UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING

CVEG 563V: SPECIAL PROBLEMS
TRANSPORTATION SYSTEM CHARACTERISTICS
Spring 2022

Instructor: Dr. Suman Kumar Mitra, Assistant Professor
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Office Hours: Tuesdays 2 PM-3 PM (via team; If you want to meet during office hours, please send an email beforehand) (or by appointment)

Lectures: Tuesdays & Thursdays 12.30-1.45 PM, ENGR 0307 (Recorded lectures will be uploaded on the Blackboard at least for the first two weeks).

COVID-19 Policy: Please maintain all the COVID-19 protocols issued by the University of Arkansas. University of Arkansas COVID-19 Campus guidance can be found here: https://health.uark.edu/coronavirus/returning-to-campus/

University of Arkansas Policy (abridged):

Face Coverings

- Face coverings are required for all students, employees and visitors while on campus in indoor settings when social-distancing measures are difficult to maintain.
- Appropriate use of face masks or coverings that mask both the mouth and nose is critical in minimizing risk to others near you.
- Those not complying with use of face coverings will be asked to leave and return with a face covering. Individuals may be subject to warnings or other sanctions available in the Employee Handbook or Code of Student Life.
- The university expects the U of A community to behave responsibly with respect for the health and safety of others.

Social Distancing

- In addition to self-assessments and monitoring by the UA community, the university will adhere to CDC and ADH guidelines and recommendations regarding social distancing — keeping a minimum of 6 feet between individuals whenever possible

Course Description:
This graduate-level course will introduce the fundamentals of traffic engineering and transportation networks. In the first part, students will become familiar with traffic engineering studies, traffic flow theory, traffic control devices, traffic signals, capacity, and level of service analysis of freeways and urban streets. The second part of this course will introduce the basic concepts of transportation network analysis and explore some applications.

Course Learning Outcomes:
Students who successfully complete this course will be able to:

- Identify traffic stream characteristics.
- Recognize how traffic congestion starts and propagates
- Design a pre-timed signalized intersection, and determine the signal splits.
- Design an actuated signalized intersection
- Interpret and elaborate different types of traffic data
- Understand the fundamentals of transportation networks
- Understand and apply the general network algorithms.

Textbooks:
1. R.P. Roess, E.S. Prassas and W.R. McShane, *Traffic Engineering*, 4th Edition, Prentice Hall, 2010
2. Mannering, F.L., S.S. Washburn, and Kilareski, W.P., Principles of Highway Engineering and Traffic Analysis, 4th Edition, John Wiley and Sons, 2008. (Optional reference)
3. Sheffi,Y.(1985) Urban Transportation Networks, Prentice Hall
4. Course Notes: Printed version of lecture slides

Tentative Course Outline (It may be modified as the semester progresses):

Part I: Traffic Engineering

Topic 1. Introductory Concepts

Topic 2. Transportation System

Topic 3. Traffic Flow Theory

Topic 4: Introduction to Queuing Theory

Topic 5. Highway Capacity and Level of Service Analysis

Topic 6. Intersection Design and Control

Part II: Transportation Network

Topic 7. Transportation Network Fundamentals: Network Notation, Representation, and Storage

Topic 8. Network Flow Problems

Topic 9. Networks, Performance, Transshipment

Topic 10. The Shortest Path Problem

Grading Criteria:

Homework/Quizzes	25%
Midterm	25%
Final Exam	30%
Term Project	20%
Participation in Class Discussion	Bonus points

Term Project: The students will have two options for the term project. This first option is to collect and analyze both qualitative and quantitative data related to traffic-related problems in a city. The instructor will facilitate the data collection process. The second option is to develop a game (tabletop games, video games, active indoor games, etc.) for K-12 students (kindergarten to Grade 12). The main theme of the game needs to be transportation (preferably traffic engineering or transportation network). Two students will team up together to develop a game. Each team will present the idea with a demonstration in the final week of the semester. The underlying objective of the game is educational, specifically to grow interests in transportation engineering/planning among K-12 students.

An interesting article on the use of games in transportation teaching:
Huang, A., & Levinson, D. (2012). To game or not to game: Teaching transportation planning with board games. *Transportation research record*, *2307*(1), 141-149.
https://journals.sagepub.com/doi/pdf/10.3141/2307-15