

Syllabus for SAE 550: *Systems Architecting and the Political Process*

USC Viterbi School of Engineering Systems Architecting & Engineering Program

SAE 550: Systems Architecting and the Political Process

Fall 2025—Wednesday—6:40-9:20 PM

Location: On-Line (DEN Webcasted Class) and On Campus OHE 114

Instructors:

Mr. Kenneth L. Cureton

Office: Virtual – By Appointment

Office Hours: Virtual – By Appointment

Contact Info: cureton@usc.edu

Dr. Edwin Ordoukhanian

Office: Virtual – By Appointment

Office Hours: Virtual – By Appointment

Contact Info: ordoukha@usc.edu

COURSE DESCRIPTION

The design and development of a major engineering system is often strongly influenced by political processes in governments and corporations for funding and approval of that project. System architects are carefully trained in analytical techniques for dealing with cost, schedule, and performance challenges, but are often woefully unprepared for the role of governmental and corporate politics in their projects. This class provides system architects with training in political risk mitigation tools that aid in understanding and surviving the political processes that inevitably affect engineering decisions. Real-world Case Studies are provided to demonstrate the impact of political processes and are analyzed to reveal potential risk mitigation techniques.

Prerequisite(s): None; however, SAE 549 *Systems Architecting* is recommended.

Recommended Preparation: at least 2 years of work experience

LEARNING OBJECTIVES

- To provide students with an understanding of the various ways that the political processes drive the architecture of (U.S. and other) government-funded and corporate-funded systems.
- To examine the U.S. Federal Government acquisition processes (both Administrative and Congressional) for typical funding and approval procedures in major government-funded systems.
- To enhance anticipation of political impacts through application of political risk analysis and heuristics (the Political Facts of Life).
- To understand and analyze potential impact of programmatic risks originating from political factors and how to mitigate those risks by architecting appropriate system
 - To improve the students' ability to generate a professional-level research paper, suitable for presentation at a system engineering conference or publication in a professional journal.

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COURSE NOTES, REQUIRED READING AND SUPPLEMENTARY MATERIALS

This is a webcasted class in Distance Learning format via the USC Distance Education Network (DEN). All course materials (webcasted lectures, lecture notes, references, and reading material) are available on-line via the DEN.

ALL required materials are available on-line via the DEN—no textbooks are required for purchase. However, the following materials are suggested for reference:

1. Eberhardt Rechtin (1991). *Systems architecting: Creating and building complex systems*. Englewood Cliffs, NJ: Prentice Hall. ISBN: 0-13-880345-5. Chapter 12.
This text is out of print but is sometimes available on Amazon or American Book Exchange.
2. Mark Maier & Eberhardt Rechtin (2009). *The Art of Systems Architecting* (3rd ed.). Boca Raton, FL: CRC Press ISBN: 978-1-4200-7913-5
3. Michael E. Kraft & Norman J. Vig, ed. *Technology & Politics*, ed. Duke University Press, 1988: ISBN 0-8223-0838-X trade paperback
This text is out of print but is sometimes available on Amazon or American Book Exchange.
4. Kate L. Turabian (April 2018). *A Manual for Writers of Research Papers, Theses, and Dissertations*, Ninth Edition by The University of Chicago Press, Hardback ISBN: 9780226494425, Paperback ISBN: 9780226430577

TECHNOLOGICAL PROFICIENCY AND HARDWARE/SOFTWARE REQUIRED

Must have access to (and be proficient in the use of) a web browser in order to access course materials, view lectures, submit assignments, and interact with the instructor.

COURSE STRUCTURE AND TEACHING PHILOSOPHY

This class is not a “one-way” lecture and student participation and discussion is highly recommended. You can choose to work as individuals or in groups or teams for discussions. Just as in the real world, interaction with the instructor and each other can be (but does not have to be) face-to-face. Interaction can be in class or real-time via the DEN tools (e.g., Webex) or even asynchronously via the DEN Discussion boards regardless of Time Zone differences and regardless of time-of-day.

