BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani

INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout (Part II)

Date: 02/08/2016

In addition to part I (General handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No : CE G543
Course Title : Traffic Flow Theory
Instructor-in-charge **:** Durgesh Vikram

1. **Scope and Objective of the Course:**
   Traffic phenomena are complex and nonlinear, due to the interactions of a large number of vehicles. Moreover, vehicles do not interact simply following the laws of mechanics, but also due to the reactions of human drivers. In particular, they show phenomena of cluster formation and forward and backward-propagating shock waves of vehicle density. Fluctuations in measured quantities (e.g., mean speed of vehicles) are often huge, which can be analyzed, using an appropriate modeling technique. The mathematical or engineering study of traffic flow, and in particular, vehicular traffic flow, is done with the aim of achieving a better understanding of these phenomena and to apply it for efficient management of roadway facilities. To discuss all the above mentioned issues in detail to make the student aware of the techniques available, this course has been introduced.

2. **Text Book:** Adolf May, Traffic Flow Fundamentals, Prentice Hall, 1990.

3. **Reference Books:**

1. Drew BR, Traffic Flow Theory and Control, McGraw Hill Co.
2. Wohl and Martin, Traffic System Analysis, McGraw Hill Co.
3. P. Chakroborty and A. Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2003.
4. Pignataro L. J., Traffic Engineering – Theory and Practice, Prentice Hall, 1973.

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4. Course Plan:

Lecture No.	Topic	Learning Objective
1-5	Introduction to traffic flow theory and traffic flow characteristics	• Describe Objectives of Traffic Systems • Discuss four major characteristics of traffic flow • Identify key factors affecting traffic performance • Define and compute microscopic and macroscopic traffic parameters • Derive fundamental traffic flow equations • Classify data collection methods
6-13	Macroscopic Models and Empirical Data, Car Following Models Fluid Flow Models	• Compare flow density and flow speed relationships from models and empirical data • Illustrate difficulties in measuring flow density curves with empirical data • Describe the premise and application of car following models
14-19	Continuity Equations	• Given the trajectory determine the velocity field • Derive the continuity equation for traffic flow • Estimate speed-density relationship from simple rules • Propagation of disturbances • Non-linear traffic waves and acceleration of stream
20-25	Shockwaves	• Analyze the propagation of large disturbances • Determine speed of shockwaves • Applications of Shockwave Analysis • Shockwave examples
26-27	Two Fluid Model	• Estimate two fluid model parameters • Explain flow-density relationship as per two-fluid model
28-32	Queuing Theory	• Analyze the performance of queues formed under incidents • Evaluate costs due to incidents and benefits due to incident management
33-40	Random Queuing Systems	• Differentiate and identify various types of random queuing systems • Analyze the relationship between performance and system state for general queuing systems in steady state

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5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Mid Semester Test	90 minutes	25%	<TEST_1>	Closed Book
Assignments/ Term Paper/ Seminar/ Quiz	40 %		Continuous	Open Book
Comprehensive	180 minutes	35%	<TEST_C>	Closed Book

6. Chamber Consultation Hour: To be announced in the class

Instructor-in-charge