CIVE 615 Traffic Flow and Network Modeling

2026 Winter Semester (3 Units)

Monday 2:00 PM - 4:50 PM, NREF 2-122

Instructor: Prof. Tony Qiu Office: Donadeo ICE 6-271 Phone: (780) 492-1906 Email: zhijunqiu@ualberta.ca Office Hour: 11:00am-12:00pm on Monday or make an appointment by email.	Teaching Assistant: Kaizhe Hou, kaizhe@ualberta.ca Office Hour: Make an appointment by email.

[Course Description]

Traffic flow and network modeling are two major approaches in the field of transportation engineering, and can be applied in the research studies of traffic operation, traffic safety and transportation planning. This course will develop students' knowledge and ability to analyze dynamic traffic flow and traffic network management in an urban transportation network.

This course will address and answer the questions what is the characteristics of traffic flow in an urban transportation network, how traffic flow pattern can be determined in a long-time horizon, and how traffic flow could be forecasted and managed in a short time horizon. The static analysis aims to provide traffic predictions for long term planning purposes and the dynamic analysis is used to generate short term predictions and optimization strategies for advanced traffic management and information systems. This course will provide a comprehensive education in the fundamentals of traffic flow and network modeling, and provide experiences to develop professionalism in advanced transportation demand and supply analysis.

[Text and References]

1. [TFT] TRB AHB45, Traffic flow theory: A State-of-the-Art Report, Revised Monograph, 2001, and it can be downloaded from the website: http://www.fhwa.dot.gov/publications/research/operations/tft/
2. [SY] Sheffi Y., Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Methods. Prentice-Hall, Englewood Cliffs, NJ., 1985, and it can be downloaded from the website: http://web.mit.edu/sheffi/www/urbanTransportation.html
3. [RB] Ran B. and Boyce D.E., Modeling Dynamic Transportation Network -- An Intelligent Transportation System Oriented Approach. Springer-Verlag, Heidelberg., 1996

* Several necessary handouts will be distributed in class.

[Grade]

Assignment –	20%
Mid-term exam –	20%
Term project –	30%
Final exam –	30%

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[Course Schedule – tentative*]

Week	Date	Lecture topic	Reading	Assignment
1	Jan 5	Course introduction and schedule, Overview of flow and network models	TFT 1, 10 SY 1, RB 1	Set 1 out
2	Jan 12	[No Class, TRB Conference Week]		
3	Jan 19	Traffic flow stream characteristics, Microscopic traffic model	TFT 2, TFT 4	
4	Jan 26	Continuum flow model, Model parameter calibration	TFT 5	Set 1 due Set 2 out
5	Feb 2	Macroscopic traffic flow modeling, Fundamental Diagram	TFT 6	
6	Feb 9	Mid-term Exam		
7	Feb 16	Reading Week		
8	Feb 23	Cell Transmission model METANET model	Handout	Set 2 due Set 3 out
9	Mar 2	Static traffic network modeling, Introduction of non-linear programming	SY 2 SY 4	
10	Mar 9	Route choice concept and model, Solving route choice problems	SY 3 SY 5	Set 3 due Set 4 out
11	Mar 16	Modal Split/ Distribution/ Assignment, Stochastic Route Choice Model	SY 6 SY 7	
12	Mar 23	Dynamic traffic network modeling, Stochastic Dynamic Route Choice	RB 4 RB 9,10	Set 4 due
13	Mar 30	Student paper presentation	Handout	
14	Apr 6	Final Exam (TBD) / Easter Monday		

* Lectures may be modified/replaced/supplemented with guest lectures, field trips, etc.