

# CE 582

## Transportation System Security and Emergency Management

**USC**  
**Viterbi**

School of Engineering  
*Sonny Astani Department  
of Civil and Environmental  
Engineering*



### CE 582 - Transportation System Security and Emergency Management

**Units:** 4

**Term:** Spring 2022

**Wednesdays:** 6:00 PM-9:20 PM

**Location:** KAP 137

**Instructor:** Shahed Rowshan, Ph.D., P.E.

**Office:** KAP 203

**Office Hours:** Wednesdays 5:00 PM-6:00 PM and by appointment

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[consult@usc.edu](mailto:consult@usc.edu), 0-5555 for ITS

### I. CATALOGUE COURSE DESCRIPTION

Multimodal transportation resilience with emphasis on transit systems. Principles of emergency management, preparedness, vulnerability assessment, countermeasures. Related topics in policy and economics.

### II. EXPANDED COURSE DESCRIPTION

Transportation is the lifeline of our nation, connecting people, supporting the economy, and facilitating the delivery of goods and services. This course presents the fundamental concepts of multi-modal transportation system security, with emphasis on transit systems, along with principles of emergency management and preparedness. In addition to transportation safety and security discussions, this course includes topics related to impacts of COVID-19 and supply chain to the transportation systems, policy and economics involved in securing the transportation systems, and impacts of the Infrastructure Investment and Jobs Act.

On September 11, 2001, nearly 3,000 people were killed in a series of coordinated terrorist attacks in New York, Pennsylvania and Virginia. The course reviews the effect of these attacks—and other attacks on surface transportation assets, such as the bombings in Madrid, London, and Moscow—to demonstrate the vulnerability of the transit assets to disruption and the consequences of the attacks on people, property, and the economy. The course also discusses emergencies arising from terrorist threats highlighting the need for transportation managers to minimize the vulnerability of people and assets through incident prevention, mitigation, preparedness, response, and recovery.

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The U.S. Department of Homeland Security (DHS) provides guidance for developing contingency plans for continuity of operations (COOP). COOP planning facilitates the performance of department/agency essential functions during any emergency or situation that may disrupt normal operations. The course provides an overview of how COOP plans prepare a transportation agency for response during, and recover from a disruption in internal operations whether caused by severe weather, other natural or man-made disasters, or a terrorist attack, safeguarding people, places, and equipment—while at the same time ensuring operations continuity.

### **III. LEARNING OBJECTIVES AND OUTCOMES**

Students who successfully complete the course will gain a basic understanding of the concepts related to multi-modal transportation system resilience and emergency management and preparedness. The course is appropriate for graduate students in the Viterbi and Price Schools, subject to approval of their program advisors.

The course provides the history, state of practice, policies, and economics of transportation security and federal and state policies in emergency management and preparedness. The class discussions include but not limited to the following topics:

- Basic theories of security, resilience, and emergency management
- The integrated nature of the nation's critical infrastructure and the threats to transportation in each surface mode
- An overview of the Multimodal Transportation Safety, Security, and Emergency Management
- Impacts of COVID-19
- Federal agencies working in emergency management and transportation security, their intelligence and response requirements and capabilities, their roles, responsibilities and policies
- Infrastructure Investment and Jobs Act (Infrastructure Law, 2021)
- Surface Transportation Security – Threats and Strategies with Case Studies
- Bridge/Tunnel/Highway Infrastructure Vulnerability Assessment
- Prioritizing High-Value Transportation Choke Points
- Risk Management Concepts and Risk Mitigation Strategies
- Transit Security Risks – Threats and Strategies with Case Studies
- Practices for the Protection of Transportation Infrastructure from Cyber Incidents
- Aviation Security - Threats and Strategies
- Freight and Maritime Transportation Security – Threats and Strategies
- The types of disasters that have occurred in the U.S. and selected other nations, and their significant economic impacts
- Emergency-Response Preparedness, Continuity of Operations (COOP)

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- Impacts of Supply Chain Issues and Economic Impacts of Disruptions to the Goods Movement System
- Transportation and Economic Consequences of Terrorist Attacks
- Chemical, Radiological, Biological, Nuclear Threats and Countermeasures to the Transit System
- Applying Military Situation Awareness and Technologies to Transportation Applications
- An International View of the Preparedness, Response, and Recovery in the Transit Industry with Case Studies

The students are expected to actively participate in class discussions. Each student conducts a comprehensive independent research effort, on topics related to multi-modal transportation system security and emergency management and preparedness to enhance their understanding of a specific topic of their interest.

