



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Master of Engineering**

**Level: PG**

**Branch: Civil Engineering (Transportation Engineering)**

**Subject Code: ME02069021**

**Course/Subject Name: Road Safety Audit**

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	PCC

<b>Prerequisite:</b>	Transportation Engineering, Traffic Engineering
<b>Rationale:</b>	With the growth in population and vehicular ownership, the undesirable outcome of the transportation system is an increase in the number of accidents. Loss of lives is detrimental for the economy and progress of the nation. It is prime consideration to provide maximum safety to the people during and after construction of highways. It is necessary for the transportation engineer to know about the causes of accidents and environmental pollution due to highway or other transportation facility construction activities. The mitigation measures shall be taken properly to minimize the accidents and environmental pollution. The road safety audit includes all these aspects in a systematic way. Therefore, the study of this subject will enable to provide all necessary features regarding road safety to the students.

## Program Outcomes

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & write and present technical reports.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex engineering problems.
04	Plan, assess, create, integrate, carry out, and oversee complex engineering projects in a sustainable local and global context.
05	Address societal issues by offering technologically advanced, reasonably priced solutions while upholding high standards of ethics and professionalism.



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## Course Outcome:

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

No	Course Outcomes	RBT Level
01	Impart basic knowledge in technical areas of road safety engineering, traffic engineering and road design	U
02	Illustrate importance of road safety aspects and environmental impacts for commissioning the highway project.	U
03	Carryout Road Safety Audit of Highway projects	N
04	Give an idea/a solution for mitigation measures for improving traffic safety and environment.	N
05	Conversant with major elements for safe road environment, consequently for, designing each module to enhance skills, and should understand and aware about their application in an audit context.	U

\*Revised Bloom's Taxonomy (RBT)

## 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 / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<b>Introduction:</b> Road traffic accidents scenario in India, Characteristics of accidents, accidents vs. crash, land use and road environment for safety, Multidisciplinary approach to planning for traffic safety and injury control; pre-crash and post-crash models; roles of vehicle, roadway traffic, driver, and environment, crash and injury causations; accident analysis, conflict points at intersections, pedestrian safety, road safety improvement strategies. vehicle design factors & Driver	10	25



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	characteristics influencing road safety. Identification of Hazards on road location. Application of computer analysis of accident data.		
2.	<b>Road safety audit and analysis:</b> Stages, aim and objectives, principles, process, roles and responsibility, Specific parameters, design standards, various stages of road safety audit, RSA for rural roads, Checklists, Structuring of report. Steps in treatment of crash locations, diagnosing crash problem and solutions, accident report form, storing of data, using and interpreting crash data, identifying and prioritizing hazardous locations, condition and collision diagrams; Vulnerable Road users: crashes related to pedestrian and bicyclists, their safety, provision for disabled; Crash reconstruction: understanding basic physics, calculation of speed for various skid, friction, drag, and acceleration scenarios.	15	30
3.	<b>Engineering measures:</b> Speed humps, speed bumps, speed tables, speed cushions; Community awareness and education; Enforcement- Non-physical measures- physical measures, Characteristics of Traffic Incidents, Types of Incidents, Impacts, Incident management process, Incident traffic management; Applications of ITS, Road Signs, Marking and Traffic Signals.	10	25
4.	<b>Energy related aspects of different transport technologies:</b> Traffic calming measures, road transport related air pollution, sources of air pollution, effects of weather conditions, vehicular emission parameters, pollution standards, measurement and analysis of vehicular emission; imitative measures, urban and non-urban traffic noise sources, noise pollution.	10	20
<b>Total</b>		<b>45</b>	<b>100</b>

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

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	30	20	10	10

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



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## **References/Suggested Learning Resources:**

### **(a) Books:**

1. Indian Roads Congress, Road Safety Audit Manual, IRC: SP-88-2019
2. Indian Roads Congress, Highway Safety Code, IRC: SP-44:1996
3. Kadiyali L. R., Traffic Engineering & Transport Planning, Khanna Publishers, 2003
4. Pocket book for highway engineers, Third Revision, Ministry of Road Transport and Highways, published by Indian Road Congress, New Delhi, January 2019
5. Evans S.K., Traffic Engineering Handbook, Institute of Traffic Engineers, USA
6. Wohl M., Martin B.V., Traffic system analysis of Engineers & Planners, McGraw Hill, New York.
7. Guidelines on Design and Installation of Road Traffic Signals, IRC:93-1985.
8. Specification for Road Traffic Signals, IS:7537-1974.
9. Myer Kutz, Handbook of Transportation Engineering, Second Edition, Volume II, McGraw Hill.
10. Highway Safety Manual, 1st Edition, AASHTO
11. IRC103-2022 Guidelines for pedestrian facilities – Second Revision
12. Limpert, Rudolf. Motor Vehicle Accident Reconstruction and Cause Analysis, 5th Edition, Lexas Publishing, Charlottesville, VA.
13. IRC 067: Code of Practice for Road Signs (Third Revision)
14. Geetam Tiwari, and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016, First Edition.

### **(b) List of resources on web:**

1. <http://tripp.iitd.ernet.in/publication/report>
2. <https://atpio.org/webinar-on-addressing-road-safety-worldwide-vulnerable-road-users-human-factors-rs-in-lmic/>
3. <https://ebrdelearning.com/course>
4. <https://morth.nic.in/reports-working-group-4-es-road-safety-0>
5. <https://vimeo.com/294277710>
6. <https://www.ptvgroup.com/en/solutions/products/ptv-visum/ptv-visum-safety/>
7. <https://www.who.int/data/gho/data/themes/road-safety>
8. <https://www.who.int/teams/social-determinants-of-health/safety-and-mobility/decade-of-action-for-road-safety-2021-2030>
9. <https://nptel.ac.in/courses/>



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**(d) List of Experiments/Tutorials:**

1. Collection of road accident data.
2. Accident analysis of collected data.
3. Collection of data regarding black spots on major highways including geometric details.
4. Analysis of black spots data and suggest mitigation measures.
5. Collection of air quality data (emission level) and noise level data on problematic spots of highway.
6. Analysis of collected data and suggest improvement measures.

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