University of Waterloo

Civ E 342 Transport Principles and Applications

Instructor: *Professor L. Fu*

www.civil.uwaterloo.ca/lfu/courses/cive342/

Course Overview

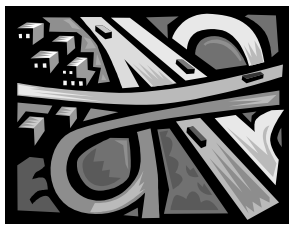
- Course Setting: Lecture + Tutorial
- Text: Mannering, L. F. and W. P. Kilareski , *Principles of Highway Engineering and Traffic Analysis*, Third Edition, Jon Wiley & Sons, Inc. , 2005.
- Handouts: Available from the course web site (posted weekly!)
- Course Evaluation:

Assignments:	20 %
Midterm:	20 %
Final:	60 %

1. Introduction

- Transportation: the **movement** of ***people*** and ***goods***






Transportation In Canada: Some Statistics

- ~ $39 billion, or 4% of GDP
- ~ 10% work force is in transport industries
- ~ 50% petroleum is used for transportation
- ~ 1 hour travel/day *per capita*
- ~ 0.6 vehicles *per capita*
- ~ 15% of our household expenditure in travel ($3,000/person)

1.1 Transportation System

- Transportation System
  - Passenger Transportation
    - •Private
    - •Public
  - Freight Transportation
    - •Highways
    - •Railways
    - •Water
    - •Pipeline

Public Transportation

- Public Transportation
  - Mass transit:
    - •Fixed routes
    - •Fixed schedules
    - •Fixed vehicles
  - Paratransit
    - •Flexible routes
    - •Flexible schedules
    - •On demand
  - Ridesharing:

Transportation System Components

- Transportation Components
  - Terminals: locations (or nodes) where travel and shipment begin or end.
  - Links: roadways or tracks connecting one or more terminals.
  - Vehicles: means of moving people and goods
  - Traffic Control: signals and signs that regulate vehicle movements

1.2 Transportation Engineering?

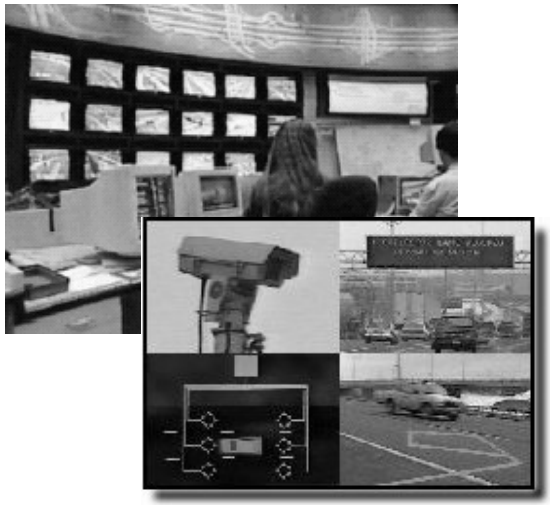
- Transportation Engineering: *planning, design, construction and operation of transportation systems*
  - Planning
    - What to build and where to build?
    - e.g.
  - Design: Geometric Pavement ...
    - What dimension and material?
    - e.g.
  - Operation: Traffic Maintenance
    - How to operate and manage?
    - e.g.

1.3 Challenges Confronting TE:
Aging Infrastructure

- Freeway&primary:115,000 km
- Second&arterial: 114,000 km
- Local&rural: 1.2 million km
- 15,000 transit vehicles

- From design to *management*
- Develop new techniques and technologies to combat aging highway

Challenges Confronting TE:
New Technologies



- Information Technologies

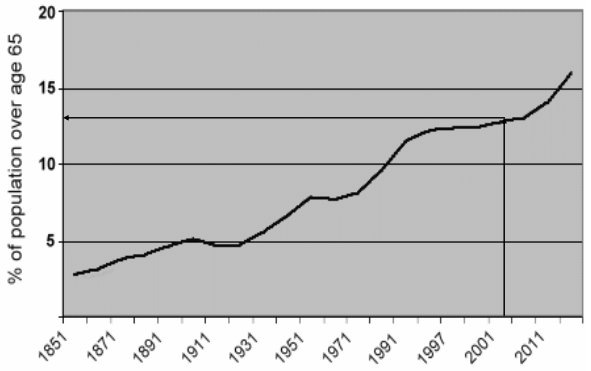
- Understand/evaluate the impacts
- Understand the mechanism
- Work closely with engineers of other disciplines

Challenges Confronting TE:
Auto Dominance

- ~16.8 million cars
- 16,900 km/veh.

- Meet the mobility need?
- Increase transit use?

Challenges Confronting TE:
Changing Population and Landuse



- Changing age, income, HH, job..
- Redistribution of landuse

- Predict future demand
- Consider future driving population

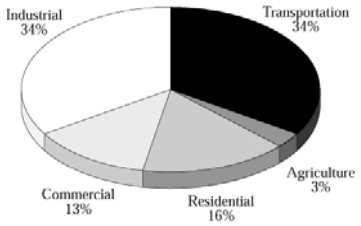
Challenges Confronting TE:
Increasing Safety Concerns

3000 people per year killed from road accidents in Canada

- Design safer roads?
- Develop countermeasures
- Improve incident detection and response

Challenges Confronting TE:
Deteriorating Environments

GHG Emission



- Integrated strategies, technologies, planning to reduce emission
- Increased use of transit
- Intermodal efficiency

Focus of This Course

- It focuses on planning and design of highway systems, including:
  1. Transportation demand forecast
  2. Characteristics of human and vehicles
  3. Geometric design
  4. Traffic analysis
  5. Structural design: pavement
- It focuses on the principles and techniques that can be applied to other transportation modes!!!

Curriculum in Civil Engineering

Transportation Engineering at UW

Planning

Design:
Geometric
Pavement

Operation:
Traffic
Maintenance

- **Civ E 342** "Transport Principles and Applications"
- **Civ E 344** "Urban Transportation Planning"
- **Civ E 440** "Public Transportation"
- **Civ E 443** "Traffic Engineering"
- **Civ E 542** "Pavement Design & Management"

Transport Systems Group:
Professor L. Fu
Professor F. Saccomanno
Professor B. Hellinga
Professor S. Tighe
Professor J. Casello

Sources of Information

1. Institute of Transportation Engineers (ITE) – US and Canada
    - UW Student Chapter!
2. Transportation Association of Canada (TAC) – Canada
    - Each province has their own design manuals/standards
3. American Association of State Highway and Transportation Officials (AASHTO) – US
4. Transportation Research Board (TRB) – US
5. …