



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code: DI04006081

Subject Name: Traffic Engineering

<b>w. e. f. Academic Year:</b>	2025-26
<b>Semester:</b>	4 <sup>th</sup>
<b>Category of the Course:</b>	Professional Elective - II

<b>Prerequisite:</b>	Students should have a basic understanding of road construction and surveying, along with knowledge of fundamental mathematics. An interest in studying traffic flow, road safety, and transportation systems will help them in learning this subject effectively.
<b>Rationale:</b>	Traffic engineering is essential for ensuring the safe and efficient movement of people and vehicles on roadways. It equips diploma engineers with knowledge of road user behaviour, vehicular characteristics, and roadway elements that affect traffic flow. Students learn to conduct various traffic surveys, analyse the collected data, and prepare useful reports. The course also develops skills in applying traffic control devices, accident analysis, and road safety measures. Additionally, exposure to modern traffic management systems and emerging technologies prepares students for real-world field applications.

## Course Outcome:

After Completion of the Course, the students will be able to:

No	Course Outcomes	RBT Level
01	Recall basic concepts of traffic engineering and road user/vehicle characteristics	R
02	Explain methods of traffic data collection and studies	U
03	Identify traffic control devices and their applications	U
04	Apply principles of traffic management and road safety	A
05	Conduct simple traffic surveys and prepare reports	A
06	Explain the concepts of Highway Traffic Management System (HTMS), Intelligent Transportation Systems (ITS), and Smart Traffic Management Systems (STMS).	U

\*Revised Bloom's Taxonomy (RBT)



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## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA (M)	PA (I)	ESE (V)	
03	00	02	04	70	30	20	30	150

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	<b>Introduction to Traffic Engineering:</b> 1.1. Definition, Objectives, and Scope <ul style="list-style-type: none"><li>Meaning of traffic engineering</li><li>Need for safe and efficient movement</li><li>Role of traffic engineers in society</li></ul> 1.2. Road User Characteristics <ul style="list-style-type: none"><li>Physical: eyesight, hearing, fatigue</li><li>Mental: decision-making, judgment</li><li>Emotional: anger, stress, impatience</li><li>Effect on driving behaviour</li></ul> 1.3. Vehicular Characteristics <ul style="list-style-type: none"><li>Dimensions: length, width, height, wheelbase</li><li>Performance: acceleration, braking, speed potential</li><li>Effect on roadway design and capacity</li></ul> 1.4. Driver Reaction Time <ul style="list-style-type: none"><li>PIEV theory explained</li><li>Factors influencing reaction time (age, alcohol, fatigue)</li><li>Examples and field relevance</li></ul>	5	11
2	<b>Traffic Data Collection and Studies:</b> 2.1 Types and Need for Traffic Studies <ul style="list-style-type: none"><li>Importance in planning and design</li><li>Volume, O-D, speed, parking, accident studies</li></ul> 2.2 Traffic Volume Studies <ul style="list-style-type: none"><li>Manual count methods (cross-section, intersection)</li><li>Automatic methods (sensors, video, apps)</li><li>PCU concept and its applications</li></ul>	10	22



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	<ul style="list-style-type: none"> <li>○ Data presentation (graphs, charts)</li> <li>2.3 Origin–Destination Studies               <ul style="list-style-type: none"> <li>○ Need and uses (travel pattern, planning new facilities)</li> <li>○ Survey methods: roadside interview, mail-back, number plate method</li> <li>○ Simple tabular representation</li> </ul> </li> <li>2.4 Speed Studies               <ul style="list-style-type: none"> <li>○ Spot speed and space mean speed</li> <li>○ Data collection methods (stopwatch, radar, sensors)</li> <li>○ 85th percentile speed and its applications</li> <li>○ Speed-flow relationship basics</li> </ul> </li> <li>2.5 Parking Studies               <ul style="list-style-type: none"> <li>○ On-street vs. off-street parking</li> <li>○ Accumulation and duration methods</li> <li>○ Parking demand estimation</li> <li>○ Solutions for parking problems</li> </ul> </li> <li>2.6 Accident Studies               <ul style="list-style-type: none"> <li>○ Collection of accident data</li> <li>○ Spot map and collision diagrams</li> <li>○ Importance in road safety planning</li> </ul> </li> </ul>		
<b>3</b>	<p><b>Traffic Control Systems:</b></p> <ul style="list-style-type: none"> <li>3.1 Principles of Traffic Control Devices               <ul style="list-style-type: none"> <li>○ Need for uniformity and clarity</li> <li>○ Human factors in design</li> </ul> </li> <li>3.2 Traffic Signs               <ul style="list-style-type: none"> <li>○ Classification (Regulatory, Warning, Informatory)</li> <li>○ Placement and visibility</li> <li>○ Examples from IRC standards</li> </ul> </li> <li>3.3 Traffic Signals               <ul style="list-style-type: none"> <li>○ Types: fixed-time, vehicle-actuated, manual control</li> <li>○ Advantages and disadvantages</li> <li>○ Coordination of signals (green wave concept)</li> </ul> </li> <li>3.4 Signal Cycle Time Design               <ul style="list-style-type: none"> <li>○ Factors affecting signal timing (volume, pedestrian flow, safety)</li> <li>○ Webster’s method and IRC recommendations</li> <li>○ Simple numerical problems</li> </ul> </li> <li>3.5 Road Markings               <ul style="list-style-type: none"> <li>○ Pavement, kerb, object markings</li> </ul> </li> </ul>	10	22



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	<ul style="list-style-type: none"> <li>○ Use of reflective paints and studs</li> <li>○ Road safety contribution</li> </ul>		
<b>4</b>	<p><b>Traffic Operations and Management:</b></p> <p>4.1 Principles and Objectives of Traffic Management</p> <ul style="list-style-type: none"> <li>○ Efficient use of road space</li> <li>○ Reducing congestion and delays</li> </ul> <p>4.2 Street Furniture</p> <ul style="list-style-type: none"> <li>○ Delineators and hazard markers</li> <li>○ Speed breakers, rumble strips</li> <li>○ Guard rails, bollards, barricades</li> <li>○ Safety applications</li> </ul> <p>4.3 Traffic Regulations</p> <ul style="list-style-type: none"> <li>○ Scope of traffic rules and laws</li> <li>○ Important provisions of the Motor Vehicle Act</li> <li>○ Role of enforcement in regulation</li> </ul> <p>4.4 Traffic Geometrics</p> <ul style="list-style-type: none"> <li>○ Types of at grade intersections</li> <li>○ Interchanges (flyover, cloverleaf – basic)</li> <li>○ Traffic islands – channelizing, refuge, rotary</li> <li>○ Terminal facilities – bus bays, parking terminals, truck terminals</li> </ul>	8	18
<b>5</b>	<p><b>Road Safety and Environmental Aspects:</b></p> <p>5.1 Road Accidents</p> <ul style="list-style-type: none"> <li>○ Definition and classification</li> <li>○ Causes: human error, vehicle defect, roadway/environmental factors</li> <li>○ Preventive strategies</li> </ul> <p>5.2 Accident Recording and Analysis</p> <ul style="list-style-type: none"> <li>○ Accident reporting system</li> <li>○ Data collection formats</li> <li>○ Collision and condition diagrams and interpretation</li> </ul> <p>5.3 Road Safety Measures</p> <ul style="list-style-type: none"> <li>○ Road safety rules and regulations</li> <li>○ Traffic safety education and awareness</li> <li>○ Engineering measures for accident prevention</li> <li>○ Role of police and community</li> </ul> <p>5.4 Street Lighting</p> <ul style="list-style-type: none"> <li>○ Objectives and advantages of road lighting</li> <li>○ Types of lamps (LED, sodium vapor, solar)</li> </ul>	7	16



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	<ul style="list-style-type: none"> <li>○ Factors affecting visibility and safety</li> </ul> <p>5.5 Arboriculture</p> <ul style="list-style-type: none"> <li>○ Role of roadside plantation in road safety</li> <li>○ Selection of trees suitable for highways</li> <li>○ Maintenance and environmental benefits</li> </ul>		
<b>6</b>	<p><b>Emerging Trends in Traffic Engineering:</b></p> <p>6.1 Highway Traffic Management System (HTMS)</p> <ul style="list-style-type: none"> <li>○ Concept and objectives of HTMS</li> <li>○ Main components: traffic monitoring, communication, control centres</li> <li>○ Applications on expressways and urban roads</li> </ul> <p>6.2 Intelligent Transportation Systems (ITS)</p> <ul style="list-style-type: none"> <li>○ Definition and importance</li> </ul> <p>6.3 Smart Traffic Management System (STMS)</p> <ul style="list-style-type: none"> <li>○ Adaptive traffic signals (basic idea)</li> <li>○ Use of cameras and sensors in traffic monitoring</li> </ul>	5	11
	<b>Total</b>	<b>45</b>	<b>100</b>

**Suggested Specification Table with Marks (Theory): (in %)**

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
30	50	20	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

**References/Suggested Learning Resources:**

**(a) Books:**

S. No.	Title of Book	Author	Publication with place, year, and ISBN
1	Traffic Engineering and Transport Planning	L. R. Kadiyali	Khanna Publishers, Delhi, 2001, ISBN: 10:8185240779
2	Highway Engineering	S. K. Khanna & C. E. G. Justo	Nem Chand & Bros, Roorkee, 2017, ISBN: 9788193403536
3	Transportation Engineering Vol. I & II	V. N. Vazirani & S. P. Chandola	Khanna Publishers, Delhi, 2016
4	Transportation Engineering	N. L. Arora	Khanna Publishers, Delhi, 1996, ISBN: 81-7319-0933



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S. No.	Title of Book	Author	Publication with place, year, and ISBN
5	Traffic Planning and Design	S. C. Saxsena	Dhanpat Rai & Sons, Delhi, 2016, ISBN: 8123913500
6	Indian Highways – IRC Journal	IRC (Indian Road Congress)	Monthly Issue, India, ISSN: 0376-7256
7	IRC: SP:110-2017 – Application of Intelligent Transport System for Urban Roads	IRC (Indian Road Congress)	Indian Roads Congress, New Delhi.

**(b) Open-source software and website:**

1. NPTEL Transportation Engineering Lectures
2. MoRTH Manuals and Guidelines
3. IRC Codes and Publications
4. IndiaAI – Role of IoT in Traffic Management

**Suggested Course Practical List:**

Exp. No.	List of Practical	Unit No.	Approx. hrs. Required
1	Assignment on objectives of traffic engineering and road user/vehicular characteristics	1	02
2	Assignment on methods of traffic data collection and surveys	2	02
3	Assignment on traffic control systems (signs, signals, markings, cycle time)	3	02
4	Assignment on traffic regulations, street furniture, and geometrics	4	02
5	Assignment on road safety measures, street lighting, and arboriculture	5	02
6	Assignment on emerging traffic management approaches (HTMS, ITS, STMS)	6	02
7	Traffic volume study by manual method (field work)	2	04
8	Perform traffic volume study at intersection.	2	04
9	Carry out O-D Survey within area of your town/city.	2	04
10	Spot speed study using stopwatch/radar gun	2	02
11	Parking survey at an urban location	2	02
12	Study of traffic signs, signals, and markings in field	3	02
13	Numerical of traffic signal cycle design using different methods	3	02



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14	Preparation of accident spot map and collision diagram	5	02
15	Visit report on traffic management system (HTMS/ITS/STMS)	6	02
		<b>Total</b>	<b>30</b>

## **Suggested Project List:**

- Preparation of traffic management plan for a busy intersection
- Road safety audit of a selected stretch
- Accident analysis and remedial measures for black spots
- Parking demand survey and proposal for solutions

## **Suggested Activities for Students:**

- (A) Group discussion on road safety awareness
- (B) Poster-making/quiz on traffic rules
- (C) Case study on successful traffic management in Indian cities

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