

CE 584 – Intelligent Transportation Operations

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Office Hours: Wed 10:30 am- 12:30 pm by
appointment
Office hour zoom link:
<https://usc.zoom.us/j/96293798917>
Meeting ID: 962 9379 8917

Units: 4
Term: Fall 2024
Schedule: Tue 9:00 am-12:20 pm
Location: KAP 267
Teaching Assistant: N/A

Catalogue Course Description

Fundamentals of intelligent transportation systems, including automated vehicle technology and applications, communication systems, advanced transportation management systems, policy issues, transportation network services, and smart cities.

Expanded Course Description

The objective of this course is to introduce concepts of intelligent transportation systems (ITS). This course provides students with the knowledge and skills to cope with the principals of ITS in communication systems, vehicle technologies, transportation planning and policy, infrastructure design, and smart city concepts. The history of ITS, emerging technologies in ITS, and the future applications of ITS in transportation systems will also be discussed. The topics and discussions will be supported by related case studies.

Learning Objectives and Outcomes

After completing this course students will be able to:

- Understand the history of ITS and the latest ITS technologies
- Recognize the benefits of ITS in different transportation systems
- Interpret the different applications of ITS in transportation planning and infrastructure design
- Analyze the elements of the smart transportation system
- build an ITS scenario and develop a collaborative research term paper

The learning objectives will be assessed using assignments, homework, exam, and term paper

Prerequisite(s): None

Co-Requisite(s): None

Concurrent Enrollment: None

Recommended Preparation: Prior coursework in transportation engineering at the level of CE 471 or PPDE/CE 637. This course is primarily for graduate engineering students but is accessible to applied social science students if they have a special interest in the topic, particularly if they have an undergraduate engineering background.

Course Notes

All the course materials including assignments, lecture slides, homework, solutions, and scores will be posted on the class Blackboard website.

Technological Proficiency and Hardware/Software Required

There are no special software or other technical proficiency requirements.

Readings and Supplementary Materials

Assignments and the reading material for the class comes primarily from the instructor's handouts and online references provided during lectures. These will be available for download from the Blackboard course website. The following references are optional reading.

- Perallos, Asier, Unai Hernandez-Jayo, Enrique Onieva, and Ignacio Julio García Zuazola, eds. *Intelligent transport systems: technologies and applications*. John Wiley & Sons, 2015.
- Gordon R. *Intelligent Transportation Systems*. Cham: Springer. 2016.
- Ozguner U, Acarman T, Redmill KA. *Autonomous ground vehicles*. Artech House; 2011.

Description and Assessment of Assignments

The following components are used to assess the outcomes:

Homework (25%): At the end of each topic, homework will be available and they are due one week from the assignment date, unless otherwise indicated. Students are expected to complete all homework on time. Late assignments are accepted only for up to 24 hours after the due date with a 20% penalty. Homework must be electronically submitted to Blackboard, clearly handwritten or typed and show all work. Many students choose to type up written answers but handwrite mathematical answers. Homework should be solved independently. If there is any evidence of cheating, relevant University policies and regulations will be applied. Homework will be graded based on organization, neatness, accuracy, and effort.

Class assignment (25%): Class activities are evaluated using class assignments. Class assignments are group activities assigned during the class and are due in hardcopy by the end of the class. Time is allotted during each class period to discuss the class assignment questions. Late assignments are accepted only by the end of the class day with a 20% penalty. Grades will be based on a student's involvement in these class activities and the quality of the solutions.

Mid-Term Exam (25%): There will be one close-book midterm exam held during our regularly scheduled class time on Tuesday, October 8th at 9:00 am. If case the midterm exam is missed, an official, acceptable, and verified excuse must be presented to be able to make up the exam as early as possible. This excuse must be recorded within 24 hours. An unexcused failure to take the exam will result in a zero for the exam.