Starting Lecture #4, several case studies will be available on the DEN. Students are required to accomplish required readings and accomplish homework assignments before start of class in order to interact with the instructor and classmates during the lecture. All such interaction is recorded and available to all enrolled students. You can also document your questions and observations on the DEN discussion boards so that others may respond at any time. You should use the latter capability if you cannot participate in real-time during the scheduled class periods.

DESCRIPTION AND ASSESSMENT OF ASSIGNMENTS

One Research Paper is required of each student in place of a Final Exam. Students choose their research topic and submit an abstract for approval by Instructors. One take home midterm and five homework assignments are required of each student.

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GRADING BREAKDOWN

Assignment	Points	% of Grade
Research Paper	200	50%
Homework #1 - #5 (20 points each)	100	25%
Take Home Midterm	100	25%
TOTAL	400	100%

ASSIGNMENT SUBMISSION POLICY

Submit assignments on-line to the DEN system, according to the published course schedule (see below). All assignments (including late submissions) are due no later than Final Class Week—no submissions will be accepted beyond that date.

RESEARCH PAPER

GOAL: Your paper must be purposeful—it should have an academically acceptable goal, something more than just demonstrating that you can accomplish research and write a cogent Research Paper that summarizes that research, as those are necessary but not sufficient goals for academic purposes. For this class, your purpose should include two additional goals:

- Your first goal is to demonstrate that you understand and can properly apply the concepts presented in the class through the accomplishment of structured analyses of a technical topic.
- Your second goal is to inform the reader and “teach” your instructors regarding the political influences and the technical details of your chosen topic.

Failure to achieve any of the above will impact your paper’s grade!

TOPIC: *Describe an engineering or scientific program and analyze it in terms of the course concepts, both in terms of events (what happened, how and why) and lessons-learned (how to apply learnings on other programs). Your analysis should be quantitative where possible (e.g., budgets, votes, constituency) and provide qualitative discussions based on the political risk mitigation factors presented in this course, as detailed in the Research Paper Checklist.*

Subject to our approval, you get to choose the topic:

- It can be something that interests you, or something with which you have been personally involved. But be careful if using a program from a current employer—make sure that you have authorization to write on that topic!
- It can be an engineering program or a scientific program. Social programs are discouraged unless they have significant engineering or scientific components.
- It can be ongoing, or it can be past history. New or future programs are discouraged unless they have substantial progress to-date or comparable experience with past systems.

APPROVAL: You must submit a one-page abstract regarding your proposed topic for approval. Please submit on-line via DEN Assignments no later than **October 8, 2025**.

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FORMAT: Microsoft WORD (.DOC or .DOCX) or Adobe Acrobat (.PDF) format for your Abstract and Research Paper.

The class website provides a list of topics from students in prior years. It also provides guidelines on how to write a research paper, with suggestions for format, organization, structure, and content of good research papers.

LENGTH: The term paper should be no more than 20 pages, single-spaced, in 12-point type. Papers should tell the story clearly and to present a well-organized analysis in terms of the course. A template for final term paper will be provided to students.

SOURCES: You must properly reference all sources. We use the turnitin.com service to look for matches with existing books, magazine and newspaper articles, journals, prior student papers, and all Internet sources. Published works (such as books, scholarly articles, and journal publications) are preferred. If you obtain information via interviews, then a list of sources and contacts is essential, listing what sources you used and anyone you interviewed. Be sure to provide the URLs of any Internet sources used in your research. If you directly quote text from a source, you must properly designate quoted material “in quotation marks” or in italics and give a citation for each quotation via a footnote or a numbered reference or in-text (author-date) notation. The amount of quoted text relative to the total text in your paper should be kept to a minimum—if excessive; this will detract from your paper’s grade.

WARNING: Failure to properly designate copy-and-pasted text will be considered as a violation of academic integrity (see University Policy Statements at the end of this syllabus). This includes quotations from your prior papers (e.g., from SAE 549 or other classes)! You can build on your own work from other classes, and from other author’s works, if you properly cite those references. You must not directly copy text from those sources—even *your own*—unless properly marked and cited as a quotation. Instead, you must add value by citing then restating such work in your own words plus your own enhancements, such that the combination has enhanced relevance to this class. You can directly copy graphics, tables, or figures if you give a citation for each copied item. Although there is no limitation on the relative number of copied items, your own artwork—however crude yet clearly legible and illustrative—is always acceptable.

