SAE 549: Systems Architecting

Summer 2017

Class Session: Tuesday, 6:00 pm – 9:10 pm, OHE 120

Class Section: 32312D (DEN/Off-campus) and 32342R (On Campus)

Contact Information:
Instructor: Mr. Kenneth L. Cureton  
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We encourage you to e-mail us if you have any questions and difficulties with understanding course materials. The usual turnaround time for emails is 24 hours. If you don’t hear from us within that timeframe, please send us a reminder. Always include the TA in any email sent to the instructor.

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.
- 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) relevant to complex systems architecting.
- To introduce the students to key concepts in performing trade-off analysis which is 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 Reader:
- Required Text:
- Recommended Reading:

Class Grade:
Your grade will be based on two exams and one final research paper. All exams will be administered online through Desire 2 learn. Each exam will account for 30% of your final grade. The final research paper will account for 40% of your final grade.
SYLLABUS
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Exams:
- The exams will consist of multiple questions that will test students’ knowledge about the fundamentals of systems architecting, complex systems, and systems thinking. These exams will be cumulative on all the subjects covered in previous lectures and assigned readings. These will be open book and online exams through Desire2Learn. These will be timed exams. The first midterm can be done online anytime between **June 17 2017 6:00 AM and June 19 2017 11:59 PM**. Students will have 3 hours to finish the exam once they start. The second midterm can be done online anytime between **July 15 2017 6:00 AM and July 17 2017 11:59 PM**. Students will have 3 hours to finish the exam once they start.
- You **are not allowed** to collaborate on the exams. The default punishment for unauthorized collaboration and cheating on the exams is F for the course.

Term Paper:
The term paper should address the following problem:
*Describe and analyze the architecture of a selected system (see below for selection choices) in terms of any or all of the class concepts presented in lectures. Your analysis should discuss how the architecting process led to the architecture. The architecting process should address, to the extent possible, the key tradeoffs, the steps taken, the questions asked, the people involved, the options generated, the decisions made, and any heuristics used.*

The student can choose any ONE of the following systems, with focus on the Architecture:
- Automated (Self-Driving) Cars (recommend Google Car or BOSS)
- Electric Cars (recommend GM EV1 or Tesla S, or Hybrid such as Toyota Prius)
- Residential or Commercial Alternative Electric Power Generation (recommend Solar)
- Dam Projects (recommend Hoover/USA or 3 Gorges/China or Sardar Sarovar/India)
- iPhone or iPad or iPod
- High-Speed Rail System (recommend California)
- Large Passenger Aircraft (recommend Boeing 787, 777, 747, or Airbus A380, A350)
- Concorde Supersonic Passenger Jet
- Hubble Space Telescope or James Webb Space Telescope
- Mars Rover (recommend Curiosity)
- Apollo Manned Space or Space Shuttle System
- International Space Station
- F-117, F-15, F-16, F-18, F-22 or F-35 Aircraft (any ONE configuration)
- Global Hawk Drone
- GPS Navigation Satellite System
- B-2 or B-52 Bomber
- SR-71 Blackbird Aircraft
- V-22 Tiltrotor
- Apache AH-64 Helicopter
- Future Combat System (FCS)
- Zumwalt-class destroyer or DD-21 or DD(X)
SYLLABUS

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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 August 8 2017 at 11:59 PM.

DELIVERY: The term paper proposal, and main paper should be submitted through D2L. Links for submitting the assignments will be available under “Assignment” section of Desire to Learn system (http://courses.uscden.net).

GRADING: Each term paper will be graded on the letter scale: A, A-, B+, B, B-, etc. Your paper grade will require writing a paper that would be instructive or of general interest to systems architects, including those who may not be necessarily interested in the particular system you analyze.

LATENESS: Term papers are due on August 8 at 11:59 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/. 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/.
## Schedule of Class Sessions
The exact schedule is subject to change, based on availability of special topic lecturers. Dates of readings may change to align with other schedule adjustments. Changes will be announced.

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<thead>
<tr>
<th>2017</th>
<th>Lecture Topics</th>
<th>Readings</th>
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| May 23    | 1. Intro to SAE Program, the course, the instructor, and systems architecting | 1. “Preface” of Rechtin, 1991  
2. Chapter 1, 2, and 3 of Rechtin, 1991 |
2. Chapter 15 from Rechtin 1991 |
3. Section 2.3 of Bahill & Madni 2017 |
2. Section 2.4 of Bahill & Madni 2017 |
| Jul 4     | University Holiday                                 |                                                                          |
3. Chapter 11 from Rechtin 1991 |
## SYLLABUS

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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Notes</th>
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<tr>
<td>Jul 25</td>
<td>9. System Architecting Leadership &amp; Risk Management</td>
<td>To Be Announced</td>
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<tr>
<td>Aug 1</td>
<td>10. System Architecting in Different Industries &amp; Domains</td>
<td>To Be Announced: Architecting examples/differences/commonalities of different domains (e.g. Healthcare, Automotive, Aerospace, Energy Grid)</td>
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<td>Chapter 16 from Rechtin 1991</td>
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Assigned Readings List

You can download these papers from Google Scholar or USC Libraries for free.