

## Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

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### CE7017 - Advanced Traffic Flow Theory

**Credit Distribution:** C:9 L:3 T:0 P:0 E:0 O:6 TH:0

**Course Type:** Theory

**Description:** Evaluate the strengths and limitations of the macroscopic and microscopic traffic models for analysis of congested traffic conditions. Discuss the theory, properties, and solutions of the network flow model and demonstrate its implications for analysis and control? Illustrate the extension of the macroscopic modeling framework to pedestrian models and discuss their properties? Apply the traffic flow models to develop control strategies for highways and Marterials

**Course Content:** Macroscopic Models: Solution methods and Properties Higher order models and numerical solutions; Kinematic Wave Model, Entropy condition, Hamilton-Jacobi representation, Variational method; Driving Behaviour Models Car following models - Newell's, IDM, Gipps; Lane changing models; Stability; Cellular automata. Network Traffic Flow Theory Network-level traffic relationships, Properties, Hysteresis, Method of cuts, Influence of network properties, Implications for analyses; Pedestrian Flow Models Pedestrian flow relationships, Group behavior, Theory and models; Applications Simulation of macroscopic, microscopic, and pedestrian models; Freeway Control " Ramp Metering and Variable Speed Limit; Arterial Control " Oversaturated intersections and Adaptive Traffic Control Systems

**Text Books:** No defined textbook, relevant reading material will be provided

#### Reference Books

- Treiber,M., & Kesting, A. (2013).
- Traffic Flow Dynamics: Data, Models and Simulation, Springer-Verlag Daganzo, C. F. (1997).
- Fundamentals of transportation and traffic operations (Vol. 30). Oxford: Pergamon. Elefteriadou, L. (2014).
- An Introduction to the Traffic Flow Theory (Vol 84). NewYork, NY, USA, Springer

**Prerequisite:** NIL