University of Connecticut

CE 4740/5740 Traffic Engineering Characteristics

Fall 2020 Course Syllabus

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**Class times:** Tuesdays 5-7:30 in OAK 104 **Website:** [**http://lms.uconn.edu**](http://lms.uconn.edu)

**Office hours:** Please email any questions or concerns

**Texts:** we will use the following textbooks for this course:

* Traffic Engineering, 5th Edition, McShane, Roess, and Prasas
* Excerpts from *Highway Capacity Manual,* Transportation Research Board (provided on HuskyCT)

**Pre-requisites:** students should have completed the following courses or an equivalent:

* CE 2251 *Probability & Statistics in CEE* or equivalent: we will be applying statistical analysis methods learned in this course.
* CE 2710 *Transportation Engineering* or equivalent: we will be building upon fundamental traffic engineering and highway capacity concepts learned in this course.

**Catalog Course Description:** Relationships among traffic flow characteristics; concepts of demand and capacity, microscopic and macroscopic representations of traffic flow; capacity and level of service of highways; traffic stream models.

**Course Outcomes:** Students completing this course will be able to do the following:

* Understand concepts of demand, volume, and capacity and how these are important in understanding the fundamentals of traffic flow.
* Conduct field studies to observe gaps, speed, and volume data and how this data can be used in traffic flow analysis.
* Understand the fundamentals of traffic signal operations including signal phasing and timing.
* Use Highway Capacity Manual methods and Highway Capacity Software to estimate capacity and delay for freeways, multi-lane and two-lane rural highways, roundabouts, and signalized and unsignalized intersections.
* Determine why, when, and how traffic simulation can be used on projects.

**ABET Engineering Accreditation Commission Student Outcomes (**[**www.abet.org**](http://www.abet.org)**):**

* + - 1. **identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics:** Students will learn concepts of traffic flow on roadways and intersections which are based on engineering theories and mathematic models.
      2. **apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline:** Students learn to use observations of traffic flow characteristics to analyze and predict conditions under different road scenarios.
      3. **develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions:** Students learn to analyze real data sets and also conduct field experiments to collect traffic data for analysis.
      4. **communicate effectively with a range of audiences:** Students will lead and participate in class discussions about current events relevant to traffic flow theory.
      5. **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:** Students will conduct independent research to identify current events to share with the class or prepare a term paper on a topic related to the class.
      6. **recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge:** Students will learn to use Highway Capacity Manual methods for estimating capacity and level of service.
      7. **function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment:** Students work in teams to collect field data for analysis.

**University Policies and Regulations:**

* **Absences from Final Examinations:** <http://catalog.uconn.edu/academic-regulations/grade-information/#exam-absence>
* **Class Attendance:** <http://catalog.uconn.edu/academic-regulations/grade-information/#attendance>
* **Credit Hour:** <http://policy.uconn.edu/2012/08/22/credit-hour/>
* **People with Disabilities, Policy Statement:** <http://policy.uconn.edu/2011/05/24/people-with-disabilities-policy-statement/>
* **Policy Against Discrimination, Harassment and Related Interpersonal Violence:** <http://policy.uconn.edu/2015/12/29/policy-against-discrimination-harassment-and-related-interpersonal-violence/>
* **The Student Code:** <http://community.uconn.edu/the-student-code-preamble/>

**Class conduct:** My intention is to maintain a classroom environment that is conducive to learning. I will not tolerate any disruptive behavior that detracts from this environment, including, but not limited to, mobile phone or computer use (not related to the class), talking and eating. Any student engaged in behavior that I determine to be disruptive will be asked to cease the behavior, and if he/she refuses or continues, will be asked to leave. I also will not tolerate any abusive, offensive or demeaning actions or communication aimed at any person participating in the class. These expectations extend to any online forums or other electronic communication used for class discussions.

**Schedule of Topics and Exams, Readings and Homework and Term Paper Due Dates:**

Sep 1 - Introduction; course overview, review of key terms, traffic stream relationships, statistical measures (Ch. 5 and 7) **HW 1**

Sep 8 – The Concepts of Demand, Volume, and Capacity, field observations - traffic volumes, gaps, speeds (Chapter 6, 10, and 11) **HW 2**

Sep 15 - Major project topics, Traffic control devices, Manual of Traffic Control Devices, Intersection pavement marking and signage, freeway signage (Ch 4 and 31) **HW 3**

Sep 22 – Signal Warrant Analysis, Traffic signal operation, Pre-timed, Fundamentals of signal timing (Chapter 15 and 18) **TERM PAPER ASSIGNED FOR CE 5740 ONLY - HW 4**

Sep 29- Actuated signal operation, Detection, semi-actuated operation, elements of intersection design and layout, pedestrian phases (Ch 18, 19 and 20) – **HW 5**

Oct 6 - Capacity analysis of signalized intersections, calibration of signalized intersection analysis parameters, vehicle queuing, signal progression and coordination (Ch 21 and 22) – **HW 6**

Oct 13 - Capacity analysis of signalized intersections, calibration of signalized intersection analysis parameters, vehicle queuing, signal progression and coordination (Ch 21 and 22) – **HW 7**

Oct 20 - Vehicle queuing, signal progression and coordination (Ch 21 and 22)

**MID TERM EXAMINATION – TAKE HOME (CE 4740 and 5740) –Oct 20**

Oct 27 – Un-signalized intersections, roundabouts - basics, operational Analysis (Ch 25) – **HW 8**

Nov 3 – Un-signalized intersections, roundabouts - basics, operational Analysis (Ch 25) – **HW 9**

Nov 10 (Option 1) - Capacity Analysis of Freeways, Types of Ramp Analysis (Ch 28 and 29) – **HW 10**

Nov 10 (Option 2) - Definition of Micro and Macro Traffic Simulation; Discussion of HCS – **HW 10**

Nov 17 – **TERM PAPER PRESENTATIONS**

Dec 1 – **CURRENT EVENT PRESENTATIONS**

TBA **FINAL EXAMINATION (Covers entire course) Term paper due (CE 5740 only)**

**Field activities:** Traffic flow theory can be somewhat abstract and it is much easier to understand operation of traffic by observing it in action. Students will be encouraged to observe and conduct field studies to familiarize themselves with key traffic flow concepts. This activity will be conducted in groups based on class size.

**Homework:** Homework will be assigned and submitted electronically on HuskyCT and due as listed on the schedule above. Homework problems will be discussed in the class in which they are due, and therefore, late assignments will not be graded. The highest ten homework scores out of a possible twelve will count toward the student’s grade.

**Current Event Presentation:** Each student enrolled in CE 4740 will prepare a five-minute presentation about a news event related to a traffic engineering related activity on either a highway, intersection, or freeway. One student will do this during each class period until all students have had an opportunity. The class will then spend about 10 minutes discussing the presentation. The presentation should include a news article or media clip to share with the entire class and answer the following questions about it: 1) What is the main story presented by the article or clip? 2) What issue(s) related to traffic engineering does it illustrate? 3) How can you apply something you have learned in this course about traffic engineering to this situation? Presentations will be graded on the basis of answers to the above questions and the relevance of the selected article or media clip to class content.

**Term Paper:** Each student enrolled in CE 5740 will prepare a term paper on a topic assigned by the instructor. This project will involve a thorough exploration of the literature, a summary of the findings reported in the work found, and an interpretation and assessment by the student of the importance and value of the work to the field of traffic engineering, including any unanswered questions which might arise from the analysis. Your paper must not simply be a restating of the abstracts of the papers you read; if I find you are copying abstracts you will not receive credit for the paper. Your final submission for the term paper must be uploaded to HuskyCT on or before the date of the Final Exam. Papers should be no more than twenty double-spaced pages in length, including figures and tables. I will not read past twenty pages. Grades on late submissions will be reduced five percent per calendar day. Papers will be graded on content, presentation and writing quality (grammar, spelling, punctuation, clarity, and organization). Students will also give a 15-20 minute (depending on time available) presentation about their findings on the last day of class and answer questions from the rest of the class.

**Exams:** There will be two exams - a mid-term and a final – Mid-term will be take home and the final exam will be given after the completion of classes. These dates are subject to change and will be confirmed at least two weeks ahead of time. Students enrolled in CE 5740 will have one extra question on each exam. No makeup will be given for the Mid-term exam without prior arrangement with the instructor.

**Grading:** Each portion of the course work will contribute toward the final grade as follows:

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| --- | --- | --- | --- | --- |
| CE 4740 | HW = 10% | Current event presentation = 30% | Midterm Exam = 30% | Final Exam = 30% |
| CE 5740 | HW = 10% | Term Paper = 30% | Midterm Exam = 30% | Final Exam = 30% |

**Plagiarism:** It is permissible and encouraged to work with classmates on problem assignments. The purpose of group collaboration is to bring together different viewpoints so a colleague may shed new light on a problem you are grappling with. The purpose of group collaboration is not to collectively put together one solution to a problem and pass it off as individual work. In fact, collective solutions violate the University of Connecticut code on plagiarism and require that actions be taken which may include dismissal from the university. See the Student Code of Conduct (URL listed above) for more details.