

GANPAT UNIVERSITY					
FACULTY OF DIPLOMA ENGINEERING					
Programme	Diploma in Civil Engineering				
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2026-27	Effective for the batch Admitted in		JULY 2025
Course code	1CI3104	Course Name	Transportation Engineering		

I. TEACHING-LEARNING AND ASSESSMENT SCHEME																			
Course Type	Course code	Course Title	Teaching & Learning Scheme									Examination Scheme							
			Credit				Actual Contact Hrs/week			SLH	Total Learning Hrs/Week	TH			PR			SLA	Total
			CL	TL	LL	Total	CL	TL	LL			CE	SEE	Total	CE	SEE	Total		
DSC	1CI3104	Transportation Engineering	3	0	1	4	3	0	2	3	8	40	60	100	30	20	50	20	170

Abbreviation:	CL- Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	NLH - Notional Learning Hours	SLA - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		SA - Summative Assessment

II. PRE-REQUISITES
Students should have a basic knowledge of civil engineering, mathematics, and surveying, and possess a strong motivation to enhance their problem-solving skills.
III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES
Employers expect graduates to apply transportation engineering in design, construction, and maintenance, focusing on safety, problem-solving, and effective communication for durable infrastructure.
IV. COURSE LEARNING OUTCOMES
At the end of the course, students will be able to achieve the following course learning outcomes: CO1: Analyze the importance of transportation engineering and apply the principles of road design and alignment in real-world infrastructure projects. CO2: Understand the factors affecting road geometric design and apply key concepts like camber and sight distance in road planning. CO3: Remember different road construction methods, analyze soil stabilization techniques, and apply maintenance practices to prevent pavement failures. CO4: Understand the role of drainage systems in road and railway infrastructure and apply effective maintenance techniques for water management. CO5: Remember the components and design aspects of railway tracks and bridges, and apply proper maintenance practices to ensure their safety and functionality.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:				
Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 Introduction	TLO 1.1 Discuss various Modes of transportation TLO 1.2 Explain the various Components of a road section. TLO 1.3 Demonstrate the basic requirement of road Alignment. TLO 1.4 Describe various terms used in road geometry.	1.1 Importance of Transportation Engineering. 1.2 Mode of Transportation Engineering. 1.3 Classification of Road 1.4 Importance & Advantages of Road Transportation. 1.5 Road alignment and their types, Requirement of good alignment & factors affecting Road alignment 1.6 Engineering Survey Road Location, Map & Drawing	06	04

		Required for Road Project.		
Unit-2 Road Geometric Design	TLO 2.1 Demonstrate the basic requirement of road alignment TLO 2.2 Describe various terms used in road geometry	2.1 Road geometric design and factor affecting Road geometric Design. 2.2 Different Cross section of road Showing its component as per IRC. 2.3 Function of each component Terms used in road geometry Camber, sight distance, Super elevation, Widening of Road, 2.4 Transition curve and Gradient	07	06
Unit-3 Road Construction And Maintenance	TLO 3.1 Describe various types of road construction methods. TLO 3.2 Explain various types of failures and maintenance of road. TLO 3.3 Explain various types of tests on road materials.	3.1 Types of Pavement 3.2 Necessity of Soil Stabilization 3.3 Types of materials used in road Construction 3.4 Various tests on Aggregate and bitumen 3.5 Brief on Construction of Flexible and Rigid Pavement. 3.6 Types of Failures in roads 3.7 Maintenance of roads and its Components.	08	06
Unit-4 Road Drainage	TLO 4.1 Explain importance of drainage and its maintenance	4.1 Importance and Purpose of Drainage 4.2 Methods and Construction surface & Subsurface drainage 4.3 Maintenance of drainage System	04	04
Unit-5 Introduction of Railway Engineering	TLO 5.1 Describe the basic parts of railway track and its Functions. TLO 5.2 Explain the Joints and Gauge. TLO 5.3 Explain basic knowledge of points and Crossing.	4.1 Cross- section of various Permanent way and Functions of Various Component 4.2 Methods fixing Rail with Sleeper. 4.3 Rail joints, Types of Railway gauge and Uniformity of gauge.	06	04
Unit-6 Railway point Crossing and Yards	TLO 6.1 Discuss the function of various yards.	6.1 Point Crossing and factors Affecting Point crossing. 6.2 Turn out and types of Crossing 6.3 Classification and Functions of Yards.	09	05
Unit-7 Railway Track Maintenance	TLO 7.1 Explain requirement of track Maintenance	7.1 Requirement of Track Maintenance. 7.2 Daily and periodical Maintenance. 7.3 Maintenance of Alignment, Drainage, Track Material and its components, Point and crossing and level crossing.	05	05