Term Paper (25%): Students will be required to complete a group research paper. The topic can be chosen from a list of proposed research topics. Students are also welcome to suggest their own topic title, but the instructor must approve this. Project tasks and timeline are available later in the class. Grades are assigned based on the project tasks and details will be discussed with you in the class. Students will receive feedback on each task. The final report shall be in the style of an academic paper (3500-5000 words) with in-text citations and is due on the last week of the class. All the groups will present their research findings and share their results with the rest of the class. All the member of the group are required to participate in the final research presentation.

Grading Breakdown

Final grades will be calculated as follows:

| Assignment | % of Grade |
|-------------------|-------------|
| homework | 25% |
| Class Assignments | 25% |
| Mid-Term Exam | 25% |
| Term Paper | 25% |
| TOTAL | 100% |

Assignment Rubrics and Grading

The rubric for oral presentation of the research paper as well as the research paper outline including the tasks and timeline will be provided during the class. Grades will be posted on class web page within two weeks after each assignment submission.

Additional Policies

Students are expected to assist in maintaining a classroom environment, which is conducive to learning. In order to assure that all students have an opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from using cellular phones and MP3 players in class, laptops for nonrelated class activities, or engaging in any other form of distraction. Inappropriate behavior in the classroom shall result in, minimally, a request to leave class. Attendance is not required but will be monitored throughout the semester. Each student is required to be on time. Incidences of excessive absence will be dealt with in a manner consistent with University policy and procedures.

Course Schedule: A Weekly Breakdown

*This schedule serve as a guideline. It may be changed at the instructor's discretion

| | Topics/Daily Activities | Readings | Deliverables |
|-------------------|---|-----------------------|--|
| Week 1 Aug 27 | Introduction to ITS | Handout by instructor | NA |
| Week 2 Sep 3 | Traffic Flow Theory and mathematical models | Handout by instructor | HW1 is assigned |
| Week 3 Sep 10 | Role of ITS in traffic control and operation | Handout by instructor | HW1 is due HW2 is assigned |
| Week 4 Sep 17 | Concept of capacity and Level of Serice | Handout by instructor | HW2 is due HW3 is assigned |
| Week 5 Sep 24 | Application of ITS in congestion mitigation and accident clearance | Handout by instructor | HW3 is due HW4 is assigned |
| Week 6 Oct 1 | Signal Design Traffic signal control systems and adaptive traffic management | Handout by instructor | HW4 is due Project Task 1 is assigned |
| Week 7 Oct 8 | Midterm exam | | NA |
| Week 8 Oct 15 | Connected vehicles | Handout by instructor | Project Task 1 is due HW6 is assigned Project Task 2 is assigned |
| Week 9 Oct 22 | Wireless vehicular communication V2X | Handout by instructor | HW6 is due |
| Week 10 Oct 29 | Active traffic and corridor management | Handout by instructor | H Project Task 2 is due HW7 is assigned |
| Week 11 Nov 5 | Autonomous vehicles Object detection | Handout by instructor | HW7 is due HW8 is assigned |
| Week 12 Nov 12 | Use of ITS in traffic management Ramp metering | Handout by instructor | Project Task 3 is due Project Task 4 is assigned HW8 is due |
| Week 13 Nov 19 | Evaluation of system design Benefit/cost analysis | Handout by instructor | |
| Week 14 Nov 26 | ITS and security Review of Legal aspects | Handout by instructor | Project Task 4 is due |
| Week 15 Dec 6 | Research Paper Presentations | NA | Project Final Draft is due |
| Week 16 Dec 11 | Final exam week | NA | NA |

Statement on Academic Conduct and Support Systems

University Policies on Scientific Misconduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Technical Blackboard and Zoom Assistance
<https://keep-teaching.usc.edu/>

Campus Support and Intervention
<https://campussupport.usc.edu/>

Kortschak Center for Learning and Creativity
<https://kortschakcenter.usc.edu/>

USC Libraries
<https://libraries.usc.edu/covid-19-library-support-online-teaching-and-research>

USC writing Center
<https://dornsife.usc.edu/writingcenter>

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic, which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.