

Branch Name:	Transportation Engineering
Program Code:	ET211
Course Name:	Traffic Flow Theory and Simulation
Course Code:	2ET2110301T
Pre-requisite Course:	Traffic Engineering

Course Objective:

1. To impart knowledge in Traffic Flow Characteristics, Flow Modeling and Computer Simulation
2. To characterize the statistical distributions of principal traffic flow parameters.
3. To understand the difference between macroscopic and microscopic models.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
5	3	2	-	5	24	60	16	40	-	-	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Traffic Stream Characteristics: Measurement, microscopic and macroscopic study of traffic stream characteristics - flow, speed and concentration; use of counting, interval and translated distributions for describing vehicle arrivals, headways, speeds, gaps and lags; fitting of distributions, goodness of fit tests, gap acceptance	10	10
2	Traffic Stream Models: Fundamental equation of traffic flow, speed-flow-concentration relationships, normalized relationship, fluid flow analogy approach, shock wave theory, platoon diffusion and Boltzmann like behavior of traffic flow, car-following theory, linear and non-linear car-following models, acceleration noise	10	30
3	Queuing Analysis: Fundamentals of queuing theory, demand service characteristics, deterministic queuing models, stochastic queuing models, multiple service channels, models of delay at intersections and pedestrian	8	20
4	Highway Capacity & Level-of-Service Studies: Concepts, factors affecting capacity & level-of service, capacity analysis of different highway facilities, passenger car units, problems in mixed traffic flow	7	20
5	Traffic Simulation: System simulation, simulation languages, generation of random numbers, generation of inputs – vehicle arrivals, vehicle characteristics, Road geometrics, design of computer simulation experiments.	10	20

Reference Books:

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. Wohl M. and Martin, B V., Traffic System Analysis for Engineers and Planners, McGraw-Hill, New York.
6. McShane W R & Roess R P, Traffic Engineering, Prentice-Hall, NJ, 1990.
7. Neylor, T.H. et al., Computer Simulation Techniques, John Wiley.
8. Highway Capacity Manual, Transportation Research Board, Washington DC, 2000, 2010.
9. Bratley, P., Fox B. L., Schrage, L. E. B., Guide to Simulation, Springer- Verlag, New York 1983.
10. Leigh, J. R., Modelling and Simulation, Peter Peregrinus, London, 1983.
11. Bernard, Z., Theory of Modelling and Simulation, John- Wiley, New York, 1976.
12. Ortuzar, J. and Willumsen, L.G, Modelling Transport, Wiley, Chinchestor, 1994.
13. Hansher, D. A., and Button. K. J., Handbook of Transport Modelling, Pergamon, Oxford, UK, 2000
14. Partho Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI

List 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. Intersection volume count and delay measurements.
5. Pedestrians flow measurement and their crossing behaviour analysis.
6. Data collection for determining highway capacity and level of service.
7. Computer simulation of observed traffic data, using programme or software.
8. Simulation experiments for improving the traffic conditions

Open Ended Problems:

1. Design of signal for Isolated Intersection – A case study of urban area
2. Design of co-coordinated signals - A case study of urban area

Course Learning Outcome:

1. Students would have knowledge of Traffic Flow characteristics and the theory of Traffic Flow that would help them to develop an efficient transport system.
2. Understand the traffic flow descriptors and their measurement.
3. Model and analyze macroscopic and microscopic traffic models

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Students would have knowledge of Traffic Flow characteristics and the theory of Traffic Flow that would help them to develop an efficient transport system	L-1, L-2
CLO2	Understand the traffic flow descriptors and their measurement	L-1, L-2
CLO3	Model and analyze macroscopic and microscopic traffic models	L-1, L-2, L-3, L-4

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with Pos & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M	M	M	M	M		M		M			M	M	M	M
CLO2	M	M	M	M			M			M		M	M	M	M
CLO3	M	M	M	M	M	M			L		H	M	M	M	M

H: High, M: Medium, L: Low