

# Evaluation of Transportation Systems (20-575)

## Pre-requisite:

- (1) Transportation Engineering and Planning
- (2) Transportation Systems Analysis

## Course Objectives:

Introduction to certain transportation decision problems and their solution procedures.

## Course Titles:

1. Introduction to certain important transportation decision problems
2. Attribute decision making
  - 2.1. Single Attribute decision-making: Engineering economic decisions (Present Worth, Equivalent Annual Payment, Rate of Return, and Benefit/Cost Methods)
  - 2.2. Cost-Effectiveness Index methods
  - 2.3. Multi-attribute decision-making
  - 2.4. Example: Low volume road decisions
3. Road network design problem (Conventional)
  - 3.1. Introduction, objective function, user/system equilibrium flow, Braess's Paradox
  - 3.2. Linear Programming methods
  - 3.3. Implicit enumeration techniques
  - 3.4. Simplifying and heuristic methods (linear obj. function, decomposition)
  - 3.5. Meta-heuristic algorithms (Genetic, Simulated Annealing, Ant system, and Hybrid Methods)
4. Road Network Design Problem (Reliability)
  - 4.1. Design for infrequent-long term effect events (Earthquakes)
  - 4.2. Design for frequent-short term events (traffic accidents)
  - 4.3. Design for travel time reliability
5. Special Road Network Design
  - 5.1. Bus Network Design
  - 5.2. One-Way street Design
6. Air Network Design
  - 6.1. Basic Air Network Design Rules
  - 6.2. Long Distance Air Network Design

- 7. Water Way Network Design
- 8. Road Network Maintenance Problem
  - 8.1. Integer Programming
  - 8.2. Fuzzy Analysis
  - 8.3. Markovian Decision-Making
- 9. Decision under Uncertainty
  - 9.1. Criteria-based decisions
  - 9.2. Bayesian decision-making
- 10. Environmental Aspects of Transportation Decision
  - 10.1. Impact Area
  - 10.2. Quantification methods