

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: ADVANCED TRAFFIC ENGINEERING
(COURSE CODE:3356001)**

Diploma Programme in which this courses offered	Semester in which offered
Transportation Engineering	5 th Semester

1. RATIONALE

Traffic engineering is a branch of civil engineering that uses engineering techniques to achieve the safe and efficient movement of people and goods on roadways. As vehicular traffic began to increase, the congestion on the streets began to hamper the safe and efficient movement of traffic. More and more accidents are being caused, and serious problems of parking and environmental pollution have begun to be felt. It is, therefore, necessary to give increasing attention to the operational characteristics of highway transportation and study the need for better geometric design, capacity, intersections, traffic regulations, signals, traffic signs, roadway markings, parking facilities and street lightings etc. Therefore, knowledge and understanding of these aspects of traffic engineering are very important for engineers working at site in order to make transportation system safe and efficient. At diploma level, students are expected to study about these aspects of traffic engineering so as to develop their understanding and apply their knowledge in the field.

2. LIST OF COMPETENCY

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

- **Incorporate design features and systems such as traffic signs, signals, islands, speed breakers etc. in roads to make traffic safe and smooth.**

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. Estimate highway capacity
- ii. Explain general principle and functions of road and traffic signs, traffic signals and its maintenance aspects.
- iii. Describe street lighting, high mast lighting and maintenance of lighting installations
- iv. Discuss different types of traffic island.
- v. Analyse traffic problems in cities and its environmental impact.
- vi. Apply information technology to improve transport services.

4. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Schedule				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topic and Sub-topics
Unit-I Highway Capacity	1a. Explain highway capacity and level of service that can be achieved with the factors affecting it 1b. Describe steps to determine merging, diverging and weaving flow 1c. Describe the capacity of freeways, expressways, multilane highways, urban streets and signalised intersection.	1.1 Capacity, Level of Service concept, affecting Factors, Capacity of freeways, expressways, multi-lane highways, urban streets and signalised intersection. 1.2 Merging – Diverging Flow, Weaving Flow calculations
Unit-II Traffic Control And Regulation	2a. Describe the functions of road and traffic signs. 2b. Explain the types and importance of road marking. 2c. Describe the general principles of longitudinal pavement marking 2d. Describe types and the factors determining the location, height of traffic signs. 2e. Describe the strategies to maintain the traffic signage placed on roads for the optimum performance 2f. Differentiate types of traffic - Island-roundabout, refuge islands, painted island, traffic medians, safety island. 2g. Identify the locations where speed breakers are needed 2h. Explain design and safety features associated with speed breakers.	2.1 Standardisation of road signs: Functions and types of road marking, Longitudinal objects, Transverse markings, Word messages, Parking, Hazardous location 2.2 General principles of longitudinal pavement marking 2.3 General principles of traffic signs: Types of traffic Signs: Warning, Regulatory, Mandatory, Special regulation, Stop, Yield, Crossbuck and Dead End signs 2.4 One-way traffic, Speed limit (by country), Advisory speed limit, Information sign, Direction, position, or indication sign, Variable-message sign, Bilingual sign, Driver location signs, Logo sign, Priority to the right 2.5 Location, Height and maintenance of traffic Sign.

Unit	Major Learning Outcomes (in cognitive domain)	Topic and Sub-topics
		2.6 Traffic islands; types.- roundabout, refuge islands , painted island , traffic medians , safety island 2.7 Speed breakers, need, locations and design and safety features
Unit-III Traffic Signals And Street Lighting	3a. Describe importance and the phasing of traffic signals 3b. Differentiate the methods for determining signal cycle time - Trial cycle, Approximate, Webster's, IRC method 3c. Compute signal cycle time by Trial cycle, Approximate, Webster's, IRC method for the given data of parameters 3d. Describe the term, candle, candela, and other terms used in street lighting 3e. Describe the distribution of light from lantern with respect to mounting height, spacing and lantern arrangements 3f. Describe the steps to maintain lighting installations: Traffic lighting , high mast lighting , street lighting , highway lighting and special application systems . 3g. Describe the method to light dual carriage ways, at bends, of roads carrying only local traffic, bridges, tunnels, high mast lighting.	3.1 Traffic Signals: Phasings 3.2 Signal Cycle Time fixing methods: Trial cycle method, Approximate method, Webster's method, IRC method 3.3 Illumination intensity 3.4 Distribution of light: Mounting Height, Spacing and Lantern arrangements 3.5 Illumination of traffic rotaries 3.6 Lighting dual carriage ways, at bends, of roads carrying only local traffic, bridges, tunnels , High mast lighting 3.7 Maintenance of lighting installations
Unit- IV Traffic Problems and Environmental Impact	4a. State the problems and difficulties in urban transportation 4b. Describe the remedial measures to ease the traffic 4c. Explain the effects and impacts of traffic on the environment – air and noise pollution, vibration, visual intrusion, degrading the aesthetics, severance and land consumption.	4.1 Growth of town and traffic 4.2 Present difficulties in urban transportation and its remedial measures 4.3 Detrimental effects of traffic on the environment: Air and Noise Pollution, Vibration, Visual intrusion and degrading the aesthetics, Severance and Land Consumption 4.5 Situation in India

