

ME EN 5165/6165 - Requirements Engineering and Management

Section 030: Contract | Section 090: Main Campus | Sections 290/031: UOnline

Department of Mechanical Engineering
The University of Utah | Spring 2024

Prerequisites:
5165: senior standing / instructor approval
6165: graduate standing

This course covers the methods, processes, and tools for the elicitation, definition, modeling, and management of stakeholder needs and system requirements for engineered systems of all kinds. Emphasis is given to the technical processes taking place within the concept and development stages of systems, including business or mission analysis, stakeholder needs and requirements definition, system requirements definition, verification, and validation. Course assignments and projects adopt industry-standard Model-Based Systems Engineering (MBSE) software to model system requirements using the Systems Modeling Language (SysML).

COURSE CONTACTS

Instructor:

Pedro Huebner

pedro.huebner@utah.edu

Office: 1346 MEK

OH: Tuesdays | 11:00 AM - 1:00 PM
Thursdays | at MEK 1346 or Zoom



PROGRAM WEBSITE

<https://systems.utah.edu>

LEARNING OUTCOMES

Upon successful completion of this course, students shall be able to:

- Describe and apply the elicitation process of stakeholder needs and their translation into system requirements.
- Formulate system requirements that are atomic, quantitative, measurable, unambiguous, understandable, testable, and verifiable.
- Describe the general phases and processes within requirements engineering and management.
- Apply SWOT analysis, decision analysis, gap analysis, and benchmarking as tools to support the management process of requirements.
- Develop and employ requirements traceability tools to support the decomposition and allocation of requirements.
- Use MBSE software to model system requirements using SysML.

COURSE STRUCTURE

The course is structured in the form of weekly activities assigned according to a semester-specific schedule. The contents of each week may include recorded lectures, demonstrations, discussion forums, knowledge checks, review sessions, Q&As, quizzes, exams, *etc.* It is the responsibility of each student to stay on schedule and complete course activities as they are assigned in observation of their due dates and times. Regular announcements sent via Canvas will include reminders of important deadlines and activities with a significant impact on the course grade. The instructor will make every effort to give students the opportunity to follow the course at a steady and balanced pace.

Sections 030, 090, and 290 follow an entirely online and (somewhat) asynchronous format. There are no scheduled course meetings and students are welcome to watch lectures and complete assigned activities according to their own availability. The course is paced to balance the release of new content evenly throughout the semester as a means of achieving high levels of student enjoyment without the strain of overwhelming amounts of work.

Lecture videos cover a collection of different perspectives and materials on each course subject. Videos are short and about 5 to 10 minutes long each. They cannot be fast forwarded but can be played at a faster speed. An autogenerated transcript of spoken content is available. Several videos incorporate **knowledge checks**, which will require students to interact with the player and answer one or more questions to continue. Lengthier activities that fall outside of the scope of a simple knowledge check will be hosted and completed on Canvas. These will be referenced in the videos when they become relevant and will not interrupt the playback.

At the end of most weeks, **discussion forums** are open to all students and the instructor to engage in a conversation relevant to the materials covered up to that point in the course. Participation is highly expected and graded as an incentive. These discussions are organic, meant to clarify any points of confusion or uncertainty and to give everyone the opportunity to share their personal experiences with a given subject, or to simply to engage with their peers in the fantastic world of Requirements Engineering and Management... or Systems Engineering more broadly!

Homework assignments must be submitted individually, but collaborative work is encouraged. In other words, students are free to work together when formulating problems and coming up with creative solutions but are required to submit their own work and not that of their colleagues. All assignments will require the submission of electronic materials through Canvas. Pay attention to specific instructions for each activity provided in video recordings and/or in written form.

Short **quizzes** will be assigned at the end of each module and should take about 45 minutes to be completed. They are graded activities that cover subjects recently covered in the course. Quizzes are taken individually on Gradescope, are closed-book/notes, and are meant to reinforce important topics by means of a critical assessment of relevant problems.

One **midterm exam** and one **final exam**, also completed on Gradescope, will contain a variety of multiple choice, essay, and engineering-type questions. Exams are open-book/notes unless otherwise specified. They are designed to be typically completed within a 1-hour interval but will remain open for completion for about 24 hours. You can use a calculator to solve math problems. Exams are individual assignments, so please refrain from discussing their contents with course colleagues before the due date and time.

A **group project** is assigned later in the semester and is designed to encourage students to display creativity and demonstrate that they have mastered the concepts illustrated in the course. All team members are expected to contribute equally to the completion of the project report. A peer evaluation will be conducted after the submission date where students will be rated by their teammates based on individual contributions. The outcome of the peer evaluation will be taken into consideration in the grading process.

