North South University

Department of Civil and Environmental Engineering (DCEE)

CEE 490A: Special Topic (Advanced Traffic Engineering)

Course Outline

1 BASIC INFORMATION

1.1 COURSE DESCRIPTION

This course will cover the fundamental principles and practices of traffic engineering. Specifically, the course will introduce the characteristics of road user, vehicle and roadway as they affect the traffic engineering function; the concepts of highway capacity and traffic flow theory; traffic control devices; the concepts of intersection control, intersection signal design and capacity analysis; traffic engineering studies involving volume, speed, and travel time; and techniques and methodologies applied to collect traffic data as well as scientific and statistical techniques used to analyze such data..

1.2 COURSE CONTENTS

1. Introduction to Traffic Engineering and Course Overview
2. Road User and Vehicle Characteristics
3. Roadway Characteristics; Sight Distance on Horizontal and Vertical Curves;
4. Levels of Intersection Control and intersection sight triangle
5. Fundamentals of Signal Timing: Pre-timed Signals- HCM Methodology
6. Shockwaves in Traffic Streams
7. Volume, Speed, and Travel time Studies
8. Statistical Applications in Traffic Data Analysis

1.3 COURSE INFORMATION

1. Senior level undergraduate course
2. Credit hours: 3 hours of classroom contact and 6 hours of self-study per week.
3. Two classes per week having 1.5 hours of duration
4. The course requires knowledge on probability and statistics

1.4 PREREQUISITE COURSE:

CEE 350: Traffic Analysis and Design

1.5 FACULTY

1. Name: Md Shoaib Chowdhury, Ph.D., P.E., F.ASCE; Professor, DCEE, Initial: SbC
2. Room No: SAC 732,
3. Phone: Office Ph: 8852000 ext. 6231
4. E-mail: shoaib.chowdhury@northsouth.edu
5. Office hours for Summer 2019:

   Monday 01:00 pm – 02:30pm; 4:20 pm- 5:20 pm

   Wednesday 01:00 pm – 02:30pm; 4:20 pm- 5:20 pm

1.6 CLASS HOURS:

- Section 1: MW 08:00 am –09:30 am (Room # SAC 304)
- Section 2: MW 02:40 pm –04:10 pm (Room # SAC 207)

1.7 TEXT BOOK(S)/RECOMMENDED READINGS:

1. Nicholas J. Garber and Lester A. Hoel, "Traffic and Highway Engineering", Cengage Learning, 5th edition, January,2014(Recommended)

2. Roger P. Roess, William R. McShane, and Elena S. Prassas, "Traffic Engineering", Fourth Edition, Prentice Hall, 2011 (Recommended)

3. Transportation Research Board, "Highway Capacity Manual (2010)", National Research Council, 2010 (Recommended)

4. Transportation Engineering & Planning, 3rd Edition. Papacostas, C.S. and P.D. Prevedouros. Prentice Hall, Upper Saddle River, NJ, 2001. ISBN 0-13-081419-9 (Recommended)

5. N. T. Kottegoda , R. Rosso, "Applied Statistics for Civil and Environmental Engineers" ISBN-10: 1405179171 and ISBN-13: 978-1405179171, 2nd Edition Wiley-Blackwell; 2008 (Recommended)

6. Jotin Khisty and B. Kent Lall, "Transportation Engineering-An introduction", Prentice Hall, Upper Saddle River, New Jersey, USA, latest Edition (Recommended)

2 COURSE OBJECTIVES AND OUTCOMES

2.1 COURSE OBJECTIVES:

1. To provide students with an understanding of the influence of human factors and vehicle characteristics on roadway geometric design and intersection control considerations
2. To introduce the fundamental concepts and principles of intersection signalization; and key steps involved in the design and analysis of pre-timed signal phasing and timing plan using the highway capacity manual (HCM) methodology
3. To introduce the concept of shockwave in traffic stream and its application in modeling traffic flow
4. To introduce the tools/techniques used to collect roadway traffic data (i.e., volume, travel time/delay, speed etc) and application of statistics in traffic data analysis

2.2 COURSE OUTCOMES (COs):

2.2.1 CO1: understand the importance of and consider human factors and vehicle characteristics in traffic engineering design

2.2.2 CO2: develop/design pre-timed signal phasing and timing plan for simple intersections using the highway capacity manual (HCM) methodology

2.2.3 CO3: explain the concept of shockwave and conduct shockwave analysis as part of a traffic flow problem

2.2.4 CO4: learn the tools/techniques used to collect traffic data (i.e., volume, travel time/delay, speed etc) and perform basic statistical analysis on such data

2.3 MAPPING OF COURSE OUTCOMES TO BSCEE PROGRAM OUTCOMES

L: Slightly maps (low); M: Moderately maps (medium); H: Substantially maps (high)

	PO - 1	PO – 2	PO - 3	PO – 4	PO - 5	PO - 6	PO - 7	PO - 8	PO - 9	PO - 10	PO - 11	PO - 12	PO - 13
CO1			M										
CO2	H												
CO3	H												
CO4				M									

