

SIE 250- Introduction to Systems and Industrial Engineering Fall 2023, University of Arizona

- Instructors:** Dr. Mike Kwinn
Office: ENGR 103
Email: kwinnm@arizona.edu
Office Hours: by appt
- Dr. Tomas Cerny
Office: ENGR 122
Email: tcerny@arizona.edu
Office Hours: by appt
- Teaching Assistant:** Ryan Ford ryanford@arizona.edu
Office Hours: T&Th 2-3pm via Zoom or by appt
- Class meetings:** Mon, Wed, Fri, 11:00–11:50am, Saguaro Hall 101
- Catalog description:** System modeling; the elementary constructs and principles of system models including discrete time, discrete-state system theory; finite state machines; modeling components, system coupling, and system experiments (simulation). System design including requirements, life-cycle, performance measures and cost measures, tradeoffs, alternative design concepts, testing plan, and documentation. Applications and case studies from engineering.
- Prerequisite(s):** MATH 129
- Textbook (required):** Kossiakoff, Alexander; Sweet, William; Seymour, Samuel; Biemer, Steven, *Systems Engineering Principles and Practice*.
- Software packages:** Minitab
- Outcome Related Course Learning Objectives:**
- Define key elements of a systems engineering lifecycle.
 - Apply principles and practices of requirements derivation into the functional and physical architecture.
 - Apply a working knowledge of interfaces to system design.
 - Define critical interfaces.
 - Conduct Systems Decision Making
 - Apply MATLAB/Simulink tools, basic mathematical modeling, and optimization.
 - Understand and apply industrial engineering concepts such as Lean and statistical process controls.
- Topics covered:**
- Systems Engineering foundations
 - Functional and Requirements Analysis
 - Systems Thinking and Design
 - Lifecycle analysis

- Systems Modeling
- Systems Decision Making
- Statistical Process Controls
- Lean Manufacturing
- Human Factors Engineering
- Special Topics in Systems Engineering

D2L Website:

You will access this site by going to <http://d2l.arizona.edu> and logging in with your UA Net ID. If you need assistance with D2L you should contact D2L Help (<http://help.d2l.arizona.edu>); you may also try the 24/7 IT Support center on campus (<http://the247.arizona.edu>), which is available 24 hours a day, 7 days a week. When you log on to D2L, this course will be listed on the welcome page under “My Courses”.

Announcements, class notes, PowerPoint files, spreadsheets used in class, homework assignments and solutions, and links to news items of interest will be posted to this website. You must be registered for the class to be permitted entry to the site.

Homework Assignments

- a. All assignments will be shared in class on the lesson slides.
- b. Each student will be responsible for completing 10 homework assignments and submitting them via D2L. No late homework will be accepted. If you have a valid reason for handing in late homework, you must let me know in advance. Emergencies will be considered on a case-by-case basis.
- c. Academic integrity: Students are expected to uphold the University of Arizona academic integrity policy.

Exams

- a. There will be two midterm exams during the semester and a final exam at the end of the semester. The final exam will be comprehensive.
- b. Exams may be given in class or take home. The final will be given in class.
- c. All cellphones must be OFF and put away during exams. This applies to class time, too.
- d. Anyone caught acting against UA Code of Academic Integrity, will receive a non-droppable grade of zero on an exam.
- e. Partial credit will generally be given so best to fully explain your answers. For some systems engineering questions, there may not be one right answer, so explaining your

thought process is critical.

- f. Exam scope. Exams may require you to think beyond the scope of the course to gain insights into systems thinking.

Course Project:

There will be a course project that will be conducted in small groups. This project will be a review of the course material and is designed to show a real-world application of the material presented. More specific information about the project will be shared later in the semester in a separate document.

Grading:

The final grades will be assigned based on homework assignments on Web Assign, 2 exams (also through D2L>Quizzes), a final project, and a final exam.

Homework assignments	15%
Exam 1	20%
Exam 2	20%
Course Project	20%
Final	25%
Total	100%

Attendance policy:

Attendance for all exams is mandatory. To miss a scheduled exam, you must have a Deans Excuse and notify the instructor ahead of time. Class time is the best time to interact with the instructor and clarify information presented. It also helps make the class better when there are students with whom to collaborate and learn. There will be material that is not in the text that will be presented in class. In class examples are performed, demonstrations will be done with the computer, and discussions will be conducted on the material. All material from the class is fair game on the exams. The webpage can be used as a backup for a missed class and for additional help, but it is not a substitute for class activities, discussions, demonstrations, and performed examples. Missed announcements that may pertain to exam schedules, modifications in syllabus, handouts, and homework assignments are your responsibility if you miss a class.

- All holidays of special events observed by organized religions will be honored for those students who have affiliation with that religion. Please work with the instructor to ensure awareness of the holiday. It is not the instructor’s responsibility to track all the holidays.
- Absences pre-approved by the UA Dean of Students (or Dean’s designee) will be honored.

