

Class Session: Thursdays, 6:30 – 9:10 pm, Online only

Class Section: 32301D (DEN/Off-campus) and 32331D (On Campus/Online)

Contact Information:

Instructor: Kenneth Cureton
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Course Description

Systems engineering is an essential part of achieving success for system products, services, and processes in important domains such as Aerospace & Defense, Transportation, Medical, and Energy Management. As such systems become increasingly complicated and complex, fundamental concepts and rigor become increasingly important throughout the system life cycle: from concept evaluation through retirement. This class provides both theoretical and practical knowledge needed for conceptualizing, designing, supporting, and evaluating today's and tomorrow's systems.

Course Learning Objectives:

- Introduce students to Systems Engineering support of design processes, architecture concepts, operations concepts, systems integration, and life-cycle support concepts
- Explore means for performing trade studies and evaluating risk
- Introduce system Verification, Validation, Quality, Test, Specialty Engineering, Security, and Mission Assurance concepts
- Familiarize students with various standard Systems Engineering Handbooks and Guides and related International Standards Organization (ISO) documents
- Discuss representative systems that highlight course concepts

Prerequisite(s): None

Readings:

- Representative (INCOSE, DoD, NASA, and FAA) Systems Engineering Handbooks, Guides, ISO Standards, and other readings posted on the DEN/D2L system as downloadable PDF files.
- No textbooks are required for purchase in this class.

Class Assignments:

- All deliverables for the course must be submitted via the DEN/D2L system.

Homework Assignments:

The 12 homework analyses are assigned at the end of most lectures, and homework will be due before class the following lecture. The homework assignments count as 10% of your class grade.

CAUTION! Failure to accomplish the homework assignments will place you at a severe disadvantage in successfully completing the two exams, as the content of those two exams is consistent with the homework assignments!

Midterm Exam

The Midterm Exam will cover lecture topics presented in Lectures 1 through 7. The exam will be an individual effort, take-home exam with open book and notes. The exam will be downloadable from the DEN starting on Thursday March 3rd, 2022 at 9:10 PM Pacific Time. Responses must be submitted to the DEN before 6:30 PM Pacific Time on Thursday March 10th, 2022.

FORMAT: Microsoft WORD (.DOC or .DOCX) or equivalent (no PDF files, please).

GRADING: The Midterm counts as 45% of your class grade. All late or missing submissions will receive a score of zero. Collaboration on the Midterm is forbidden. Violators will receive an automatic score of zero.

Final Exam

The Final Exam will cover lecture topics presented in all lectures (1 through 14). The exam will be an individual effort, take-home exam with open book and notes. The exam will be downloadable from the DEN starting on Thursday April 28th, 2022 at 9:10 PM Pacific Time. Responses must be submitted to the DEN before 6:30 PM Pacific Time on Thursday May 5th, 2022.

FORMAT: Microsoft WORD (.DOC or .DOCX) or equivalent (no PDF files, please).

GRADING: The Final Exam counts as 45% of your class grade. All late or missing submissions will receive a score of zero. Collaboration on the Final Exam is forbidden. Violators will receive an automatic score of zero.

Class Grade:

Your class grade is based on the homework assignments (10% of your class grade), the take-home midterm exam (45% of your class grade), and the final exam (45% of your class grade).

Schedule of Class Sessions:

The exact schedule and topics are subject to change. Changes will be announced in class.

Date	Planned topics
1/13	Lecture #1: Introduction to Systems Engineering Concepts / Value of SE (Cureton) <i>Personal Introduction assigned; Homework #1 assigned</i>
1/20	Lecture #2: Systems Engineering Processes Overview & Life Cycles (Cureton) <i>Personal Introduction due; Homework #1 due; Homework #2 assigned</i>
1/27	Lecture #3: Mission/Business Analysis, Stakeholders, Needs, Scope, & CONOPS (Cureton) <i>Homework #2 due; Homework #3 assigned</i>
2/3	Lecture #4: Requirements Analysis and Development (Cureton) <i>Homework #3 due; Homework #4 assigned</i>
2/10	Lecture #5: Functional Analysis and Allocation (Sievers) <i>Homework #4 due; Homework #5 assigned</i>
2/17	Special Topic Lecture: Operations, Maintenance, Disposal (Cureton) <i>No Homework assigned or due</i>
2/24	Lecture #6: Architecture Definition / Design Definition (Cureton) <i>Homework #5 due; Homework #6 assigned</i>
3/3	Lecture #7: Trade Study and Risk Analysis (Sievers) <i>Take-Home Midterm Exam assigned (Lecture #1-7 content); Homework #6 due</i>
3/10	Lecture #8: Systems Analysis and Control (Cureton) <i>Take-Home Midterm Exam Due; Homework #7 assigned</i>
3/17	SPRING RECESS-- (no class lecture this night)
3/24	Lecture #9: Implementation, Integration & Transition, Interface Analysis (Cureton) <i>Homework #7 due; Homework #8 assigned</i>
3/31	Lecture #10: Cyber-Physical Systems (Sievers) <i>Homework #8 due; Homework #9 assigned</i>
4/7	Lecture #11: Verification, Validation, Quality, Test (Sievers) <i>Homework #9 due; Homework #10 assigned</i>
4/14	Lecture #12: Specialty Engineering, Security, Mission Assurance (Sievers) <i>Homework #10 due; Homework #11 assigned</i>
4/21	Lecture #13: Fault-tolerant and Resilient Systems (Sievers) <i>Homework #11 due; Homework #12 assigned</i>
4/28	Lecture #14: Role of Model-Based Systems Engineering (Sievers) <i>Take-Home Final Exam assigned (Lecture #1-14 content); Homework #12 due</i>
5/5	Final Exam Week (no class lecture this night) <i>Take-Home Final Exam Due</i>

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

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

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

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, 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

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

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

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

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, 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

Non-emergency assistance or information.