ACCESS LIMITS: We cannot accept a request to limit access to your abstract or research papers. Although we do not plan to disseminate your work without your permission, we cannot guarantee that other people (including non-US citizens) will not view or handle your submitted materials. Thus, you must not use classified, proprietary or company limited-distribution materials in your coursework. If your employer requires review and approval for your submitted materials (e.g., Public Affairs Office or Export Compliance Review) then you must obtain such approval within the deadlines listed in this syllabus. As the approval practices in many companies may be time consuming, the best practice is not to use company material at all.

DELIVERY: Please submit on-line via DEN Assignments no later than the scheduled final exam date **December 17, 2025**.

GRADING: Your research paper will be graded on the letter scale: A, A-, B+, B, B-, etc.

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We must turn in the class grades shortly after the end of the Semester (after Final Exams Week), so we will inform you via e-mail regarding your research paper grade (as well as your overall grade) no later than two weeks after the paper is due.

Note: if your employer requires a written statement (or a signed postcard) for re-imbursement for this class, then please provide us with the appropriate paperwork and a self-addressed, stamped envelope (or postcard) before the end of the semester.

HOMEWORK

GOAL: Some weeks you will review a homework case study (not presented as a class lecture). You are to briefly analyze the case study in terms of the political facts of life (risk mitigation heuristics presented in the class) and their technical impact on system architecture.

LENGTH: Maximum two pages. Accomplish your analysis in bullet format for each required analysis.

FORMAT: Electronic format: .DOC or .DOCX or .PDF or .PPT (a template .DOCX file is provided on the DEN, but you can choose to use your own format.) You do not need to indicate sources or references for homework submissions.

DELIVERY: Please submit on-line via DEN Assignments no later than the designated due date— Your homework must be completed before the start of class, otherwise you'll receive only partial credit: 10 points. Any **late** homework must be submitted by **December 3, 2025**. All missing assignments will receive a score of zero.

GRADING: Each homework submission will be scored on a scale of zero-to-20, based on your analysis of the case study.

MIDTERM

The take home midterm exam consists of questions regarding political facts of life and their impact on system architecture and architecting process. The midterm exam will be a maximum of 100 points.

FINAL GRADE

GRADING: Your class grade is computed as follows:

First, your research paper letter grade is converted into a numerical score according to USC Grading Standards: 4.0 for A, 3.7 for A-, 3.3 for B+, 3.0 for B, 2.7 for B-, 2.3 for C+, 2.0 for C, 1.7 for C-, 1.5 for D+, 1.0 for D, 0.7 for D-, 0.0 for F.

This score is then multiplied by fifty to achieve a point range of 200-to-0.

The total of all homework scores is added to the above. Note that the score for any one of the five homework assignments may range from 0 to 20 points.

Your Midterm grade is then added to the above (0 to 100 points total).

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The grand total of points is divided by 100 (to scale your total to a range of four-to-zero):

$$\text{CLASS SCORE} = (\text{PAPER} + \text{HOMEWORK} + \text{MIDTERM}) / 100$$

This class score is converted into a letter grade for the class:

A	4.0 to above 3.7	B	3.0 to above 2.7	C	2.0 to above 1.7	D	1.0 to above 0.7
A-	3.7 to above 3.3	B-	2.7 to above 2.3	C-	1.7 to above 1.5	D-	0.7 to above 0.5
B+	3.3 to above 3.0	C+	2.3 to above 2.0	D+	1.5 to above 1.0	F	0.5 or below.

This letter grade is reported to USC as your class grade.

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Course Schedule: A Weekly Breakdown

All Reading and lecture materials can be found on course website.

