
CE 706 Course Syllabus

CE 706 – Advanced Traffic Control

Section 001/601

Spring 2024

3 Credit Hours

Course Description

The purpose of this course is to provide students with basic knowledge of traffic control in transportation networks. At the end of this course, the student should be able to understand basic traffic signal control, traffic metering, traffic assignment, and speed harmonization. The course will also discuss the integration of autonomous vehicles into traffic control systems. In this course, the instructor will work with students on technical or literature review papers related to the course topic. The students should strive to develop publication-quality papers and gain valuable experience in the paper preparation process. Each student will be in close communication with the instructor on different milestones of the paper.

Learning Outcomes

- 1) Demonstrate and apply a basic understanding of traffic signal systems.
 - 2) Demonstrate and apply specific knowledge of traffic metering, traffic assignment, and speed harmonization.
 - 3) Demonstrate and apply a basic understanding of the integration of autonomous vehicles in Traffic control systems.
 - 4) Get deep experience in developing journal quality publications.
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Course Structure

In Person, 4134 Fitts-woolard Hall, T/R 1:30 2:45 pm

Instructors

Dr. Ali Hajbabaie - *Instructor*

Email: ahajbab@ncsu.edu

Web Page: <https://www.ccee.ncsu.edu/people/ahajbab/>

Phone: 919 515 5938

Office Location: Zoom -

<https://ncsu.zoom.us/j/94219338465?pwd=UUVMNnJZcVRYOW04Y3BWOEIYSWJLZz09>

Office Hours: Tuesdays 12:30 pm to 1:30 pm

Course Materials

Textbooks

None. Papers will be provided.

Requisites and Restrictions

Prerequisites

CE 402 or CE 502

Grading

Grade Components

| Technical papers | Literature Review papers | Percentage | Due Date |
|------------------------------|--------------------------------|------------|---------------------|
| Paper Topic/Abstract/Outline | Paper Topic/Abstract/Outline | 10% | End of week 3 |
| Model Formulation | Extracting the relevant papers | 15% | End of week 7 |
| Solution Methodology | Extended outline | 20% | End of week 11 |
| Numerical Analysis | Key findings, future research | 20% | End of week 15 |
| Final paper | Final papers | 35% | April 25 at 2:00 pm |

Letter Grades

This Course uses Standard NCSU Letter Grading:

| | | | |
|-----------------|-----------------|-----------------|-----------------|
| A+ 97% - 100% | B+ 87% - 89.99% | C+ 77% - 79.99% | D+ 67% - 69.99% |
| A 93% - 96.99% | B 83% - 86.99% | C 73% - 76.99% | D 60% - 66.99% |
| A- 90% - 92.99% | B- 80% - 82.99% | C- 70% - 72.99% | D- <60% |

Requirements for Credit-Only (S/U) Grading

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to <http://policies.ncsu.edu/regulation/reg-02-20-15>.

Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at <http://policies.ncsu.edu/regulation/reg-02-20-04>.

Policies on Incomplete Grades

If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at <http://policies.ncsu.edu/regulation/reg-02-50-3>.

Late Assignments

No Late assignments accepted.

Attendance Policy

For complete attendance and excused absence policies, please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

Attendance Policy

Required.

Academic Integrity

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Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at <http://policies.ncsu.edu/policy/pol-11-35-01>

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct. Violations of academic integrity will be handled in accordance with the Student Discipline Procedures ([NCSU REG 11.35.02](#)).

Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Digital Course Components

Students may be required to disclose personally identifiable information to other students in the course, via digital tools, such as email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Digital Course Components: Moodle

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (<https://policies.ncsu.edu/regulation/reg-02-20-01/>).

Non-Discrimination Policy

NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information as to each Protected Status is included in NCSU REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <https://oied.ncsu.edu/divweb/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

Course Schedule

NOTE: The course schedule is subject to change.

Week 1 — No Class TRB

Week 2 —

Course introduction, Intro to Traffic Flow and Cell Transmission Model

Week 3 —

Cell Transmission Model

Week 4 —

Topic Presentation – students make a 10 min presentation about the topic, outline, and need for the study.

Week 5 —

Signal Control, existing approaches, Isolated intersection

Week 6 —

Signal Control Arterial and Network

Week 7 —

Traffic Metering

Week 8 —

Students make 15-minute presentations about the formulation/papers they have extracted. For lit rev, a clear understanding of state of the art needs to be shown in this presentation.

Week 9 —

Traffic Assignment

Week 10 —

Spring Break

Week 11 —

Speed Harmonization

Week 12 —

Students make presentations about the problem formulation/extended outline of the lit rev paper. 15-minute presentations.

Week 13 —

AV Incorporation in Traffic Control Systems

Week 14 —

AV Incorporation in Traffic Control Systems

Week 15 —

AV Incorporation in Traffic Control Systems and Project Presentation

Week 16 —

Project Presentation