Classroom Behavior Policy:

Cell phones and other communication devices are to be turned off during class and during

examinations. Exams will be taken on laptops, but you will not be allowed to visit other sites during the exam. Visiting other sites, using Excel macros/prepared workbooks, or checking other material on the laptop is prohibited and will be handled in accordance with the Academic Integrity Policy described below.

Threatening Behavior Policy:

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety, or welfare. The Arizona Board of Regents (ABOR) Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to oneself. Threatening behavior can harm and disrupt the University, its community, and its families.

Academic Integrity Policy:

Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the Student Code of Conduct and disciplinary procedures established by **ABOR Policies 5-308 through 5-404** (see chapter 5), all provisions of which apply to all University of Arizona students. This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by **ABOR Policy 5-403.A.4** and otherwise to supplement the Student Code of Conduct as permitted by **ABOR Policy 5-308.C.1**.

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work, exercises, homework, and exams must be the product of independent effort unless otherwise instructed. Students are expected to know and to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

- <http://catalog.arizona.edu/2011-12/policies/aaindex.htm>
- <https://deanofstudents.arizona.edu/policies/code-academic-integrity>

Any violation of the academic integrity code will be dealt with using the procedures detailed in the code.

Nondiscrimination and Anti-Harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex (including pregnancy), national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes they have been the subject of discrimination to report the matter immediately as described in the section below, "Reporting Discrimination, Harassment, or Retaliation." All members of the University community are responsible for participating in creating a campus environment free from all forms of prohibited discrimination and for cooperating with university officials who investigate

allegations of policy violations.

Accessibility and Accommodations:

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

If you qualify for special accommodations, please coordinate with the instructor to make sure we support all your accommodations. An exam taken in the DRC testing center is to be taken at the same time the exam is given in class.

Revisions:

Modifications may occur in this syllabus. The instructor will share any changes as soon as practical in class and through class announcements on D2L.

Student feedback:

Students may be asked to provide written feedback on the course and its contents.

Date	Topic	DUE	Lesson	Instructor	Points
21-Aug	Systems Engineering Foundations		Introduction to Systems Engineering	All	
23-Aug			Overview of a Systems Engineering Design Process	Kwinn	
25-Aug		HW 1	Systems Thinking	Kwinn	15
28-Aug			Systems Functional Analysis	Kwinn	
30-Aug			Systems Requirements Analysis	Kwinn	
1-Sep		HW 2	Systems Documentation	Kwinn	15
4-Sep			Labor Day - No Class		
6-Sep	Systems Modeling		Development life cycle	Cerny	
8-Sep			Scrum	Cerny	
11-Sep			Use Cases and Scenerios	Cerny	
13-Sep		HW 3	Use Case and System Sequence Diagram Diagrams	Cerny	15
15-Sep			Sequence Diagram Diagrams and System Operation	Cerny	
18-Sep			Domain modeling I	Cerny	
20-Sep	HW 4	Domain modeling II	Cerny	15	
22-Sep	Exam	1	EXAM ONE - Overview and Systems Design	Ford	200
25-Sep	Course Project	P1	Project Proposal		50
27-Sep	Systems Analysis		Archetecture I	Cerny	
29-Sep			Architecture II	Cerny	
2-Oct			Component diagram	Cerny	
4-Oct		HW 5	Deployment diagram	Cerny	15
6-Oct			MATLAB/SIMULINK	Ford	
9-Oct			MATLAB/SIMULINK	Ford	
11-Oct	HW 6	MATLAB/SIMULINK	Ford	15	
13-Oct	Course Project	P2	Systems Requirements Document		50
16-Oct	Systems Decision Making		Systems Decision Making Overview	Kwinn	
18-Oct			Problem Definition I	Kwinn	
20-Oct			Problem Definition II	Kwinn	
23-Oct		HW 7	Problem Definition III	Kwinn	15
25-Oct			Systems Design I	Kwinn	
27-Oct			Systems Design II	Kwinn	
30-Oct			Systems Decision Making I	Kwinn	
1-Nov			Systems Decision Making II	Kwinn	
3-Nov			Systems Implementation I	Kwinn	
6-Nov	HW 8	Systems Implementation II	Kwinn	15	
8-Nov	Exam	2	EXAM TWO - Modeling and Decision Making	Ford	200
10-Nov			Veterans Day - No Class		
13-Nov	Industrial Engineering		Introduction to Industrial Engineering	Kwinn	
15-Nov			Statistical Process Control	Kwinn	
17-Nov			Lean Manufacturing	Kwinn	
20-Nov		HW 9	Human Factors Engineering	Kwinn	15
22-Nov	Course Project	P3	Systems Design Final Report		100
24-Nov			Thanksgiving Recess - No Class		
27-Nov	Special Topics in Systems Engineering		Special Topic		
29-Nov			Special Topic		
1-Dec			Special Topic		
4-Dec		HW 10	Special Topic		15
6-Dec			Special Topic		
11-Dec	Exam	Final	SIE 250 FINAL EXAM 10:30-12:30	Ford	250