A field trip will be scheduled during the semester that allows students to observe the operation of a transportation agency security measures in the Greater Los Angeles area. COVID-19 restrictions will be considered. Occasional guest lecturers present expert transportation system security discussions, bringing practical experience to the classroom lecture, and promoting interactive discussions with the students.

Students are informed of significant local, national and international transportation system security and emergency management meetings and conferences and are guided to attend local events.

## IV. STUDENT EVALUATION

The following criteria are used for grading:

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

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

### Grading Timeline

Grades will be provided within one week after each exam.

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### **V. FIELD TRIP**

In conjunction to class discussions, a field trip to observe the security operations of a transportation agency in Los Angeles area is arranged for this class. The site visit is conducted during business hours. Attendance to site visits is required and highly recommended. The date and time of the site visits are decided based on agency availability. Ample advance notice is given to the students to plan for the day allocated to the site visits.

The facility to be visited is not necessarily accessible by the public and will be subject to COVID-19 restrictions. Details of the visit such as transportation arrangements will be discussed in class. Students will be required to write a report about what they learn from the facility visited.

### **VI. CLASS PARTICPATION/GROUP DISCUSSIONS**

Our nation's transportation systems are open and vulnerable assets. Attacks of 9/11 have resulted in tightening of airport security, but other assets, in particular the transit assets, are highly vulnerable. The lecture topics include the latest information in research and practice in transportation system security and emergency management. 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 present their thoughts and findings to the class.

### **VII. INDEPENDENT RESEARCH PAPER**

Students conduct individual independent research on a selected topic related in today's transportation threat and vulnerabilities, countermeasures, and emergency management practice and related topics. This effort is a significant part of this course and student evaluation.

The steps in fulfilling the research requirements are as follows:

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

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

#### **i) Research Topic Selection**

The topic chosen for the research may deal with technical, institutional, policy, or societal aspects of Transportation System Security and Emergency Management. The topic will be selected in consultation with the instructor and the final selection will be with his approval.

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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 research paper should be written in student's own word, with careful attention to proper citation of sources.

For the research, every student will conduct an effort aimed at identifying factors that influence transportation system security and safety 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 research topic that they are working on or intend to develop into a thesis or dissertation.

### **ii) Research Proposal**

The students are required to prepare a research topic proposal. The proposal is limited to two pages. The proposal shall include the following:

- Student Name
- Research Topic Title
- A paragraph describing the topic and specific objectives of the paper
- Preliminary outline of subjects in the paper
- List of preliminary literature research references (minimum of ten recent relevant journal articles or technical reports).

### **iii) Research Class Presentation**

Students are required to present the research results in the classroom in a professional manner at the last class. The presentation should take about 20 minutes and will follow with up to a 10-minute period for questions and discussions. The presentation is to be made with Power Point, videos, and other visual aids.

Students are required to attend the class 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:

- Knowledge of topic
- Independent and innovative ideas/approach
- Logic of conclusions and recommendation
- Overall impression/Quality of visual aids
- Ability to present and answer questions

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### iv) Final Research Paper Report Format

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

<https://trb.secure-platform.com/a/page/TRBPaperReview>

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.

Additional details and instructions are 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, class discussions, reference material, field trip, guest lecture, and student presentations.

### IX. REQUIRED TEXTS AND REFERENCES

The reading material for the class includes the recommended text books, instructor's handouts and extensive use of online references provided during lectures. These are discussed and handed out in class.

