Fall 2018

CE 351-101: Introduction to Transportation Systems

Kitae Kim

JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

CE 351 – Introduction to Transportation Systems, Fall 2018
Section: 101

INSTRUCTOR:
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Meeting Time and Location
Monday 6-9:05 PM Central King Building (CKB) 114

OFFICE HOURS:
Friday 10:00 am ~ Noon or by appointment

COURSE DESCRIPTION:
Problems in modern transportation systems will be introduced. The course will cover transportation planning and traffic engineering issues on highways and urban streets, while traffic simulation and animation will be applied to help students identify the problems. The concepts of highway (e.g., freeways, arterials and urban streets) operations and capacity, speed-flow-density relationships, traffic flow theory, ramp and weaving sections will be introduced prior to computer simulation analysis. The concepts of bus transit capacity and service quality as well as bus transit scheduling problems will be introduced.

Prerequisites: CE 200, CE 200A, CE 350

TEXTBOOK:
- Fred L. Mannering, Scott S. Washburn, ***"Principles of Highway Engineering and Traffic Analysis,"*** 5th Edition, John Wiley & Sons, Incorporated, ISBN 978-1-1181-2014-9

RECOMMENDED READINGS:
- Nicholas J. Garber and Lester A. Hoel, "Traffic and Highway Engineering", Cengage Learning, 5th edition, January,2014
- Roger P. Roess, Elena S. Prassas, and William R McShane, "***Traffic Engineering***," 4th Edition, Englewood Cliffs, NJ., Prentice Hall, 2010 (ISBN-10: 0136135730 and ISBN-13: 978-0136135739)
- Transportation Research Board, "***Highway Capacity Manual (2010)***", National Research Council, 2010
- TSIS – "***CORSIM Manual***", McTrans, University of Florida
- Transit Capacity and Quality of Service Manual, 3rd Edition, TCRP Report 165, TRB, 2013

STUDENT EVALUATION/GRADE DISTRIBUTION:
5% - Class attendance and participation
25% - Home works
20% - Term Project
25% - Midterm Exam
25% - Final Exam

FINAL GRADE:

Score	90 - 100	84 -89	76 - 83	68 to 76	60 to 68	50 to 60	0 to 50
Grade	A	B+	B	C+	C	D	F

TENTATIVE COURSE OUTLINE (SUBJECT TO MODIFICATION)

Date	Topic	Required Reading	Home Work/Project	
			Assigned	Due
9/6	Course Introduction			
9/13	Transportation Systems – An Overview: Characteristics Problems in Modern Transportation Systems	Supplementary Material	HW#1	
9/20	Transportation Systems – Components Infrastructure/Vehicles/Human	Chapter 1, 2/ Supplementary Material	HW#2	HW#1
9/27	Fundamentals of Traffic Flow Theory	Chapter 5	HW#3	HW#2
10/4	Freeway – as part of transportation systems Introduction of CORSIM – Basic Freeway Segment (lab-1)	Supplementary Material/ CORSIM Manual		
10/11	Freeway – as part of transportation systems Capacity Analysis and System Failure	Chapter 6	HW#4	HW#3
10/18	**Midterm Exam**			
10/25	Arterial - as part of transportation systems (Urban Street Systems and Traffic Control) Introduction of CORSIM – Urban Street Systems (lab-2)	Chapter 7/CORSIM Manual	HW#5	HW#4
11/1	Arterial - as part of transportation systems (Capacity Analysis and System Failure)	Chapter 7/ Supplementary Material	Project	
11/8	Transit – as part of transportation systems Introduction of CORSIM – Basic Transit Simulation (lab-3)	Supplementary Material /CORSIM Manual		HW#5
11/15	Transit – as part of transportation systems (Capacity Analysis and System Failure)	Supplementary Material	HW#6	
11/29	**Project** – System Failure – Scenario Analysis and Evaluation (Lab-4)	CORSIM Manual		HW#6
12/6	**Project** – System Failure - Scenario Analysis and Evaluation (Lab-5)	CORSIM Manual		
12/13	Project Presentation/Final Exam Review			
12/20	**Final Exam**			
12/23				Project Report

GENERAL RULES, REQUIREMENTS AND ANNOUNCEMENTS:

1) Class attendance is required (An attendance sheet will be passed around at the beginning of each class).
2) No late home-work and project report will be accepted unless there is a valid (e.g. medical) reason for late submittal. Home-works and project report are due at the beginning of the class on the designated dates. Carelessly written and disorganized homework and project will not be graded.
3) In addition to textbook chapters, lecture notes/supplementary materials/web-documents (web-links) provided electronically or in class are required readings

Course Objectives Matrix – CE 351 – Introduction to Transportation Systems

Strategies and Actions	**Student Learning Objectives**	**Student Outcomes (a-k)**	**Prog. Educational Object**	**Assessment Methods/Metrics**
Course Objective 1: Understand the components of transportation infrastructure, related traffic flow theory, and measures of effectiveness utilized for evaluating system performance.				
Introduce transportation facilities in freeways and urban streets.	Understand the facilities and their functions in different transportation systems.	1, 4, 7	1,2	Homework, exam
Introduce planning and operation issues for designing a public transportation system.	Understand the factors affecting public transportation system planning.	1, 2, 4, 7	2,3	Homework, exam
Introduce problems in modern transportation systems and ways to quantify the impact.	Learn methods to investigate the causes of transportation problems	2, 7	1,2	Homework, exam
Introduce traffic flow theory and measures for analysing transportation system performance.	Learn traffic flow theory and methods to measure system performance	1, 7	1	Homework, exam
Course Objective 2: Provide analytical and simulation skills to approximate traffic measures based on simulated, real-world liked data.				
Introduce the need for traffic simulation and analytical methods.	Utilize simulation and analytical approaches to study transportation problems.	1, 2	1,2	Homework, exam
Introduce concepts in traffic simulation and	Learn concept to interpret simulation results and use statistic	1, 2	1,2	Homework, exam

methods to analyse simulation results.	methods to estimate traffic measures.			
Develop microscopic traffic simulation models for impact analysis.	Learn computer, software to develop models for traffic simulation.	1, 2, 6	1,2	Homework, exam
Visualize simulated traffic operations and impacts under specific network.	Analyze traffic problems using traffic simulation, animation, and statistic outputs.	1, 6	1,2	Homework, exam, term project
Course Objective 3: Stimulate interest and enhance capability in solving transportation problems.				
Discuss "what if" scenarios, for mitigating the traffic impact of studied problems.	Learn potential soutions from reference books and technical papers/reports.	3, 6, 7	1,2	Homework, discussions, term project
Test and evaluate "what if" scenarios and verify the results.	Use simulation and analytical approaches to animate and evaluate all scenarios	1, 6	1,2	Homework, exam, term project.
Develop a term project and analyse designated transportation problems.	Ability to conduct an independent study, to research a transportation problem, and to investigate its causes	2, 4, 6	1,2	Term project
Host presentations for discussing the progress and findings of term project.	Ability to present the work progress and interpret results.	3, 6	1,2	Term project

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

Revised: 2/13/18