CIVL 3610  Traffic and Transportation Engineering

Time:  Spring 2017

Instructor:  Professor Hong K. Lo
Office # 3579
Phone: 2358-8742
Email: cehklo@ust.hk

TA:  Jiang Gege (gjiang@connect.ust.hk)
Patwary Ashraf Uz Zaman (auzpatwary@connect.ust.hk)
Huai Yue (yhuaiia@connect.ust.hk)
Lee Enoch (eleead@connect.ust.hk)
Wang Shuling (swangcf@connect.ust.hk)
Li Lubing (llibl@connect.ust.hk)

Text:  Handout Notes

Objectives:  Introduction to transportation systems; characteristics of transportation models; traffic flow fundamentals; geometric design of highways; travel demand analysis including trip generation, trip distribution, modal split and trip assignment.

Learning Outcomes:  On completion of this course, students are expected to be able to:
1. Evaluate the fundamental theories and methods of traffic and transportation engineering, including traffic flow fundamentals, geometric design of highways, and transportation systems planning.
2. Utilize mathematical or quantitative methods to model components of the traffic and transportation system.
3. Apply key traffic and transportation engineering principles to the analysis, design and operation of components of the transportation system, including traffic impact analysis, highway design, and transportation demand forecasting.

Grading:  Tutorial Assignments 20%
Midterm Exam 40%
Final Exam 40%

References:

Outline:

1. INTRODUCTION TO TRANSPORTATION SYSTEMS
   1.1. Definitions
   1.2. The Nature of Transportation Engineering
   1.3. Basic Structure of Transportation Systems

2. TRAFFIC FLOW FUNDAMENTALS
   2.1. Introduction
   2.2. Traffic Stream Variables
   2.3. Time-Distance Diagrams of Flow
   2.4. Categories of Traffic Flows
   2.5. Analysis of Speed, Flow and Density Relationship
   2.6. Macroscopic Models of Traffic Flow
   2.7. Shock Waves in Traffic
      2.7.1. Introduction
      2.7.2. The Shock Wave Equation
   2.8. Highway Capacity and Level of Service
      2.8.1. Introduction
      2.8.2. Level of Service
      2.8.3. Basic Definitions
      2.8.4. “Ideal” Freeway Conditions
      2.8.5. Freeway Capacity and Level of Service
      2.8.6. Capacity Restrictions

3. GEOMETRIC DESIGN OF HIGHWAYS
   3.1. Introduction
   3.2. Fundamental Classification of Highways
   3.3. Vertical Alignment
      3.3.1. Vertical Curve Fundamentals
      3.3.2. Minimum and Desirable Stopping-Sight Distances
      3.3.3. Stopping-Sight Distance and Crest Vertical Curve Design
      3.3.4. Stopping-Sight Distance and Sag Vertical Curve Design
   3.4. Horizontal Alignment
      3.4.1. Vehicle Cornering
      3.4.2. Horizontal Curve Fundamentals
      3.4.3. Stopping-Sight Distance and Horizontal Curve Design

4. TRANSPORTATION PLANNING
   4.1. Introduction
      4.1.1. Overview of Information Need
      4.1.2. Sequential Demand-Forecasting Models
   4.2. Trip Generation
      4.2.1. Some Basic Definitions
      4.2.2. Classification of Trips
      4.2.3. Typical Trip Generation Models
   4.3. Trip Distribution
      4.3.1. Introduction
      4.3.2. The Gravity Model
      4.3.3. The Fratar Model
4.4. Modal Choice
   4.4.1. Introduction
   4.4.2. Factors Affecting Modal Split
   4.4.3. Direct Generation Usage Models
   4.4.4. Trip Interchange Mode Usage Models
   4.4.5. Utility and Disutility Functions
   4.4.6. The Logit Model

4.5. Trip Assignment
   4.5.1. Introduction
   4.5.2. Route Choice Behavior
   4.5.3. Trip Assignment Procedure
   4.5.4. Mathematical Programming Approach to User Equilibrium