The following references are recommended reading:

**Ref. 1)** Edwards, F. L., and D. Goodrich, *Introduction to Transportation Security*, CRC Press, 2012

**Ref. 2)** Hakim, S., G. Albert, and Y. Shiftan, *Securing Transportation Systems*, Wiley, 2016

**Ref. 3)** Sun, Y., and Houbing Song, *Secure and Trustworthy Transportation Cyber-Physical Systems*, Springer, 2017

**Ref. 4)** Haddow, G. D., J. A. Bullock, and D. P. Coppola, *An Introduction to Emergency Management*, 7<sup>th</sup> Edition, Elsevier, 2020

**Ref. 5)** Clark, Robert M. and Hakim, Simon, *Cyber-Physical Security: Protecting Critical Infrastructure at the State and Local Level*, Springer, 2017

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The course makes extensive use of material from the research conducted by TRB Cooperative Research Programs on Security, Emergency Management, and Infrastructure Protection. The latest publications will be discussed in class. A list of some of the recent funded research and publications is included in this document:

<http://onlinepubs.trb.org/onlinepubs/dva/CRP-SecurityResearch.pdf>

### Course Notes

Additional selected readings are assigned in class.

**Prerequisite(s):** None

**Co-Requisite(s):** None

**Concurrent Enrollment:** None

**Recommended Preparation:** Prior coursework in transportation engineering at the level of CE 471. 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.

### X. COURSE OUTLINE AND SCHEDULE OF TOPICS\*

Date	Lecture Topics	Reading Assignments	Deliverable / Due Dates
01/12/22	Multimodal Transportation Safety, Security, and Emergency Management – An Overview	Slides provided on Blackboard Class online	
01/19/22	Transportation Security Federal Agencies – Roles, Responsibilities and Policies	Slides provided on Blackboard Class online	
01/26/22	Surface Transportation Security – Threats and Strategies, Case Studies Risk Management and Risk Mitigation Strategies	Slides provided in class and on Blackboard	In class assignment
02/02/22	Bridge/Tunnel/Highway Infrastructure Vulnerability Assessment	Slides provided in class and on Blackboard	Research Topic Selection Due
02/09/22	Transit Security – Threats and Strategies, Case Studies	Slides provided in class and on Blackboard	In class assignment
02/16/22	Practices for the Protection of Transportation Infrastructure from Cyber Incidents	Slides provided in class and on Blackboard	Research Topic Proposal Due
02/23/22	Aviation Security - Threats and Strategies, Case Studies	Slides provided in class	In class assignment

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Date	Lecture Topics	Reading Assignments	Deliverable / Due Dates
03/02/22	Mid-Term Exam  Freight and Maritime Transportation Security – Threats and Strategies, Case Studies	Slides provided in class and on Blackboard	Mid-Term Exam
03/09/22	Emergency Management Practices, Continuity of Operations (COOP), Case Studies	Slides provided in class and on Blackboard	
03/16/22 Spring Recess - No Class			
03/23/22	Economic Impacts of Disruptions to the Supply Chain and Goods Movement System;  Transportation and Economic Consequences of Terrorist Attacks, Prioritizing High-Value Transportation Choke Points	Slides provided in class and on Blackboard	In class assignment
03/30/22	Field Trip**	Review the web site for selected agency being visited Prepare questions	Field trip
04/06/22	Chemical, Radiological, Biological, Nuclear Threats and Countermeasures to the Transit System	Slides provided in class and on Blackboard	Filed Trip Report Due
04/13/22	Regional Transportation Planning for Disasters, Emergencies, and Significant Events	Slides provided in class and on Blackboard	In class assignment
04/20/22	Applying Military Situation Awareness and Technologies to Transportation Applications	Slides provided in class and on Blackboard	
04/27/22	Student research presentations  Review and Wrap-Up	Slides provided in class and on Blackboard	Research Presentations –  Final Study Paper Due
05/04/22	Final Exam (2 hours)		To confirm the date and time of the final, consult the USC Schedule of Classes at <a href="http://classes.usc.edu/">classes.usc.edu/</a> .

\*The order of topics is subject to change.

\*\*The field trip date will be determined during the semester pending COVID-19 restrictions.



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### XI. GENERAL INFORMATION

#### Statement 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](http://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](http://policy.usc.edu/scientific-misconduct).

##### Support Systems:

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

[studenthealth.usc.edu/counseling](http://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](http://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](http://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](http://equity.usc.edu), [titleix.usc.edu](http://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](http://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](http://dsp.usc.edu)

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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](http://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](http://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](http://dps.usc.edu), [emergency.usc.edu](http://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](http://dps.usc.edu)

Non-emergency assistance or information.

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

[ombuds.usc.edu](http://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.