Unit	Major Learning Outcomes (in cognitive domain)	Topic and Sub-topics
Unit-V Information Technology in Transportation	5a. Describe the role of information technology in improving Transport services and Highway traffic. 5b. Describe the effect of economic developments and use of IT on transport systems in Asian, western and European countries	5.1. IT in transport and economic development in India 5.2. use of IT in the Asian, western and European Countries

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Highway Capacity	8	3	7	4	14
II	Traffic Control And Regulation	9	6	6	4	16
III	Traffic Signals and Street Lighting	13	4	6	9	19
IV	Traffic Problems and environmental Impact	7	4	3	7	14
V	Information Technology in Transportation	5	2	2	3	7
	Total	42	19	24	27	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/EXPERIMENTS.

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills 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 (Outcomes in psychomotor domain)	Apprx. Hrs.
1	I	Demonstrate Stopped delay and Travel time delay at Signalised Intersection.	4
2	II	Measure Saturation flow at Signalised Intersection	4
3	III	Design of signal for Isolated Intersection	4
4	II and III	Design island and signal system for a complex road junction (where more than four roads are meeting). You may find such a junction in old part of your city.	4
5	II	Sketch the different Road Signs and Pavement Marking.	4
6	I to V	Seminar (Topic of Seminar shall be given to a group of three to five students. The students are required to submit and present / defend the Seminar in presence of students and teachers.	8
		Total	28

8. SUGGESTED STUDENT ACTIVITIES

- Undertake site visit to oversee traffic flow, road sign and traffic signal and prepare report.
- Student may be asked to collect, enlist and study IRC Code for Traffic signal, Pavement marking and Traffic Signs.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- Ask students to study different traffic problems of the city and suggest the civil engineering measures to improve the traffic flow and safety at those points.
- Arrange Expert lectures of engineers having experience of designing of roads and highways.
- Show video clips of nearby road with traffic movements and discuss the shortcomings in the road design.
- Show picture clips of Road accidents and discuss the features of road system design which could have prevented such accidents.

10. SUGGESTED LEARNING RESOURCES

A) List of books

S. No.	Title of Book	Author	Publication
1.	Traffic planning and design	S. C. Saxena	Dhanpat Rai, New Delhi
2.	Traffic Engineering; Theory and Practice	L. J .Pingnataro	
3.	Highway Capacity Manual	Washington D.C Transportation Research Board	Washington D.C
4.	Principles of Transportation Engineering	Chakraborty, Partho and Animesh Das	-
5.	Traffic Engineering and Transportation Planning	Kadiyali, L. R.	Khanna Publishers, New Delhi

B) List of software/learning websites

- i. <http://www.tecmagazine.com/>
- ii. [http://en.wikipedia.org/wiki/Traffic_engineering_\(transportation\)](http://en.wikipedia.org/wiki/Traffic_engineering_(transportation))

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty members from polytechnics**

- **Prof. Mrs. S. B. Khara** , Lecturer in Civil Engineering, G.P.G., Ahmedabad
- **Prof. Mrs. R. V. Bhatt**, Lecturer in Civil Engineering, G.P.G. Ahmedabad
- **Prof. Ms. M. A. Milisia**, Lecturer in Civil Engineering, G.P.G., Ahmedabad

Coordinator and Faculty Member from NITTTR Bhopal

- **Dr Subrat Roy**, Professor, Department of Civil and Environmental Engineering
- **Dr. Joshua Earnest**, Professor, Department of Electrical and Electronics Engineering