

**SIE 454A/554A: The Systems Engineering Process**  
Spring 2025

**Instructor:**           **Brian O’Cain**  
Office: Virtual  
Telephone: (520) 400-0388  
E-mail: brianocain@arizona.edu  
Office Hours: Communications by email or telephone (hours are flexible).  
                                Zoom or live session by appointment.  
Project Grading SIE 454A-001

**Teaching Assistant:** **Chris Thomas**  
E-mail: christhomas@arizona.edu  
Project Grading  
Sections TBD

**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

## Advice

1. Keep up with the reading during the semester
2. Attend class (prior students have consistently made this comment)
3. Participate in the exercises (in class or in the zoom sessions)
4. Take advantage of me and the TA as resources (especially on the project as you develop your system)
5. Do your project a little at a time and not try to do the assignment in one day when it is due

## Required Course Texts (Interactive Learning eBook)

1. *Fundamentals of Systems Engineering: Basics for Practical Application*, B. O’Cain, August 2022 First Edition, Cognella Publishing
  - a. eBook required (ie- active learning). Available through interactive learning in the D2L content section. You will have immediate access for the first 2weeks of class. Your bursars account will be charged on the 24<sup>th</sup> unless you drop the class and go into the app and “opt out”
  - b. Hardcopy available as an add on to eBook purchase.

If you have any difficulty ordering or accessing the book use the following contact information to get your issue resolved

Phone: (858) 552-1120

eMail: [orders@cognella.com](mailto: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 section
5. Practice quizzes (eBook, not for grade) to reinforce the concepts

## Class Exercises

Team exercises will be done in-class and on-line. Each one allows the student to develop a particular system design artifact given a set of design information. The on-line exercises will be conducted through Zoom in the evening 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. The output must be posted in D2L assignments folder within one week of the exercise date and there are no late submissions allowed. Each student must submit a file to receive credit for participation in the exercise (even though the output will be from the whole team). They are worth 10% of your total grade (1 pt each)

## Quizzes

**Practice:** There are 15 quizzes in the eBook that are there for your practice. These do not count for a grade in the course (one at the end of each textbook chapter). They will be taken online in the Cognella active learning site. They are scored and the results provided to you as feedback.

**For score-** There are 10 quizzes in D2L that are graded for the class. The questions come from the textbook reading. They are worth 15% of your total grade (1.5 pt each). Each quiz is due on the day of the lecture corresponding to the reading for that chapter. You have one week to complete them. Late assignments will not be accepted so there are no late deductions.

**Homework**

There are 3 homework assignments. These are individual assignments. The submission must be in pdf or word format. They are worth 6% of your total grade (2 pts each). They are due 4 days after the associated class date. These can be submitted late with deductions all the way up to the end of classes.

**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. These are individual projects and the scope should be approved by me or a TA to ensure you are on the right track before you start deliverable 1. You will be expected to apply the methods taught in the class and submit a final report at the end of the semester that complies with the Rubric provided for the class. There are 6 “deliverables” that successively build the system design/report, resulting in a complete design report. They are the “*Problem Statement/System Concept*”, “*Concept Design*”, “*Functional Design*”, “*Preliminary Design*”, “*Detail Design*”, and “*Final Report*”. The project deliverables make up 69% of your grade.

**Due Dates**

Shown in the D2L assignment section for each assignment.

**Homework and Deliverable assignments:** Late submissions will be penalized as follows: not more than a day late 1%; less than 1 week 5%; over a week late 15% (unless excused by me before the due date). The final report will not be accepted beyond the due date listed.

**Quizzes and exercise input:** Must be completed within 1 week of the assignment date (**no late submissions will be accepted**), unless excused by me before the due date

**Basis of the class grade**

Element	Weight	Notes
Homework	6%	3 Assignments Official due dates are shown in the D2L assignments folder
Quizzes	15%	10 Quizzes Official due dates are shown in the D2L assignments folder
Exercise Participation	10%	10 Exercises Official due dates are shown in the D2L assignments folder

Problem & System Concept	6%	Each deliverable must follow the project rubric for your specific class (454A or 554A). Official due dates are shown in the D2L assignments folder
Concept Design	12%	
Functional Design	12%	
Preliminary Design	12%	
Detail Design	12%	
Final Project Report	15%	

### **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