Please reference formal communication from the University of Arizona on COVID-19; this is dynamic. Policies and practices are changing in real time. Our commitment to you is to effectively teach the critical elements of systems and industrial engineering regardless of your location or availability this semester. Systems engineering is done in practice by teams, across the globe, with varying backgrounds and skill sets. In some respects, your experiences during COVID may better prepare you for the reality of this profession.

The University of Arizona
Systems and Industrial Engineering

Syllabus for
Systems and Industrial Engineering SIE250
Fall, 2022

Instructor(s): Dr. John Brock Ullrich
Email: ullrich@email.arizona.edu
Course Website: D2L Arizona

Class Time and Dates:

- MWF, 11:00, ILC141
- Courses meet via ZOOM Join URL: https://arizona.zoom.us/j/84865677839

  Meeting ID: 848 6567 7839

Attendance factors into final grades. If you need to miss a class session, notify the instructor in advance. However, all discussion threads and homework are due on time – no exceptions allowed.

Office Hours:

- For 3 hours every week, the professor will be available for drop-in office hours, as follows:
  - MWF 4:00PM-5:00PM AZ
  - https://arizona.zoom.us/j/82104773370
  - Text, call, email, or stop by Old Engineering anytime MWF

Bulletin Description of the Course:
The course serves as an introduction to systems engineering. Students experience the systems development lifecycle as a methodology; fundamental principles and practices will be discussed and detailed through the entire spectrum of systems engineering, notably: engineering processes, concept development, including problem definition, stakeholder identification, elicitation of stakeholder objectives, the purpose of system requirements, concept generation, concept selection, system verification, and system validation.

Also within the scope of this course is an introduction to industrial engineering, including the concepts of design for manufacturing, sales and operations planning, optimization, and an overview of Six Sigma concepts and methodologies, focusing on solving novel Engineering Management problems using the DMAIC process. Note: This is not a belt certification class.

Course Learning Objectives:
Upon completing the course, students will be able to:

1. Define critical elements of a systems engineering lifecycle
2. Apply principles and practices of requirements derivation into the functional and physical architecture
3. Apply a working knowledge of interface design
4. Define critical interfaces
5. Define vital elements of Six Sigma and Lean and their application
6. Describe and apply the DMAIC phases
7. Apply MATLAB/Simulink tools, such as basic mathematical modeling, and optimization
8. List and apply key Lean concepts, such as Muda (waste reduction), VSM, value analysis, and other Lean fundamental concepts

Required Textbook and Other Materials: All available online through the University of Arizona

Systems Engineering Principles and Practice, 2nd Edition

Kossiakoff, Alexander; Sweet, William N; Seymour, Samuel J; Biemer, Steven M; 2011

- Principles and practice provide an educationally sound, entry-level approach to the subject
- MATLAB (SIMULINK) https://new.library.arizona.edu/tech/software/matlab-r2019b
- https://softwarelicense.arizona.edu/mathworks-matlab

Average Amount of Out-of-Class or Independent Learning Expected per Week:

Students will spend 3 hours per week in lecture, 1 hour in D2L discussion, and 6 hours in two exams given outside class hours. Homework and other out-of-class work averages twice the classroom time. https://catalog.arizona.edu/policy/credit-definitions

Class Schedule and Assignments:

Module	Topic/Activity	Key Items
1	Foundations	Modern Systems Engineering •Characteristics of complex systems •Intro to models (or thinking of system concepts as models) Definition of a System Model (Wymore) •Systems Engineering Viewpoints –Why are we different Hierarchical models of complex systems •Framework –The building blocks of complex systems Systems Life Cycles
2	Concept Development	Origins of a new system •Validate and understand the operational need •Creation of operational requirements Concept Explorations •Deriving or creating system concepts from requirements •Alternate Concepts, trades, and analysis Selecting the Preferred System •Using modeling and analysis to select
3	Engineering Design	•Concerned with designing all the parts so that they will fit together as an operating whole that meets the system operational requirements •It is an intensive and highly organized effort focused on designing components that are reliable, maintainable, and safe under all conditions to which the system is likely to be subjected

		•Your end goal is producible, cost-effective, and on target
4	Industrial Engineering	• Role of Systems Engineering in the Factory • Engineering for Production Principles • Product Operations Overview
5	Simulink and Modeling	• Mathematical Modeling • Optimization • Machine Learning

Class Organization:
Leverage ZOOM for all class lectures; any in-person meetings depend on the progression (or regression) of COVID-19. Students are encouraged to use two screens to follow along as the instructor provides demonstrations. Reference Panopto for class recordings.

Student performance evaluations on assignments and course assessments:

1. **Weekly Discussion Board**
    a. See each post for a specific direction; posts may include discussing learnings or insights for that week's homework
    b. Evaluation is an output of accuracy of interpretation and clarity and guideline adherence. Avoid verbosity
    c. Incomplete or late discussions will receive a zero – there will be no exceptions made
2. **Homework Assignments**
    a. Homework assignments will relate to the current lecture or reading material
    b. The student will provide answers using the assessment tool in D2L; work is graded automatically on submission
    c. Homework will be reviewed in the following class as time permits or discussed in the open office hours sessions
    d. Homework not completed on time will receive a zero grade. Both homework and discussion threads are due by 11 PM Thursday before the Friday class, or as noted in D2L

Exams:

- There will be a mid-term and a final exam, administered on D2L outside the class meeting time
- Exam windows are open for a minimum of 72 hours after posting

Project:

- Application of learning demonstrated through a semester design project. This individual effort tests a student's ability to leverage systems principles and practices on a national problem provided by the instructors

Grading:
A, B, C, D, and E constitute the regular grades used at the University of Arizona. Calculation of grade-point-average (GPA) contribution based on traditional grade marks.

A minimum grade of C may be required to register for some courses when a higher level of mastery than a D is necessary for the student's success in the subsequent term. Students should check the requisites (recommended coursework) and enrollment requirements (required coursework) when planning their class schedules and registering for the next time. Reference the UAccess Class Search and the Course Catalog for recommended and required coursework.

https://catalog.arizona.edu/policy/grades-and-grading-system

- Homework: ~ 20%
- Project ~ 40%
- Exams ~ 40%
- Total 100%

Other Policies and Links: https://catalog.arizona.edu/policies

- **Student Responsibilities:** Attending regularly scheduled sessions, make-up classes, and other course meetings is a fundamental student responsibility. Attendance at every scheduled session, for the entire session, is expected but ultimately the student's responsibility.
- **Academic Integrity Code:** Academic dishonesty is cheating of any kind, including misrepresenting one's work, taking credit for the creation of others without crediting them and without appropriate authorization, and fabricating information. All academic work is subject to University policy. For more information, see http://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity
- **Student Disability Support Services:** Students needing an accommodation based on the potential impact of a disability should contact Disability Support Services
- **Student Mental Health Services:** UofA offers 24/7 assistance and referral for students needing crisis and emergency mental consultations, confidential assessment, and counseling services
- **Emergencies:** In case of emergency, notifications provided via D2L