SIE 454A/554A: The Systems Engineering Process
Spring 2022

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Prerequisite: Advanced standing in the College of Engineering; or
SIE 250 Introduction to Systems and Industrial Engineering

Course Description
Processes and tools for engineering large-scale, complex systems: resources, architecture, requirements, risk management, concept design, preliminary design, detail design, decision making, tradeoff studies, life-cycle models, requirements decomposition, verification planning, life cycle planning, product maintenance, teamwork, and documentation.

Course Objectives
This course is aimed at developing your capability for systems thinking by introducing classical and advanced systems engineering theory, methods, and tools. Practical examples will be used to demonstrate the concepts. After taking this course, you should be able to:

- Apply systems engineering methodologies & tools to the design of large, complex systems from eliciting customer requirements through disposal
- Apply systems engineering methodologies & tools to a project
- Judge the applicability of any proposed process, strategy, or methodology for systems engineering using fundamental concepts
- Understand system engineers' role and responsibilities within organizations
- Understand the dynamics of teams and their role in successful projects
- Recognize the value and limitations of modeling and simulation
- Be able to utilize the internet to research materials that supplement and expand the systems engineering philosophy and techniques taught in the class

Pandemic Accommodations
The course will be taught with in-class sections being live in accordance with University policies. The lectures will be recorded and available in D2L. This will be the case unless directed otherwise.

Required Course Texts (Interactive Learning eBook)

1. *Fundamentals of Systems Engineering: Basics for Practical Application*, BD O'Cain, August 2021 preliminary edition, Cognella Publishing
    a. eBook required. Available from UA Bookstore or Cognella Publishing catalog
    b. Hardcopy available as an add on to eBook

If you have any difficulty ordering or accessing the book use the following contact infor to get your issue resolved
Phone: (858) 552-1120
eMail: orders@cognella.com

Included eBook Resources

1. Reading references that supplement the materials taught in class.
2. Video tutorials that further explain the key concepts in the class
3. Student reports as examples of good class project designs
4. Comprehension checks at the end of textbook sections

Class Exercises

Team exercises will be done in class starting from a system design development point and continuing that design to create the next set of systems artifacts. The exercises will also be conducted on-line through an evening Zoom session on the same day as the in-class exercise. This on-line exercise event will be at 7:00 pm MST and will be recorded for those who cannot attend either session. The link and recording will be in D2L.

Quizzes

There are 15 quizzes, one at the end of each textbook chapter. They will be taken online in the Cognella eBook site (not D2L). They must be completed within 1 week of the chapter reading assignment to ensure that you keep up with the required class reading. They are worth 15% of your grade. The grades will be transferred from the eBook website to D2L periodically as an aggregate score for all quizzes taken to that point.

Homework Assignments

There are ten homework assignments. These are individual assignments. Some build on the output from team exercises. The format must be pdf or word. Submissions not more than a day late will be docked 5%, less than a week 20%. Over a week late will not be graded unless authorized by me in advance. All homework must be submitted electronically via the D2L website.

System Design Project

You are to define a problem and then develop a system design to satisfy it. This may be defining a new system or a replacement for an existing system. You will be expected to apply the methods taught in the class and submit a final report at the end of the semester. The project makes up 55% of your grade. There are 3 deliverables leading up to the final report. They are the problem statement, the "System Concept of Operations" and the "System Detail Design". The scope of your proposed system will be evaluated by me to ensure the scale is appropriate for this class.

These are individual projects. Late deliverables will be docked 5% if less than a day, 20% if less than a week, and no credit if more than a week late (unless authorized by me in advance).

Due Dates
These are shown in D2L and on the class schedule. The D2L dates always have precedence in the event of a conflict.

Basis of grade

Component	Weight	Notes
Homework	30%	5 assignments Official due dates are shown in the D2L assignments folder
Quizzes	15%	15 Quizzes. One at the end of each chapter. Official due dates are shown in the class schedule (not D2L)
Problem & System Concept ConOps & Functional Design Detail Design Final Project Report	5% 15% 15% 20%	Each deliverable must follow the project rubric for your specific class (454A or 554A). Official due dates are shown in the D2L assignments folder

Accessibility and Accommodations
Our goal is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations. For additional information on Disability Resources and reasonable accommodations, please visit http://drc.arizona.edu/.

If you have reasonable accommodations, please plan to meet with me by phone to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Inclusive Excellence is a fundamental part of the University of Arizona's strategic plan and culture. As part of this initiative, the institution embraces and practices diversity and inclusiveness. These values are expected, respected and welcomed in this course.

Threatening Behavior Policy
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to one's self. See: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Homework assignments and the Midterm will be evaluated for originality using the "Turn-it-In" tool. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity

The University Libraries have some excellent tips for avoiding plagiarism available at: http://www.library.arizona.edu/help/tutorials/plagiarism/index.html

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA email to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student email addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy
The University is committed to creating and maintaining an environment free of discrimination, http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our learning environment is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Subject to Change Statement
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor