

CE 584 – Intelligent Transportation Systems

**Sonny Astani Department of Civil and Environmental Engineering
University of Southern California**

Fall 2015 Course Syllabus

Lecturer	Shahed Rowshan, Ph.D., P.E. srowshan@usc.edu Mobile/Text: (310) 995 5025
Class Time	Tuesdays 6:30 – 9:10 PM
Location	KAP 141
Office Hours	Tuesday 5:30-6:30 PM and by appointment

I. COURSE SUMMARY

This course presents the fundamental concepts of Intelligent Transportation Systems (ITS) to students with interest in engineering, transportation systems, communication systems, vehicle technologies, transportation planning, transportation policy, and urban planning. ITS refers to information and communication technologies, as applied to transportation infrastructure and vehicles, that improve transportation safety, productivity, environment, and travel reliability. With accessibility of mobile devices, ITS applications, such as trip planners, help travelers make informed travel choices. ITS is an international program intended to improve the effectiveness and efficiency of surface transportation systems through advanced technologies in information systems, communications, and sensors. In addition to technology discussions, this course will include topics related to policy, economics, security, as well as, urban and rural planning.

II. LEARNING OBJECTIVES

Students who successfully complete the course will have gained a basic understanding and appreciation of the concepts related to ITS technologies and industry applications of the field such as self-driving cars. The students will conduct a comprehensive independent research project, on topics related to ITS, to enhance their understanding of a specific topic of their interest.

One or two field trips will be scheduled during the semester that would allow students to observe the operation of a transportation management center and field applications of ITS technologies in the Greater Los Angeles area. Guest lecturers may be invited to present expert ITS discussions, to bring practical experience to the classroom lecture, and to promote interactive discussions with the students.

Students will be informed of significant local, national and international transportation meetings and conferences and guided to attend the local meetings, if possible.

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III. TOPICS TO BE COVERED

This class will include but not limited to the following topics:

- Introduction to Intelligent Transportation Systems (ITS)
- Advanced Transportation Management Systems (ATMS)
- Advanced Traveler Information Systems (ATIS)
- Federal ITS Programs
- ITS Highway Safety Perspective
- Environmental Aspects of ITS
- Connected Vehicle Technology and Applications
- Self-Driving Cars
- ITS Standards and Architecture
- ITS Telecommunications
- 511 Travel Information Systems
- Interactive Voice Recognition (IVR)
- Mobile Applications
- Transit ITS – The Next Generation
- ITS System Integration
- Economics of ITS – Revenue Generation Models
- ITS and Security
- ITS Policy Issues
- International ITS Programs
- Case Studies of ongoing State ITS programs
- Study of a current ITS Request for Proposals (RFP)
- Careers in the ITS Field

IV. REFERENCES

The reading material for the class comes primarily from the instructor's handouts and online references provided during lectures. These will be available on the Blackboard course website or handed out in class.

The following references are optional reading:

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

Marco Picone, *Advanced Technologies for Intelligent Transportation Systems*. New York, NY, Springer, 2014.

Sussman, Joseph. *Perspectives on Intelligent Transportation Systems (ITS)*. New York, NY, Springer, 2010.

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V. STUDENT EVALUATION

The following criteria will be used for grading:

Active Class Participation	10%
Field Trip Reports/ Assignments	10%
Mid Term Exam	20%
Independent Research Project/Presentation	40%
Final Exam	<u>20%</u>

Total: 100%

VI. FIELD TRIP(S)

In addition to class-related projects, one or two field trips to transportation management centers in Los Angeles area will be arranged for this class. The site visit(s) will be conducted during business hours. Attendance to site visit(s) will be required and highly recommended. The date and time of the site visit(s) will be decided based on agency availability. Ample advance notice will be given to the students to plan for the site visit(s).

Most facilities to be visited are not necessarily accessible by the public. Therefore, students should make every effort to attend each facility visit. Details of the visit(s) such as transportation arrangements will be discussed in class. Students will be required to write a report about what they learn on the site visit or related selected topics.

VII. INDEPENDENT RESEARCH PROJECT

Students will conduct an independent research project on a selected topic on the application of Intelligent Transportation Systems and related topics. This project is a significant part of this course and student evaluation.

All students and the instructor will grade each student project and presentation. The collective average grade provided by the students and the instructor will count toward the grade for class project/presentation for each student.

The steps in fulfilling the research project requirements are as follows:

- i) Project Topic Selection
- ii) Project Proposal
- iii) Project Class Presentation
- iv) Paper Submittal

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The specific requirements and expectations for completion of the research project are as follows:

i) Project Topic Selection

The topic chosen for the research project 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 presenting simply 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 word, with careful attention to proper citation of sources.

