

The Hong Kong University of Science and Technology
Department of Civil and Environmental Engineering

CIVL 4620 Transportation System Operations

Time: Fall 2023

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Objectives:

- To provide students with an introductory understanding of fundamental theories and concepts for transportation management, including transportation economics; land use and transportation interaction, queuing theory
- To equip students with engineering methods for traffic operations, including intersection signal control, public transportation operations and management
- To prepare students function as a traffic engineer via objectives 1 and 2

Grading:	Quiz	20%
	Midterm Exam	35%
	Final Exam	45%

References:

Transportation Engineering: An Introduction. C. Jotin Khisty. Prentice Hall Inc. 1990

Transportation Engineering and Planning (Second Edition). C.S. Papacostas & P.D. Prevedouros. Prentice Hall., 1993.

Principles of Highway Engineering and Traffic Analysis. F.L. Mannering and W.P. Kilareski. John Wiley & Sons, 1990.

Traffic Flow Fundamentals. Adolf D. May. Prentice Hall Inc., 1990.

Traffic Engineering. W.R. McShane and R.P. Roess, Prentice Hall, Inc. 1990.

Modeling Transport. J. de D. Ortuzar and L. G. Willumsen. John Wiley & Sons. 1990.

Urban Public Transportations: Systems and Technology. V. R. Vuchic. Prentice Hall, 1981.

Course Outline:

1. QUEUING THEORY AND TRAFFIC FLOW ANALYSIS
 - 1.1. Foundations of Traffic Flow Analysis
 - 1.2. Probabilistic Models of Traffic Flow
 - 1.3. Dimensions of Queuing Models
 - 1.4. D/D/1 Queuing Regime
 - 1.5. M/D/1 Queuing Regime
 - 1.6. M/M/1 Queuing Regime
 - 1.7. Traffic Analysis at Highway Bottlenecks
2. INTERSECTION CONTROL AND DESIGN
 - 2.1. Introduction
 - 2.2. Inter-green Period and Dilemma Zone
 - 2.3. Saturation Flow and Lost Time
 - 2.4. Approach Capacity and Degree of Saturation
 - 2.5. Determination of Lane Groups
 - 2.6. Cycle Length and Green Allocation
 - 2.7. Signal Coordination
 - 2.8. Delay Analysis at Signalized Intersections
3. TRANSPORTATION ECONOMICS
 - 3.1. The Scope of Transportation Economics
 - 3.2. Transportation Demand
 - 3.3. Sensitivity of Travel Demand
 - 3.4. Kraft Demand Model
 - 3.5. Consumers' Surplus
 - 3.6. Costs
 - 3.7. Pricing and Subsidy Policies
4. TRANSIT OPERATIONS AND MANAGEMENT
 - 4.1. Introduction
 - 4.2. Definitions of Quantitative Performance Attributes
 - 4.3. Transit Line Capacity
 - 4.4. Way Capacity
 - 4.5. Vehicle Control and Operating Safety Regimes
 - 4.6. Transit Station Operations
5. THE LAND-USE TRANSPORTATION SYSTEM
 - 5.1. Introduction
 - 5.2. Accessibility
 - 5.3. Location Theory
 - 5.4. Land-Use and Transportation
 - 5.5. Characteristics of Land-Use Forecasting and the Land-Use Plan