CODE OF CONDUCT

As the course is designed to be interactive in many ways, all students and instructional staff are expected to follow proper “classroom behavior and etiquette” and treat others with civility and respect. Despite the rather informal environment encouraged by the instructor, if one’s actions or behavior become offensive, disruptive, utterly off-topic, or inappropriate in any way, the instructor reserves the right to block that student’s access to shared online resources and report them to departmental leadership for further disciplinary action.

Furthermore, all items in the University of Utah’s Policy 6-400: Student Rights and Responsibilities apply herein. To learn more about the broad requirements related to student behavior and behavior violations, check the policy’s full text at <https://regulations.utah.edu/academics/6-400.php>.

REFERENCE TEXTS

This course will adopt the primary reference texts listed below. Students should have access to an electronic copy of the first two at no additional cost using the J. Willard Marriott Library’s website. While on campus or logged in for off-campus access, use the search tool to find the references below, download individual chapters, or view the entire book using your browser or third-party software. The third reference is offered at no cost by the International Requirements Engineering Board. Additional materials and other relevant references will be shared throughout the semester at no cost to students.

- Project Management Institute (PMI). Requirements Management: A Practice Guide. Project Management Institute, 2016. Print ISBN: 9781628250893, eBook ISBN: 9781628251098.
- Bron, Jean-Yves. System Requirements Engineering: A SysML Supported Requirements Engineering Method. John Wiley & Sons, 2020. Print ISBN: 9781786305947, eBook ISBN: 9781119751540.
- Glinz, Martin; van Loenhoud, Hans; Staal, Stefan; Bühne, Stan. Handbook for the CPRE Foundation Level According to the IREB Standard, version 1.1.0. International Requirements Engineering Board, 2022.
 - Download a free copy of the handbook here: <https://www.ireb.org/en/downloads/>

GRADING

	Weight	Details
Knowledge Checks	0%	see note below
Course Intro	5%	quiz/self intro
Weekly Forums	10%	6 forums
Homework	20%	4 assignments
Practicums	10%	4 case study sets
Quizzes	10%	4 short quizzes
Group Project	15%	1 written report
Midterm Exam	12%	open-book/notes
Final Exam	18%	open-book/notes

This course follows the letter grading scheme below:			
$95 \leq A \leq 100$ $90 \leq A- < 95$	$87 \leq B+ < 90$ $83 \leq B < 87$ $80 \leq B- < 83$	$77 \leq C+ < 80$ $73 \leq C < 77$ $70 \leq C- < 73$	$67 \leq D+ < 70$ $63 \leq D < 67$ $60 \leq D- < 63$ $0 \leq E < 60$
The option to curve the overall grade distribution is at the sole discretion of the instructor and will never be in disadvantage of any student.			

Note regarding the **knowledge checks**: individually, knowledge checks are not graded and failing to complete them will not affect one's grade negatively. However, every student with a knowledge check completion rate of 80% or more will have their numeric (decimal) grade rounded up to the nearest integer before conversion into a letter grade.

Regrade and grade correction requests must be made directly to the instructor no later than one week after the grade or work in question has been returned. Please monitor your grades posted in Canvas continuously as it holds the course's official gradebook preceding the assignment of letter grades that go on a student's transcript.

LATE ASSIGNMENTS AND MAKEUP WORK

The grade for an assignment submitted up to one day following the original deadline will have a 50% penalty applied to it. Assignments submitted more than one day after the original deadline will not be accepted or graded. Legitimate excuses must be supported with appropriate documentation. Makeup work, when authorized by the instructor, will be discussed on a case-by-case basis.

PARTICIPATION

Watching every lecture and completing activities on time is highly recommended and encouraged. A low participation record may be detrimental to your success in this course. Excuses to the timely completion of exams and other scheduled graded activities can be granted if reasonably justified and supported by appropriate documentation. It is at the discretion of the instructor to accept excuses, which will be analyzed on a case-by-case basis in accordance to the University of Utah's policies on instruction and evaluation, available at: <https://regulations.utah.edu/academics/6-100.php>.

ACCOMMODATIONS FOR DISABILITIES

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this course, reasonable prior notice needs to be given to the Center for Disability & Access (CDA), 162 Union Building, (801) 581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access.

In addition to the standard process above, please inform the instructor if you are aware of any other personal challenges that may prevent you from fully demonstrating your abilities so that accommodations can be made to ensure your full participation in the course and safeguard your educational opportunities at the University of Utah.

