Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCEC517	Traffic Engineering and Design	3	1	0	4

Course Objective

This course provides a comprehensive introduction to traffic engineering, covering fundamental concepts related to road users, vehicle and road characteristics, and traffic stream parameters. Students will learn to conduct traffic studies, analyze capacity for urban and rural highways, and apply statistical techniques relevant to traffic data analysis. The course also explores microscopic traffic flow modeling, time series analysis, and queueing theory, equipping students with the skills to model, manage, and optimize traffic operations. Additionally, various traffic management techniques and car-following models will be discussed to enhance understanding of real-world traffic dynamics.

Learning Outcomes

Upon successful completion of this course, students will:

- Understand the fundamentals of traffic engineering, including road users, vehicle and road characteristics.
- Analyse traffic stream parameters and conduct traffic studies for various roadway conditions.
- Develop and implement microscopic traffic flow models and car-following models to assess driver behaviour.
- Apply statistical methods and distributions relevant to traffic data analysis.
- Evaluate capacity analysis concepts for urban and rural highways.
- Understand traffic control principles and evaluate various intersection designs.
- Understand and implement traffic management techniques for efficient traffic flow design

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	**Traffic stream characteristics and measurement**: Road user characteristics, Fundamental parameters and relations of traffic flow, Traffic stream models, Moving observer method, Measurement at a point; Measurement over a short section, Measurement along a length of road, Automated traffic measurement, Traffic surveys.	8L	To understand the fundamental parameters of traffic stream and various methods of measurement of these parameters.
2	**Microscopic traffic flow modelling:** Car-following models like Pipe's model, Forbes's model, General motor models, etc., Lane changing models, gap acceptance models; Vehicle arrival models (Poisson distribution and headway modelling)	8L+ 6T	Introduction to various microscopic and car following models of traffic flow.
3	**Macroscopic and mesoscopic traffic flow modeling:** Fluid flow analogy, granular flow, Lighthill-Withams theory, Shock waves and	8L + 6T	Understanding the various traffic flow phenomenon and theories for modelling

	Cellular automata concepts.		macroscopic traffic flow models
4	**Uninterrupted flow:** Capacity and Level of service LOS, Urban Street, Multilane highways, Freeway operations, Ramp metering, Corridor analysis.	8L+2T	To understand capacity and level of service concepts of various traffic facility
5	**Interrupted flow or Intersection control:** Principles of traffic control, Traffic signs, and road markings, Uncontrolled intersection, Channelization, Traffic rotary, Grade separated intersection.	6L	Understanding of various types of traffic control techniques.
6	**Specialised traffic studies:** Parking Studies, Accident Analysis, Congestion studies, Toll operation, Pedestrian studies	4L	To understand the principles of various specialized traffic studies
	Total Contact Hours	**42L+14T**	

Text Books:

1. Roess, RP., McShane, WR. and Prassas, ES. (1998), Traffic Engineering, Prentice Hall.
2. Kadiyali, LR (1987), Traffic Engineering and Transportation Planning, Khanna.
3. Garber and Hoel (2009), Traffic and Highway Engineering, Canada

Reference Books:

1. May, A. D. (1990), Fundamentals of Traffic Flow, Prentice Hall.
2. Highway Capacity Manual (2000), Transportation Research Board, USA.
3. Pingnataro, G. J. (1970), Principles of Traffic Engineering, Mc Graw - Hill.
4. Daiheng Ni (2016), Traffic Flow Theory, University of Massachusetts Amherst MA, USA