Fall 2018

CE 350-101: Transportation Engineering

Joyoung Lee

CE 350-101 Transportation Engineering
Fall 2018

Brief Course Description

This course will discuss the principles and practices of transportation engineering and urban transportation planning. The major topics of this course cover 1) highway geometric design, 2) capacity analysis of highway and intersection, and 3) travel demand forecasting. The course will have a group project investigating real world example problems related to traffic impact analysis studies for transportation facilities.

Prerequisites: CE 200, CE 200A.

Course Objectives

1. Understand the principles and practices of transportation engineering and urban transportation planning.
2. Understand the interactions between transportation planning and land use planning, economics, social planning and master plans.
3. Gain the facility of utilizing the state of the art techniques and models in the field.
4. Have the capability to identify and solve transportation problems within the context of data availability and limitations of analysis tools

Instructor Info & Office Hour

Professor Joyoung Lee, Ph.D.
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Office Hour: Thursday 3:00-5:00PM; Friday 3:00-4:00PM

Lecture Hours and Location

Thursday 06:00 PM - 09:05 PM; CKB 330

Textbook

F. Mannering and S. Washburn. Principles of Highway Engineering and Traffic Analysis, **5th Edition**, John Wiley & Sons, Inc., ISBN 978-1-1181-2014-9

Grading

Mid-term Exam: 25%
Final Exam: 35%
Homework: 10% (2% @ each)

Group Project: 30%

Group Project

The class will be divided into multiple groups to conduct a virtual traffic impact analysis (TIA) studies dealing with level of service analysis for transportation facilities such as freeway, interchange, intersection, and parking lot. Each group will perform the modeling of such facilities by using a microscopic traffic simulator, VISSIM, and Highway Capacity Software (HCS).

Each group must submit the list of group members by the end of Test 1 (i.e., the 4th week of the semester) and the presentation of the group project will be held in the 15th week of the semester. The format of the final report is free but following sections must be included in the report.

a. Goal and objectives of the project;
b. Spatial and temporal scopes of the project;
c. Project site description (e.g., intersection geometry, traffic condition, signal phase sequence, etc.);
d. Data collection summary (e.g., approach volume, green time, yellow time, saturation flow rate, etc.);
e. Level of service analysis summary; and
f. Conclusions and Recommendations (if any).

Exam/Homework Policies

Exam: All exams will be in-class closed book. Students are allowed to bring their own one-page formulation sheet which must be submitted to the instructor along with the question and answer sheet at the end of each exam.

Homework: Problems will be assigned to reinforce course learning objectives. The assignments will be targeted to provide practice for methods that may be included in course exams. There will be approximately two homework assignments during the semester. Homework should be turned in at the start of the class period identified by the instructor. No late homework will be accepted.

Collaborating, sharing, and/or copying for exam/homework is **NOT** allowed. Credit will not be given to individuals who either asked or allowed such behaviors. The NJIT honor code will be upheld and any violation will be brought to the immediate attention to the Dean of Students. See http://studentsenate.njit.edu/wp-content/uploads/2010/03/University_Code_on_Academic_Integrity.pdf

Class Polices

Cell Phones and mobile devices (e.g., Laptop, IPad/Tablet PC, IPod, etc.): Cell Phone should be turned off prior to coming to class. Texting and the use of mobile devices during the class shall not be allowed. Each student will be excused to miss up to two classes with prior permission/**VALID** reason. Each subsequent class missed will cost the student up to 5% of the overall grade. Five (5) or more missed classes will result in an F grade.

Course Schedule

Week	Topic	Reading	Assignment
1	Course Overview & Introduction to Transportation Engineering Road Vehicle Performance: Principles of Braking, Braking Forces	*Ch.1*	
2	Road Vehicle Performance: Stopping Sight Distance Geometric Design of Highway: Vertical Curve	*Ch. 2 pp. 9-41* *Ch.3 pp. 47-92*	Homework #1
3	Geometric Design of Highway: Vertical Curve		
4	Geometric Design of Highway: Horizontal Curve		Homework #2
5	Geometric Design of Highway: Horizontal Curve & Fundamentals of Traffic Flow	*Ch. 5 pp. 135-168*	
6	Fundamentals of Traffic Flow		Homework #3
7	Queuing Model		
8	Midterm Exam		
9	Highway Capacity and Level of Service Analysis: Basic Freeway Segment/Multi-Lane Highway	*Ch. 6 pp. 169-219*	
10	Highway Capacity and Level of Service Analysis : Multi-Lane Highway/Two-Lane Highway	*Ch. 6 pp. 169-219*	
11	Lab: Highway Capacity Software		Homework #4
12	Traffic Control and Analysis at Signalized Intersections	*Ch.7 pp. 253-279*	
13	Traffic Control and Analysis at Signalized Intersections & Lab: VISSIM Microscopic Traffic Simulation Model		Homework #5
14	Travel Demand and Traffic Forecasting	*Ch. 8 pp 285-324*	
15	Group Project Presentations		
	Final Exam		

Outcomes Course Matrix – CE 350-001 Transportation Engineering

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Demonstrate the principles and practices of transportation engineering and urban transportation planning.			
Discuss public transportation facilities.	2, 7	1, 2	Discussions, quizzes, and homework
Develop tools transportation facilities.	2, 7	1	Homework and quizzes.
Implement design of transportation facilities.	2	1, 2	Graded projects.
Student Learning Outcome 2: Recognize the interactions between transportation planning and land use planning, economics, social planning and master plans.			
Link transportation to land use, economics, social planning, and master plans.	2, 4	2, 3	Homework and quizzes.
Develop interactions between each of the above factors.	2, 4	2, 3	Homework and quizzes.
Give examples of growth due to improvement in transportation.	2	2, 3	Discussions, quizzes, and homework
Student Learning Outcome 3: Employ state of the art techniques and models in the field.			
Introduce need for forecasting models.	1, 2, 7	1, 2	Homework and quizzes.
Discuss application of models.	1, 2, 7	1, 2	Homework and quizzes.
Assign large scale problems.	1, 2, 7	1, 2	Quizzes and graded assignments.
Student Learning Outcome 4: Identify and solve transportation problems within the context of data availability and limitations of analysis tools.			

Discuss how to obtain data necessary for transportation studies.	7	1, 2	Homework.
Match up analysis tools, data sets and problems to solve.	2, 7	1, 2	Quizzes and homework.
Introduce problems to be solved using analysis tools.	2, 7	1, 2	Quizzes and homework.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies