CE 584 Intelligent Transportation Systems
Units: 4
Term: Fall, 2021
Tuesday: 6:30 PM-9:50 PM

Location: KAP 113

Instructor: Shahed Rowshan, Ph.D., P.E.
Office: KAP 200-A

Office Hours: Tuesdays 5:30 PM-6:30 PM and
by appointment
Contact Info: srowshan@usc.edu
Text/Phone: (310) 995-5025

Teaching Assistant: N/A

IT Help: engrhelp@usc.edu for Viterbi IT
consult@usc.edu, 0-5555 for ITS

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
Intelligent Transportation Systems (ITS) are an international initiative to improve the effectiveness and efficiency of surface transportation systems through advanced technologies in information systems, communications, and sensors. ITS refers to information and communication technologies applied to transportation infrastructure and vehicles that improve transportation safety, productivity, environment, and travel reliability.

This course presents the fundamental concepts of ITS to students with interests in engineering, transportation systems, communication systems, vehicle technologies, transportation planning, transportation policy, and urban planning. With accessibility of mobile devices, ITS applications such as trip planners assist travelers to make informed travel choices. Automated vehicles and impact of ITS on the future of ride sharing are discussed. In addition to technology discussions, this course will include topics related to policy, economics, security, legal, as well as urban and rural planning.

This course will include but is not limited to the following topics:
- Introduction to Intelligent Transportation Systems (ITS)
- Advanced Transportation Management Centers
- Advanced Traveler Information Systems
- Federal ITS Programs
- ITS Strategic Plan (2020-2025) and Emerging Technologies
- ITS Highway Safety Perspective
- Environmental Aspects of ITS
- Connected Vehicle Technology and Applications
- Autonomous Vehicle Technology and Applications
- Smart Cities and Communities
- Parking Solutions
- Automated Vehicles and Ride Sharing
- ITS Standards and Architecture
- ITS Communication Systems
- 511 and Waze Travel Information Systems
- Interactive Voice Recognition (IVR)
- Bus Rapid Transit (BRT) Systems
- Autonomous Transit Systems
- ITS Integration
- Economics of ITS – Revenue Generation Models
- ITS and Security
- ITS Policies and Legal Issues
- International ITS Programs
- Case Studies of the latest ITS Implementations
- Careers in the ITS Field

Other special aspects of the course format:
- Students will be informed of significant transportation meetings and conferences, some of which are of national and international importance, and guided to participate in relevant local meetings.

Learning Objectives and Outcomes
Students who complete this course will have:
- gained an understanding of the concepts related to the latest ITS technologies.
- gained an understanding of the concepts related to industry applications within the ITS field, such as autonomous vehicles, in part by observing the operation of one or more transportation management centers and field applications of ITS technologies in the Greater Los Angeles area.
- engaged in weekly discussions on the latest technical, policy, and legal news and events in the ITS world.

The outcome of the course will be for the students to:
- have a new outlook on the future of smart cities, autonomous vehicles, parking, and ITS technologies
- learn to extemporaneously discuss related material at an advanced level by engaging in virtual class discussions and by participating in related transportation meetings and conferences.
- learn to complete a comprehensive independent research paper on a topic related to ITS.
- gain presentation skills and technical writing skills after completing their independent ITS research.

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. Students who are unsure of their preparation should consult with the instructor, who will help make a careful determination of whether students are likely to succeed in the course.

Course Notes
Additional selected readings are posted from time to time on the class Blackboard website.

Technological Proficiency and Hardware/Software Required
Students are presumed to have the equivalent of an undergraduate engineering background or the equivalent, though applied social science students are welcome to take the class. There are no other special software or other technical proficiency requirements.

Required 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.

Technical and financial news related to ITS are discussed in every class. The following references are optional reading.

Mashrup Chowdhury, et. al, *Data Analytics for Intelligent Transportation Systems, 1st Edition*, Elsevier, 2017.

Kyandoghere Kyamakya, et. al, Intelligent Transportation Related Complex Systems and Sensors, MDPI, 2021

Tsunenori Mine, Akira Fukuda, et al., *Intelligent Transport Systems for Everyone's Mobility,* 1st Edition, Springer, 2019

Radovan Miucic, *Connected Vehicles: Intelligent Transportation Systems*, 1st Edition, Springer, 2019

Samuel Morgan, *Intelligent Transportation Systems: Technologies and Applications,* Clanrye International, 2015.

Marco Picone, et. al, *Advanced Technologies for Intelligent Transportation Systems*. Springer, 2014.

Grading Breakdown

The following weights will be used for grading student performance.

Class Component	% of Course Grade
ACTIVE Participation	10%
Class Assignments	10%
Midterm Examination	20%
Independent Research Paper and Presentation Content 30%, Technical Format 5%, Presentation 5%	40%
Comprehensive Final Examination	20%
Total	100%

Participation/Group Discussions:

ITS is a field of emerging technologies. The lecture topics include the latest information in research and practice. Students are highly encouraged to participate in class discussions and to bring up topics of their interest or in the news to class. The instructor will also provide questions and topics for discussions and students are to participate in discussions in small groups. Each group will report their thoughts and findings to the class.

Other Assignments:
- Assignments should be executed independently. If there is any evidence of cheating, relevant University policies and regulations will be applied.
- Assignments must be submitted by the due date. Late assignments will not be accepted.

Midterm and Final Exam:

Mid Term and final exams will be comprehensive multiple-choice questions on broad topics included in the lectures, class discussions, reference material, and student presentations. The exams are closed book.

Independent Research Paper and Presentation:
Students will write an independent research paper on a selected topic on the application of Intelligent Transportation Systems and related areas. This paper is a significant part of this course. The paper and presentation are important means of student evaluation.

The steps in fulfilling the research paper requirements are:
i)   Research Paper Topic Selection
ii) Paper Proposal
iii) Research Paper Presentation
iv) Paper Submittal

The specific requirements and expectations for completion of the research paper are:

i)   Research Paper Topic Selection
The topic chosen for the research paper may deal with technical, institutional, policy, or societal aspects of Intelligent Transportation Systems. The topic will be selected in consultation with the instructor and the final selection will be with his approval.

In selecting the topic, the students should think beyond simply presenting a history or a literature survey. The goal is to think of what new ideas and innovative solutions can be added to a particular topic. The paper should be written in student's own words, with careful attention to proper citation of sources.

For the research paper, every student will conduct an effort aimed at identifying factors that influence the level of transportation problems and innovative solutions / counter-measures that might address the problem. The students can choose a topic that is of interest to them, and it can be a study that they are working on or intend to develop into a thesis or dissertation.

ii) Research Paper Proposal
Students will be required to prepare a research paper proposal. The proposal is limited to two pages, and shall include the following:
- Name.
- Research paper title.
- An outline of specific objectives of the paper.
- Preliminary outline of paper.
- Information on preliminary literature research (minimum of ten recent relevant journal articles or technical reports).

iii) Research Paper Presentation
Students are required to present the research paper in an online class presentation. The presentation should take about 20 minutes and followed with up to a 5-minute period for questions and discussions. The presentation is to be made with slides (Power Point, etc.), videos, or other visual aids.

Students are required to participate in all paper presentations. The presentations should be looked upon as an opportunity to gain experience making a professional presentation in a supportive environment, among peers.

Students will be evaluated on their presentation as follows:
- Relevance of topic to ITS
- Independent and innovative ideas/approach
- Logic of conclusions and recommendation
- Overall impression/Quality of visual aids
- Ability to engage the audience

iv) Paper Submittal

The final paper format requirements are similar to those called out for Transportation Research Board (TRB) papers.

https://trb.secure-platform.com/a/page/trrjournal/forauthors

The paper should include the following sections in the given order:
(1) Title page, (2) Abstract, (3) Table of Contents, (4) Main body of paper with including tables and figures (5) Acknowledgement, if any, (5) References, and (6) Appendices, if any. The paper should not be longer than 7,500 words. The abstract should not be longer than 250 words.

In addition:
- All tables and figures should be labeled, with sources cited.
- Use one-inch margins at top, bottom, left, and right.
- Number pages in lower right corner.
- Special binding is not required.

Additional details and instructions will be made available during lectures.

Grading Scale
Course final grades will be determined using the following scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
94-100	90-93.9	87-89.9	83-86.9	80-82.9	77-79.9	73-76.9	70-72.9	67-69.9	63-66.9	60-62.9	59 or below

This scale is presented for the sake of completeness. Courses in which students earn grades below a C cannot be presented for credit toward graduation in a USC graduate program, though the course grade remains part of the student's graduate GPA.

Grading Timeline

Grades will be reported back to the students within one to two weeks after each assignment is submitted.

Weekly Course Schedule:

Week	Topics	Reading	Deliverable / Due Date
8/24/21	*Overview and History of ITS* *USDOT's Intelligent Transportation Systems Strategic Plan 2020-2025*	Slides provided on blackboard	Review of ITS in the news
8/31/21	*Overview of ITS Applications, Federal ITS Programs* *ITS Benefits, Costs, and Lessons Learned*	Slides provided on blackboard	Review of ITS in the news
9/07/21	*Improving Highway Safety with ITS* *Connected Vehicle Safety Pilot* *Environmental Aspects of ITS*	Slides provided on blackboard	Class assignment
9/14/21	*Advanced Transportation Management Centers with Functional Areas* *System Engineering* *System Integration*	Slides provided on blackboard	Research Paper Topic Due
9/21/21	*Active Transportation and Demand Management* *Integrated Corridor Management (ICM)* *Case Studies in Europe and U.S. (*California and Virginia)	Slides provided on blackboard	Review of ITS in the news
9/28/21	*Traveler Information Systems* *511 and Waze Traveler Information Systems* *Interactive Voice Recognition (IVR)* *Case Studies in California and New York*	Slides provided on blackboard	Research Paper Proposal Due Class assignment
10/05/21	*Automated Vehicle Technology and Applications* *Automation Research at USDOT* *Communication Systems* *Mapping Technologies* *Safety Pilots*	Slides provided on blackboard	Quiz
10/12/21	*Mid-Term Examination*		

Week	Topics	Reading	Deliverable / Due Date
	ITS Transit Applications – The Next Generation – Bus Rapid Transit (BRT) Case studies	Slides provided on blackboard	
10/19/21	*ITS Transit Applications –The Next Generation* *Autonomous Transit Systems*	Slides provided on blackboard	Class assignment
10/26/21	*ITS Standards* *ITS Architecture*	Slides provided on blackboard	Review of ITS in the news
11/02/21	*Economics of ITS* Congestion Pricing – Revenue Generation Models	Slides provided on blackboard	Class assignment
11/09/21	ITS Security Topics Cybersecurity	Slides provided on blackboard	Review of ITS in the news
11/16/21	*International ITS Programs* *ITS Policy and Legal Discussions*	Slides provided on blackboard	Class assignment
11/23/21	***Student Research Paper Presentations*** Review and Wrap-Up		
11/30/21	***Student Research Paper Presentations*** Review and Wrap-Up		Final papers due
12/07/21	***Study Period:*** *No class held, no assignments due*		
12/14/21	***Final Examination*** *(2 hours)*		

Statements on Academic Conduct and Support Systems

Academic Conduct:

 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:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call

studenthealth.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) 740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

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

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298

equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, 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 Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

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.

 Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.