SIE-4/558 Model-Based Systems Engineering
Syllabus Spring 2022

Class Location and Times:

Classroom: AME S212
6:00-7:15 Mondays & Wednesdays, 12 January – 4 May

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 project system as a model using SysML.
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
Co-Requisite: SIE-454A/554A –Systems Engineering Process

Instructor and Contact Information

Instructor: Rick Steiner
Office: ENGR 253
Phone: 858-260-9520 (personal cell, text encouraged)
Email Address: skygazer@email.arizona.edu
Home Page: http://www.sie.arizona.edu/faculty-staff/faculty/rick-steiner.
Office Hours: Mondays 5-6 PM (or as updated in D2L), webcon by appointment

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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

Course Software

Academic license for Cameo Systems Modeler (includes Cameo Requirements Modeler, MagicDraw, and Cameo Simulation ToolKit) will be provided at no cost to the student. This is a widely used engineering toolkit comparable to Sparx Enterprise Architect and IBM Rhapsody. 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.

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 submit work for the assignments in the related D2L assignment drop folder named as: **course-assignment-yourname.filetype**, where:
"course" is SIE-458-558-22SP
"assignment" is the name of the assignment, e.g., "MA1"
"yourname" is your name
And "filetype" is the usual extension for the file (e.g., "mdzip" for Cameo).

Submissions not using this naming convention may result in significant delays grading your assignment, and frustration on the part of your graders. Don't let that happen!

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.

Grading Scale and Policies:

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

This course's grading scale is:

Grade:	Standard	Description
A	90% ≤ x	excellent
B	80% ≤ x < 90%	good
C	70% ≤ x < 80%	satisfactory
D	60% ≤ 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
Mandatory discussion board participation	40 points
Project Mission Need Statement (MNS) for subsequent Modeling Assignments (instructor approval required)	10 points
Modeling Assignment #1: Framing the system context and mission need of your project system	50 points
Modeling Assignment #2: Elaborating requirements, internal structure, behavior, and analysis approach of your project system	50 points
Modeling Assignment #3: Completing the design, interfaces, and requirements verification/traceability of your project system	50 points
Total points SIE 458 (undergrad)	200 points
SIE 558 only: Modeling Assignment #3 presentation/critique	50
Total points SIE 558 (grad student)	250
(not required) Extra Credit: >75% on all chapter quizzes	30 points

Students in the graduate version (SIE-558) will additionally conduct an oral review of their final project model with the instructor (worth 50 points), providing self-critique, suggestions for improvement, and lessons learned for MBSE deployment.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Dispute of Grade Policy: Provide within the acceptable time period for disputing a grade on a paper, project, or exam.

Participation

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: **http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop**. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, see: **http://policy.arizona.edu/human-resources/religious-accommodation-policy**. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: **http://policy.arizona.edu/employmenthuman-resources/attendance**.

Classroom 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

Academic Integrity and 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. 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://new.library.arizona.edu/research/citing/plagiarism.

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 e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement. Instructor and/or TA will carefully exam all of your homework, reports and exams to prevent plagiarism. For example:

- No copy of other people's homework In grading your homework, TA will exam all of your homework carefully and catch anyone who is copying other people's homework. Even if they are from the same software's output, TA can still judge whether it is a copy of others or not based on your writing and formatting.
- No copy or discussion in the exam TA and other students all will report these behaviors in exams and your exam papers will also be checked carefully for any cheating behavior. Do not sit too close to each other in the exam.

Teaching Assistant's Responsibility

TA is mainly responsible for assisting the instructor in various issues, including grading homework/quizzes/exams, teaching part of software and tutorial, and helping students in programming and homework during the office hour.

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

Threatening Behavior Policy:

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

UA Nondiscrimination and Anti-harassment Policy:

The University is committed to creating and maintaining an environment free of discrimination, see: **http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy**.
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. This course supports elective gender pronoun use and self-identification; rosters

indicating such choices will be updated throughout the semester, upon student request. As the course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect.

Additional Resources for Students Statement: Office of Diversity
http://diversity.arizona.edu/
http://www.health.arizona.edu/counseling-and-psych-services

Accessibility and Accommodations (for students with Disability)

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations.

Requests for incomplete (I) or withdrawal (W)

Must be made in accordance with University policies, which are available at **http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete** and **http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal** respectively.

Additional Resources for Students

UA Academic policies and procedures are available at
http://catalog.arizona.edu/policies
Student Assistance and Advocacy information is available at
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance

Subject to Change Statement

The information contained in the course syllabus, may be subject to change, as deemed appropriate by the instructor, see **http://policy.arizona.edu/faculty-affairs-and-academics/course-syllabus-policy-undergraduate-template**.