CE 650D: Traffic Simulation

Course Description:

Exploration of traffic simulation including theory and practical applications. Calibration of simulation models and uses of simulation in engineering studies. Software methods.

Course objectives (course designed to provide students with):

This course will introduce traffic simulation including both theory and applications in software. Modeling and programming exercises will be included. Students will learn about mathematical models utilized in mesoscopic and microscopic modeling, both as standalone components and as part of simulation software, and apply them in some practical use cases.

Course Outcomes (students should be able to):

1. Describe purposes of mesoscopic simulation modeling and different types of mesoscopic models.

2. Build and calibrate a mesoscopic model and extract results from it.

3. Describe modeling principles that are used in microscopic simulation modeling, including car-following and lane-changing models.

4. Build and calibrate a microscopic model and extract results from it.

5. Develop a variety of performance measures from microsimulation software models.

6. Develop and execute a plan for a traffic study that uses simulation modeling.

Course Topics
- Mesoscopic modeling
    - Robertson Model
    - Cell Transmission Model

- Applications of mesoscopic modeling: Traffic signal timing

- Microscopic modeling,
    - Car-Following Models
        - Cellular Automata
        - Wiedemann
    - Lane-Changing Models

- Calibration of microscopic simulation models

- Extracting performance measures from microscopic simulation

- Applications to microscopic modeling:
    - Freeways
    - Urban streets