2.4 CO DELIVERY AND ASSESSMENT

Course outcomes	Bloom's taxonomy, domain/level *(C: Cognitive, P: Psychomotor A: Affective)*	Delivery methods and activities	Assessment tools
CO1	C3	Lecture; examples/exercises	Assignment and/or Exam

CO2	C6	Lecture; examples/exercises	Assignment and/or Exam
CO3	C6	Lecture; examples/exercises	Assignment and/or Exam
CO4	C3	Lecture; examples/exercises	Assignment and/or Exam

2.4.1 Cognitive domain (knowledge-based): C

1: Knowledge, 2: Comprehension, 3 Application, 4 Analysis, 5: Synthesis, 6: Evaluation

2.4.2 The affective domain (emotion-based): A

1: Receiving, .2: Responding, 3: Valuing, 4: Organizing, 5: Characterizing

2.4.3 The psychomotor domain (action-based): P

1: Perception, 2: Set, 3: Guided response, 4: Mechanism, 5: Complex overt response, 6: Adaptation, 7: Origination

3 BSCEE PROGRAM OUTCOMES (PO)

3.1.1 PO – 1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex civil engineering problems.

3.1.2 PO – 2: Problem analysis

Identify, formulate, research the literature and analyze complex civil engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

3.1.3 PO – 3: Design/development of solutions

Design solutions for complex civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

3.1.4 PO – 4: Investigation

Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

3.1.5 PO – 5: Modern tool usage

Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex civil engineering activities with an understanding of the limitations.

3.1.6 PO – 6: The engineer and society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice.

3.1.7 PO – 7: Environment and sustainability

Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

3.1.8 PO – 8: Ethics

Apply ethical principles and commit to professional ethics, responsibilities and the norms of the civil engineering practice.

3.1.9 PO – 9: Individual work and teamwork

Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

3.1.10 PO – 10: Communication

Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

3.1.11 PO – 11: Project management and finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work as a member or a leader of a team to manage projects in multidisciplinary environments.

3.1.12 PO – 12: Life-long learning

Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

3.1.13 PO – 13: Contemporary Issues

Demonstrate sound knowledge on global and local contemporary civil engineering issues.

4 COURSE ASSESSMENT

4.1 TEACHING/LEARNING STRATEGIES

4.1.1 Lectures

- Attend all classes punctually
- Follow worked examples taught in the class and/or provided in the textbook
- Solve exercises from the textbook and/or assignment problems
- Discuss/work with peers to solve problems

4.1.2 Private study

- Review lecture materials and solve problems

4.2 ASSESSMENT

- Midterm exam and final exam will contain questions related to the topics covered in class to test students ability in solving analytical problems
- Assignment will be given to test students ability in solving real world problems by utilizing the analytical methods/tool/techniques learned in class

4.3 EVALUATION:

Distribution of Numerical Scores		Remarks
Assignment-I	15%	Students will work in groups to solve real world problems
Assignment-II	20%	
Midterm	35%	Duration: One hour or longer
Final Exam	30%	Duration: One hour or longer

4.4 GRADING POLICY:

Generally, NSU grading policy will be followed. However, minor deviation is still possible depending on the situation.

4.5 EXAM POLICY:

NO MAKE UP for MID-TERM OR FINAL EXAM WILL BE ARRANGED UNLESS AN ABSOLUTELY UNAVOIDABLE VALID REASON FOR ABSENCE IS FOUND. For such unavoidable circumstances, written explanation of the situation must be submitted before the exam. If the mid-term exam cannot be held on the due date, the exam will be automatically shifted to the very next available class, unless otherwise announced.

5 LECTURE SCHEDULE

***** One Day = 1.5 lecture hours, Total 24 days lecture = 36 lecture hours

Day*	Tentative Lecture Topic/ Material Covered	Assignment	
		Assigned	Due
1	Course Overview and Introduction		
2-6	Road User and Vehicle Characteristics; Roadway Characteristics; Sight Distance on Horizontal and Vertical Curves;	Assignment-I	
7- 13	Levels of Intersection Control and intersection sight triangle; Fundamentals of Signal Timing: Pre-timed Signals- HCM Methodology;		Assignment-I
14	**Midterm Exam**		
15	Fundamentals of Signal Timing: Pre-timed Signals- HCM Methodology (continued)	Assignment-II	
16-18	Traffic Stream Characteristics, Roadway Capacity and Traffic Flow Theory (Shockwaves in Traffic Streams)		
19-23	Volume, Speed, and Travel time Studies; Statistical Applications in Traffic Data Analysis;		Assignment-II
24	**Final Exam Review**		
Final Exam (As per schedule declared by NSU)			

6 CODE OF CONDUCT

Students must comply with the code of conduct as stated in the NSU policies (http://www.northsouth.edu/academic/academic-information-and-policies.html)

- It is highly requested to maintain discipline in the class like not to be late, refrain from making noise during lecture time, not to leave the class early.
- Adopting unfair means in the exams will be considered as a serious crime and the student shall be placed to the university disciplinary committee.
- All materials should be neat and clear, and demonstrate professionalism
- Direct duplication of the work of another is a big offense
- Paraphrasing another person's work with very minor changes keeping the meaning is also plagiarism