.com)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members From Polytechnics

- **Prof. (Mrs.) S. B. Khara** , LCE, Government Polytechnic for Girls, Ahmedabad
- **Prof. R. V. Bhatt** , LCE, Government Polytechnic for Girls, Ahmedabad
- **Prof. (Ms.) M. A. Milisia** , LCE, Government Polytechnic for Girls, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Subrat Roy**, Professor, Department of Civil and Environmental Engineering