

01TR0203: Traffic flow theory & Simulation

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are:

- To understand traffic flow behavior on heterogeneous traffic links
- To understand relation between simulation parameters and actual flow parameters
- To understand vehicular and pedestrian level of service

Credit Earned: 4

Students learning outcomes:

After successful completion of the course it is expected that student will be able to..

1. To understand and classify the traffic stream characteristics models.
2. To develop the relationship of fundamental stream characteristics through real field data.
3. To access the LoS of the highway segments through the traffic stream data.
4. To create or generate the vehicles through simulation or software for given characteristics and should conclude the result.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
3	2	0	4	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	Traffic Stream Characteristics:	
	traffic stream characteristics - flow, speed and concentration	2
	use of counting, interval and translated distributions for describing vehicle arrivals, headways, speeds	2
2.	Traffic Stream Models:	
	Fundamental equation of traffic flow, speed-flow-concentration relationships	2
	Fluid flow analogy approach, shock wave theory,	2
	Car-following theory, linear and non-linear car-following models	2
	Acceleration noise	2
3	Queuing Analysis:	
	Fundamentals of queuing theory,	3
	Demand service characteristics, deterministic queuing models,	2
	Models of delay at intersections and pedestrian	2
4	Highway Capacity & Level-of-Service Studies:	
	Concepts, factors affecting capacity & level-of service	3
	Capacity analysis of different highway facilities	3
	Passenger car units	3
	Problems in mixed traffic flow	3
5	Traffic Simulation:	
	System simulation, simulation languages	4
	Generation of random numbers, generation of inputs - vehicle arrivals, vehicle characteristics, road geometrics	4
	Design of computer simulation experiments	3

Suggested lists of experiments

1. Classified traffic volume count along with spot speed data on congested urban road mid-block section (Preferably using videography).
2. Generation of speed-flow-density relationship from the collected data.
3. Statistical analysis of the collected data for the parameters like - vehicle arrival pattern, headway, speed, gap, overtaking, queuing etc.
4. Computer simulation of observed traffic data, using programme or software.
5. Simulation experiments for improving the traffic conditions

Civil Engineering (Transportation)**Suggested Theory Distribution**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	20%	20%	20%	20%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:**Reference Book:**

1. TRB - SR No.165 - Traffic Flow Theory, Transportation Research Board, Washington - D.C.
2. May, A D., Traffic Flow Fundamentals, Prentice-Hall, NJ
3. Drew, D.R., Traffic Flow Theory and Control, McGraw-Hill, New York.
4. TRB Special Report 209: Highway Capacity Manual, Transportation Research Board, Washington DC, 1985.
5. Partho Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI

Web Resources**Advanced Transportation engineering NPTEL course:**

http://nptel.ac.in/courses/nptel_download.php?subjectid=105101001
