SYLLABUS

SAE 549: Systems Architecting Fall 2022

Class Session: Monday, 3:30 pm – 6:10 pm, ONLINE

Class Section: 32319D (DEN/Off-campus) and 32349R (On Campus)

Contact Information:
Instructor: Prof. Azad M. Madni
Office hours: Virtual, By Appointment Only
Office location: OHE 500
Office phone:
E-mail: minniche@usc.edu

Special Guest Lectures by Prof. Ellen Pawlikowski

Teaching Assistant: Shatad Purohit
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Kindly use online discussion boards (available on D2L) if you have any questions on course materials, midterm, or final paper. The turnaround time for TA to answer questions is 24 hours. The use of email should be limited to emergency situations. The TA will consult with instructor before responding.

Course Learning Objectives:
■ To improve students’ ability to think critically, ask the right questions, and apply the right methods when architecting various types of systems.
■ To improve students’ understanding of the role of system architects and their relationship to systems engineers and transdisciplinary systems engineering using TRASEE™ education paradigm
■ To introduce the students to new, advanced multidisciplinary topics (e.g., systems thinking, systems modeling, psychological principles in systems architecting, biologically inspired architectures, agent-based modeling, human capabilities and limitations, human behavior modeling) relevant to complex systems architecting.
■ To introduce the students to key concepts associated with trade-off analysis which are important to both systems architecting and engineering.

Readings and Notes:
■ Weekly lecture notes will be posted on the Desire to Learn (http://www.courses.uscden.net)
■ Required Text:

Grade
Your grade will be based on one exam (will account for 40% of your final grade) and a final term paper (which will account for the remaining 60% of your final grade). The exam will be administered online
Exam
- The exam will consist of multiple questions that will test students’ knowledge about the fundamentals of systems architecting, complex systems, and systems thinking. The exam will be on all the subjects covered in previous lectures and assigned readings. This will be timed exam (2 hours and 40 minutes). The exam will administered on Monday October 17, 2022.
- Collaboration on the exam is forbidden. Violators will receive an automatic F for the course.

Term Paper:
The term paper should address the following problem:
Describe and analyze the architecture of a selected system as a case study. Your analysis should discuss how the architecting process led to the architecture. The architecting process should address the heuristics used, key tradeoffs, questions posed, people involved, options generated, and decisions made, the outcomes and implications for the future.

Submit a maximum 1-page draft abstract by October 03, 2022, 3:30 PM on your chosen topic.

Student must write on a specific system from one of the following categories.

- Autonomous Systems
- Smart phones or smart tablet computers
- Passenger Aircraft
- Space Telescopes
- Robotic Systems
- Manned Space Transport
- Airborne Platforms (Fighter/Bomber aircraft/helicopter/Unmanned Aerial Vehicles)

LENGTH: The term paper should be between 6-8 pages (excluding references and appendices, and cover page), single-spaced, in 12-point type. The term paper is due on or before December 9, 2022, 3:30 PM.

DELIVERY: The term paper must be submitted through the Desire to Learn (D2L) system. Links for submitting final paper will be available on D2L (http://courses.uscden.net).

LATENESS: Term papers are due on December 9, 2022, 3:30 PM. No late papers will be accepted after the due date and time, and the student will receive an automatic F grade for final paper.

UNIVERSITY LEVEL ISSUES
- 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 GFS 120 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

- **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, contains the Student Conduct Code in Section 13.00, while the recommended sanctions are located in Appendix A: [https://scampus.usc.edu/university-student-conduct-code/](https://scampus.usc.edu/university-student-conduct-code/). Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: [http://www.usc.edu/student-affairs/SJACS/](http://www.usc.edu/student-affairs/SJACS/).
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**SAE 549: Systems Architecting**

**Fall 2022**

**Schedule of Class Sessions:** The exact schedule is likely to change, based on availability of guest lecturers. Dates of readings may change to align with other schedule adjustments. Changes will be announced.

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<tr>
<th>2022</th>
<th>Lecture Topics</th>
<th>Readings</th>
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| Aug 22 | SAE Program, Course Overview, and Intro to Systems Architecting 1 | -Preface, Introduction and Chapter 1 from Maier and Rechtin 2009  
-Chapter 1 from Madni 2018 |
| Aug 29 | SAE Program, Course Overview, and Intro to Systems Architecting 2 | Submit student bio by Sunday August 28, 11:59 PM  
Case Study 1: DC-3, Chapter 3, Case Study 3: Intelligent Transportation Systems, and Chapter 7 from Maier and Rechtin 2009 |
| Sept 05 | University Holiday – No Class | |
-Chapter 5 of Bahill and Madni 2017 |
| Sept 19 | Role of Heuristics in Systems Architecting | -Chapter 2 and Appendix A from Maier and Rechtin 2009  
-Section 2.4 from Bahill and Madni 2017  
-Section 8.6 from Madni 2018 |
| Sept 26 | Guest Lecture: Case Study – Global Information Grid | Chapter 5, Chapter 6, and Chapter 12 from Maier and Rechtin 2009 |
| Oct 03 | Model-Based Systems Architecture using Dependency Structure Matrix | Submit abstract by 3:30 PM Monday October 03, 2022  
-Part III Introduction, Chapter 8 from Maier and Rechtin 2009  
| Oct 10 | Human-System Integration: Implications for Systems Architecting | - Chapter 7 from Madni 2018  
| Oct 17 | Midterm | |
| Oct 24 | Architectural Frameworks | Chapter 9, Chapter 10 and Chapter 11 from Maier and Rechtin 2009 |
| Oct 31 | Guest Lecture – Model Based Systems Engineering and Design Reuse | |
| Nov 14 | Guest Lecture: Case Study - Ballistic Missile Defense System | Case Study 5: The Global Positioning System, and Chapter 13 from Maier and Rechtin 2009 |
| Nov 28 | Course Review | |
| Decemb er 09 | Final Papers Due at 3:30 PM | |