SIE-458/558 Model-Based Systems Engineering
Syllabus Spring 2026

Class Location and Times:
Classroom: Social Sciences 307
11:00AM-12:15PM Tuesdays & Thursdays

Description of Course
This class is an introduction to model-based systems engineering (MBSE), which is the formalized application of system modeling language, tools, and techniques to support requirements, design, analysis, verification and validation activities beginning in a system's conceptual design phase and continuing throughout development and later life cycle phases. The course emphasizes practical application of the Systems Modeling Language (SysML) in actually building and using system models.

Course Objectives and Expected Learning Outcomes:
During this course students will exercise the system engineering process through developing a student-chosen project system.   This development will be facilitated by iteratively expressing the student's project system in a model using the SysML modeling language.

Course Objectives: Key concepts to be modeled by the student include system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases. The course emphasizes practical use of the Systems Modeling Language (SysML) and MBSE methods.

Expected Learning Outcomes: Upon completion of this course, students will be able to:
1. Identify how system engineering concepts can be expressed in a system model,
2. Describe how MBSE can both compliment and challenge the traditional systems engineering approach
3. Choose an appropriate scope, define the purpose, and define the approach for a systems engineering project intended to leverage MBSE.
4. Describe the intent of SysML using the "4 Pillars" rubric.
5. Construct and interpret semantically consistent SysML models.
Graduate students will additionally be able to:
6. Critique a project's implementation of MBSE as captured in a SysML model.

Course Prerequisites or Co-requisites
Prerequisite: Advanced standing is required for undergraduate students. Please visit the webpage for more information on the advanced standing:
https://engineering.arizona.edu/academic-policies/advanced-standing
Pre/Co-Requisite Class: SIE-454A/554A –Systems Engineering Process

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Instructor and Contact Information

Instructor: Rick Steiner
Office: ENGR 154 (by appointment)
Phone: 858-260-9520 (personal cell, text encouraged)
Email Address: skygazer@email.arizona.edu
Home Page: https://sie.engineering.arizona.edu/faculty-staff/faculty/rick-steiner
Office Hours: Tuesdays 1-2 PM (or as updated in D2L), Zoom by appointment

Course Text

A Practical Guide to SysML, The Systems Modeling Language: (MK/OMG Press) 3rd Edition by Sanford Friedenthal, Alan Moore, Rick Steiner ISBN 978-0-12-800202-5
https://www-sciencedirect-com.ezproxy1.library.arizona.edu/book/9780128002025/a-practical-guide-to-sysml

Course Software

Academic licenses for Cameo "Magic System of Systems Modeler" (referred to as "Cameo") will be provided at no cost to the student. Students must install this client software on their own computers (MacOS, Win, and Linux). Students will also be required to use Cameo in conjunction with the school's TeamWork Cloud server (TWC). Assignments must be published in TWC using the provided Cameo "Collaborator" software. **The course is not a tutorial on this or any other software.** Students will be expected to familiarize themselves with the toolset and resolve problems independently. Students are encouraged to collaborate on making best use of the tool set. A discussion forum in D2L will be set up for this purpose

Course Format and Teaching Methods

All course information is located on the course homepage, which is in Desire2Learn at **https://d2l.arizona.edu/.** This site includes helpful tutorial information.

The course will utilize lecture, in-class discussion, and progressive individual model development assignments focused on a project of the student's own choosing. The Desire2Learn course website organizes the course into modules. Each module contains archives of classroom lectures & discussions, presentations, notes and other instructional materials on each session's topic, and assignments.

During the scheduled class meetings, the instructor will deliver lectures via live video-audio connection in a "Live Classroom" environment. The lectures will emphasize the important concepts and selected techniques from the textbooks and the instructor's point of view. Students will have an opportunity to ask questions during these class meetings. These class meetings will be recorded and archived on the Desire2Learn course website. Online & Distance Learning students are encouraged to attend the scheduled class meetings and use the archives to review lectures. The instructor may record and post additional lectures beyond the scheduled class meetings as needed to assist the class in understand the material.