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

ii) Project Proposal

The students will be required to prepare a project proposal. The proposal is limited to two pages. The proposal shall include the following:

- Name
- Research Project 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) Project Class Presentation

Students are required to present the research project in a class presentation. The presentation should take about 15 minutes and will follow with up to a 10 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 attend 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.

Presentation Evaluation

Students will be evaluated on their presentation as follows:

- Quality of visual aids
- Relevance of topic
- Logic of conclusions and recommendation
- Independent and innovative ideas/approach

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Ability to answer questions
Overall impression

iv) Final Paper Format

The paper requirements are similar to those of the Transportation Research Board (TRB) papers.

<http://onlinepubs.trb.org/onlinepubs/AM/InfoForAuthors.pdf>

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 abstract should not be longer than 250 words.

- 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.

VIII. MID TERM AND FINAL EXAMS

Mid Term and final exams will be comprehensive multiple choice questions on broad topics included in the lectures, reference material, field trips, guest lectures, and student presentations.

IX. COURSE OUTLINE AND SCHEDULE OF TOPICS

Date	Lecture Topics	Reading Assignments	Deliverable / Due Dates
8/25/15	Overview and history of ITS	Slides provided in class ITS Strategic Plan, 2015-2019 http://www.its.dot.gov/strategicplan.pdf	
9/1/15	Overview of ITS Applications Federal ITS Programs	Slides provided in class http://www.its.dot.gov/its_jpo.htm	
9/8/15	Improving Highway Safety with ITS	Slides provided in class http://www.its.dot.gov/	

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Date	Lecture Topics	Reading Assignments	Deliverable / Due Dates
9/15/15	Advanced Traffic Management Systems Advanced Traveler Information Systems Case Studies – California and Virginia ATM and ICM Concepts	Slides provided in class http://www.itsva.org/resources/	
9/22/15	Field Trip*	Review the web sites for selected agencies being visited	Research Project Topic Due
9/29/15	ITS Telecommunications Technologies Connected Vehicle Technology	Slides provided in class http://www.its.dot.gov/telecom/index.htm http://www.its.dot.gov/landing/cv.htm	Field Trip Report Due
10/6/15	Connected Vehicle Technology and Applications	Slides provided in class http://www.its.dot.gov/landing/cv.htm http://www.connectedvehicle.org/	Research Project Proposal Due
10/13/15	Mid-Term Exam 511 Traveler Information Systems	Slides provided in class Implementation and Operational Guidelines for 511 Services www.511.org	Mid-Term Exam
10/20/15	511 Interactive Voice Recognition (IVR) Technologies	Slides provided in class http://www.nuance.com/index.htm	
10/27/15	ITS Transit Applications – The Next Generation Bus Rapid Transit (BRT) ITS Mobile Applications	Slides provided in class	
11/03/15	ITS Standards ITS Architecture	Slides provided in class http://www.standards.its.dot.gov/	
11/10/15	Economics of ITS Congestion Pricing Revenue Generation Models	Slides provided in class - W. Berman, A Federal Perspective on Congestion Pricing, FHWA, 2010 - N. Thompson, Congestion Pricing in Minnesota, MnDOT, 2010	

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Date	Lecture Topics	Reading Assignments	Deliverable / Due Dates
11/17/15	ITS Security Topics	Slides provided in class R. Fries, M. Chowdhury, J. Brummond, Transportation Infrastructure Security Utilizing ITS, 2009	
11/24/15	International ITS Programs	Slides provided in class	Research Project Presentations
12/01/15	ITS Policy Discussions Review and Wrap-Up	Slides provided in class	Research Project Presentations - Final Paper Due
12/08/15	Study Period	No class	
12/15/15	Final Exam		Final Exam

* The field trip date will be determined during the semester.

X. About the Instructor

Dr. Rowshan is a registered Professional Engineer (PE) with over 20 years of broad experience in transportation engineering and program management. His technical and executive experience has included innovative solutions for a wide range of transportation engineering disciplines, including strategic planning, Intelligent Transportation Systems, 511 systems, rail and highway infrastructure security, and numerous federal and state Department of Transportation (DOT) programs. He has worked with international consulting firms such as Science Applications International Corporation (SAIC), Leidos, and Battelle. He has ten years of experience with the US DOT directing multi-million dollar transportation projects in research and development of innovative hardware and software applications in Connected Vehicles. He has led projects in full development of transportation web applications and Interactive Voice Recognition (IVR) 511 systems. His has led projects with clients such as the Pentagon, Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Transportation Research Board (TRB), and American Association of State Highway Transportation Official (AASHTO). Dr. Rowshan is well published in the transportation engineering and infrastructure security fields and has lectured on the topics internationally. Dr. Rowshan holds a Ph.D. degree in transportation engineering from the University of Maryland and an M.S. degree in computer science from the Johns Hopkins University.

XI. GENERAL INFORMATION

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m.,

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Monday through Friday. Website and contact information for DSP:

http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.