Lecture	Date	Topics/Daily Activities	Assigned	Due
1	Aug 27	Introduction to the Course; Discussion of the Political Process	Personal Introduction	-
2	Sep 3	Discussion of the US Federal Government Budgetary Process	-	Personal Introduction
3	Sep 10	FOL Characteristics and Budgetary Defense	-	-
4	Sep 17	Case Study #1: U.S. Manned Launch Vehicles (Mercury, Gemini, Apollo, Shuttle & future)	HW1: Superconducting Materials & Application	-
5	Sep 24	Case Study #2: V-22 Osprey Tiltrotor	HW2: Space Station Freedom (SSF)	HW 1
6	Oct 1	Case Study #3: Joint Strike Fighter (JSF) / F35	-	HW 2
7	Oct 8	Systems Engineering Concepts and Programmatic Risk Management	Take Home Midterm	Term Paper Abstract
8	Oct 15	Case Study #4: Ground Transportation Infrastructure (Roads, Autos, Trucks, Trains, etc.)	HW3: Assured Crew Return Vehicle (ACRV)	Midterm
9	Oct 22	Case Study #5: Superconducting Supercollider	HW4: Federal Fire-Fighting Process	HW 3
10	Oct 29	Case Study #6: Positioning, Timing, & Navigation Services (GNSS)	HW5: National AeroSpace Plane	HW 4
11	Nov 5	Case Study #7: California High-Speed Rail	-	HW 5
12	Nov 12	Case Study #8: Hoover Dam	-	-
13	Nov 19	Case Study #9: Future Combat System	-	-
Holiday	Nov 26	No Class; University Holiday	-	-
14	Dec 3	Class Summary, Research Paper Workshop and Systems Engineer's Toolset to Navigate Political Process	-	-
STUDY	Dec 10	None – no lecture	-	-
FINAL	Dec 17	None – no lecture	-	Research Paper Due

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Academic Integrity and AI Use Policy

Artificial Intelligence (AI) tools (including generative AI such as ChatGPT, Claude, Copilot, Grok, etc.) are permitted in this course under the following conditions:

Allowed Uses:

- **Brainstorming and concept exploration** - Generate initial ideas or approaches to problems
- **Code debugging assistance** - Help identify syntax errors or logic issues in your existing code
- **Research starting points** - Find relevant papers, standards, or methodologies (you must verify all sources, as AI-identified sources may not exist)
- **Solution verification and error checking** - Using AI to review your completed work, identify errors, and suggest corrections (you must understand and independently verify any suggested changes)
- **Writing assistance** - Grammar checking, clarity improvements, and structural suggestions for papers and reports

Required Disclosures:

- **Document all AI use** - Include a brief statement at the end of each assignment listing: (1) which AI tools you used, (2) what specific tasks you used them for, and (3) how you verified or modified any AI-generated output
- **Example:** "I used ChatGPT to help debug my MATLAB code for the signal processing algorithm and to improve the clarity of my technical writing in Section 3. All AI-generated code was tested and verified independently."

Prohibited Uses:

- **Direct copying** - Submitting AI-generated content without your substantial modification and intellectual contribution
- **Complete solutions** - Having AI initially generate papers, reports, or solve entire problems, or write entire code sections without your prior intellectual contribution
- **Fabricated data or citations** - Using AI to create fake experimental results, references, technical specifications, papers, or reports

Consequences:

Violations will be reported through USC's Academic Conduct procedures (see next page) and may result in course failure.

Note: AI detection tools may be used to identify potential violations of this policy. When in doubt, ask before the assignment is due. This policy may be modified for specific assignments.

This policy balances professional preparation (since engineers will use AI tools in practice) with academic conduct and integrity requirements.

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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. 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

Relationship and Sexual Violence Prevention Services

[CARE-SC: Confidential Advocacy, Resources, and Education Support Center – Sexual Assault Prevention and Survivor Services](http://CARE-SC:ConfidentialAdvocacy,Resources,andEducationSupportCenter-SexualAssaultPreventionandSurvivorServices)

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298; equity.usc.edu, titleix.usc.edu

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298; usc-advocate.symplicity.com/care_report

The Office of Disability Services and Programs - (213) 740-0776; dsp.usc.edu

USC Campus Support and Intervention - (213) 821-4710; campussupport.usc.edu

Diversity at USC - (213) 740-2101; diversity.usc.edu

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call; dps.usc.edu, emergency.usc.edu

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call dps.usc.edu