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Between class meetings, students should read the indicated textbook chapters, references, and complete assignments. Students should visit the course's D2L website often (not just during scheduled class meetings) for announcements, other important instructions, and to participate in online discussions.

Students should publish work for the assignments and checkpoints in the manner specified in D2L.

Semester Project:

Each student will be required to individually propose a system (with instructor approval) as a basis for them to incrementally develop the 3 required modeling assignments. These modeling assignments may collectively be considered to be an incrementally developed student project. There will be no group projects.

Artificial Intelligence/LLM Policy

Use of LLM's (Large Language Models, a.k.a. artificial intelligence) in this class is permitted (and encouraged) for gathering ideas to help with discussion posts and homework. It is ESSENTIAL, however, that students FULLY ASSESS and UNDERSTAND each AI artifact before they include or reference it in a grade-able submission! Correctness, applicability, and readability of submissions are the responsibility of the student, NOT THE LLM!

When using AI, each student is *required* to:
1. Clearly state which LLM was used
2. Provide the specific prompt used to generate the artifact
3. Provide a brief analysis of the artifact, pointing out where you agreed with it and where you disagreed.

Lack of this information may invalidate the assignment submission.

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Grading Scale, Policies, and Due Dates:

University policy regarding grades and grading systems is available at:
https://catalog.arizona.edu/policy/courses-credit/grading/grading-system

This course's grading scale is:

Grade:	Standard	Description
A	90% $\leq$ x	excellent
B	80% $\leq$ x < 90%	good
C	70% $\leq$ x < 80%	satisfactory
D	60% $\leq$ x < 70%	poor
E	x < 60%	failure

Where "x" = (points earned divided by points available X 100%) in the course.

This course's graded work includes:

Assignment	Points Available	Week due*
Mandatory discussion board participation	20 points	1,3,6,10
Project Mission Need Statement (MNS) for subsequent Modeling Assignments (instructor approval required)	20 points	2
Modeling Assignment #1: Framing the system context and mission need of your project system	20 points	5
Modeling Assignment #2: Elaborating requirements, internal structure, behavior, and analysis approach of your project system	20 points	9
Modeling Assignment #3: Completing the design, interfaces, and requirements verification/traceability of your project system	20 points	14
Total points SIE 458 (undergrad)	100 points	
SIE 558 only**: Modeling Assignment #3 presentation/critique	10	15
Total points SIE 558 (grad student)	110	
(not required) Extra Credit: >75% on all chapter quizzes	10 points	15

*General class schedule information.   See D2L for the authoritative class schedule.
**Graduate students (SIE-558) will additionally conduct a review of a provided project model providing critique, suggestions for improvement, and lessons learned.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with university policies. See relevant link at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system

Appealing a grade: see https://catalog.arizona.edu/policy/courses-credit/grading/grade-appeal

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Requests for incomplete (I) or withdrawal (W)

Must be made in accordance with University policies, which are available at
https://deanofstudents.arizona.edu/policies/code-academic-integrity.

Classroom & Online Behavior Policy:

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Mainly from the university classroom policy (adopted by the Faculty Senate):
- Not leaving early. Early leaving will distract both the instructor and students
- Not talking with other classmates while the instructor or another student is speaking. If a student has a question or comment, he or she should raise a hand, rather than starting a conversation about it with a neighbor
- Not packing backpacks to leave until the instructor has dismissed class
- Showing respect and concern for others by not monopolizing class discussion. Students must allow others time to give their input and ask questions. Students should not stray from the topic of class discussion
- Not eating and drinking during class time

University-wide Policies

Students are responsible for understanding and following all UA University-wide policies summarized here: http://catalog.arizona.edu/syllabus-policies.   These include:
- Absence and Class Participation Policies
- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement
- Additional Resources for Students

Send Feedback to US:

If you have any questions, suggestions or comments related to the class, you are very welcome to contact the instructor or TA. We have several ways for communications:
1) In-class feedback
2) Office hours
3) Emails
4) Individual appointment (if you cannot come in office hour)
5) Feedback in D2L