Unit-8 Introduction And Investigation of Bridge	TLO 8.1 Discuss the function of various parts of bridge. TLO 8.2 Explain terms related to bridge. TLO 8.3 Explain requirement of an ideal bridge	8.1 Components Bridge Engineering 8.2 Classification of Bridge 8.3 Site selection of bridge 8.4 Requirement of an ideal bridge 8.5 Types of Bridge alignment 8.6 Technical term: Scour, Afflux, Run- off, Economic Span, Clearance, Free board	10	07
Unit-9 Maintenance of Bridge	TLO 9.1 Carry out the maintenance report	9.1 Defects In Bridge. 9.2 Inspection of Bridge and Preparation of Inspection Report of Bridge. 9.3 Maintenance of Steel Bridge, Masonry Bridge, Cause Way, Piers, Pile bents, Abutment, Wing Wall, Road Surface, Drainage, Parapet Wall and Bearing.	05	04

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	Practical/Laboratory Learning Outcome (LLO)	Practical Titles	Relevant COs
1	LLO 1.1 Evaluate the toughness and durability of aggregates used in road construction.	Conduct aggregate Impact test.	CO1, CO5
2	LLO 1.2 Assess the crushing strength of aggregates to determine their suitability for construction.	Conduct aggregate crushing test.	CO1, CO5
3	LLO 1.3 Measure the softening point of bitumen to assess its performance under varying temperatures.	Conduct Softening Point test on Bitumen.	CO3
4	LLO 1.4 Determine the consistency and hardness of bitumen for appropriate road construction.	Conduct Penetration test on Bitumen.	CO3
5	LLO 1.5 Measure the flash and fire points of bitumen to ensure safe handling and use.	Conduct Flash and Fire Point test on Bitumen.	CO3
6	LLO 1.6 Assess the flexibility and deformation properties of bitumen for road durability.	Conduct Ductility test on Bitumen.	CO3
7	LLO 1.7 Determine the strength of soils and sub grades for road foundation design.	Conduct California Bearing Ratio Test.	CO3, CO4
8	LLO 1.8 Sketch road junctions, curves, and widening, understanding their role in traffic flow and safety.	Draw the dimensional sketches of cross section of road (with function of each part of road) , road junction, road curve and widening	CO1, CO2, CO4
9	LLO 1.9 Create sketches of railway components, understanding their functions in track systems. Draw different types of bridges, understanding their components and functions in transportation.	Draw the dimensional sketches of cross section of permanent way & points & crossing (with function of each part of road), Draw the sketches of various bridges	CO5

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Students can enhance their understanding by researching and comparing different transportation modes, studying road design standards, and analyzing case studies on drainage systems, road construction, and railway track maintenance.
- Engaging in real-world observations, such as visiting construction sites or studying local bridges, will develop practical skills.
- Additionally, exploring online courses and webinars, using design software, and preparing presentations on railway and bridge components will improve technical and communication abilities. These activities foster problem-solving, critical thinking, and self-directed learning in transportation engineering.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	UTI/ Compression testing machine
2	Sets of sieve and sieve shaker
3	Abrasion testing machine with balls
4	Impact machine
5	Weighing machine of required capacity.
6	Penotrometer for bitumen testing
7	C.B.R. testing machine
8	Pensky-martens closed tester
9	Ring and ball apparatus

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Highway Engineering	S.K.Khanna & Justo	Khanna publication, Delhi
2	Highway Engineering	L.R. Kadiyali	Charotar Publication, Anand
3	Highway Engineering	S. C. Rangwala	Charotar Publication, Anand

X. LINK OF LEARNING WEB RESOURCE

1	www.waterbouw.tudelft.nl/
2	www.shiksha.com
3	www. Indianrail.com

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Introduction	CO1	04	4	1	1	6
2	Road Geometric Design	CO2	06	1	2	4	7
3	Road Construction And Maintenance	CO3	06	3	3	2	8
4	Road Drainage	CO4	04	1	2	1	4
5	Introduction of Railway Engineering	CO5	04	2	2	2	6
6	Railway point Crossing and Yards	CO5	05	3	4	2	9
7	Railway Track Maintenance	CO4,CO5	05	1	2	2	5
8	Introduction And Investigation of Bridge	CO5	07	4	4	2	10
9	Maintenance of Bridge	CO5	04	2	2	1	5
	Grand Total		45	21	22	17	60

XII. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	1	3	2	2
CO2	3	3	2	1	1	1	1	3	1	2
CO3	3	2	2	2	2	1	1	3	2	2
CO4	2	2	1	2	3	1	1	2	2	2
CO5	3	2	2	2	2	2	1	3	2	2
Legends: -3- High 2-Moderate/Medium 1-Slight/Low 0-None										