NON-DISCRIMINATION POLICY

The University of Utah guarantees equality of opportunity in education and strives to provide an academic environment that is free from any form of discrimination. Therefore, discrimination or harassment of any person based on race, color, religion, creed, gender, national origin, age, disability, veteran status, sexual orientation, or gender identity is a violation of state and federal laws and/or The U's policies and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. Be advised that all students, faculty, and staff are required to

report instances of sexual harassment, sexual assault, or discrimination to the appropriate offices within the university. Information regarding non-discrimination policies and reporting guidelines can be found at <https://oeo.utah.edu>.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, (801) 581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, (801) 581-7776. To report to the police, contact the Department of Public Safety, (801) 585-2677(COPS).

Pregnancy/Childbirth: Should you need modifications or adjustments to your course requirements because of pregnancy- or childbirth-related events, please contact your instructor to discuss an accommodation plan. Congratulations and enjoy the many sleepless nights to come!

Religious Observance: Students may be given additional time to complete activities that fall on days of religious observance or religious holidays, without penalty. Please communicate potential conflicts promptly.

LGBTQ+ Individuals and Beyond: The course instructor advocates in favor of equality for all individuals, regardless of their perceived or actual sexual orientation, gender identity, or choice of gender expression. Regardless of your status as a member of the LGBTQ+ community, please inform the instructor if you have a chosen pronoun and/or name that you would like to be addressed by.

ACADEMIC INTEGRITY AND STUDENT CONDUCT

Students are required to comply with all university-level policies on academic integrity as published in the Code of Student Rights and Responsibilities. All cases of academic misconduct will be reported to the Office of the Dean of Students. Please review your rights and responsibilities available at <https://regulations.utah.edu/academics/6-400.php>.

Additionally, academic misconduct policies specific to the Department of Mechanical Engineering will also apply. These policies are available at <https://www.mech.utah.edu/academics/me-academic-misconduct-policy>. By continuing your enrollment in this course, you acknowledge to be familiar with these policies and commit to abide by them.

Integrity Pledge: Your signature (digital or otherwise) on any test or assignment implies the following integrity pledge: *"On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise."*

UNIVERSITY SAFETY

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit <https://safeu.utah.edu>.

Please review The U's Emergency Response Guide available at <https://alert.utah.edu/emergency-response-guide> and be familiar with the official procedures in the events of earthquakes, utility failures, fires, medical assistance in case of injury or illness, environmental quality concerns, active shooters and acts of violence, bomb threats, severe weather, bio/chem/RAD spills, secure in place and shelter in place orders, and evacuation orders.

COURSE DELIVERY

Sections 030, 031, 090, and 290 of ME EN 5165/6165 will be delivered entirely online and remotely. There are no in person activities nor regularly scheduled course meetings. Lecture recordings and their associated assignments are made available every Friday at 12:00 AM when classes take place during the week that follows. The course is considered asynchronous as each student is free to organize their week as they please based on the release of new materials and the due dates and times of graded activities. However, a standard pace will be set according to the release of each week's materials as defined by the detailed schedule that follows.

Copyright statement: All course materials, with the exception of textbooks and supplemental readings, as well as all video recordings are the intellectual property of the instructor and may not be shared or reproduced without their explicit and written consent. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course materials or recordings with individuals not enrolled in the course or upload them to any other online platform.

COURSE SCHEDULE AND IMPORTANT DEADLINES

See pages 5 and 6 below.

WEEKLY CALENDAR

Week	Dates	Topics
MODULE 0 - COURSE INTRODUCTION		
1	01/08 - 01/12	Course Introduction
MODULE 1 - INTRODUCTION TO REQUIREMENTS ENGINEERING		
2	01/16 - 01/19	Setting the Stage <i>Part 1</i>
3	01/22 - 01/26	Setting the Stage <i>Part 2</i>
4	01/29 - 02/02	Overview of the Requirements Engineering Process
5	02/05 - 02/09	Module #1 Practicum
MODULE 2 - REQUIREMENTS ENGINEERING FUNDAMENTALS		
6	02/12 - 02/16	Needs and Requirements Elicitation and Analysis
7	02/20 - 02/23	Requirements Verification, Validation, and Management
8	02/26 - 03/01	Module #2 Practicum
9	03/04 - 03/08	Spring Break
10	03/11 - 03/15	Midterm Exam
MODULE 3 - MODELING REQUIREMENTS		
11	03/18 - 03/22	Requirements Engineering Using SysML Project Assignment
12	03/25 - 03/29	Module #3 Practicum
MODULE 4 - THE MAGICGRID FRAMEWORK		
13	04/01 - 04/05	The MagicGrid Framework Guide <i>Week A</i>
14	04/08 - 04/12	The MagicGrid Framework Guide <i>Week B</i>
15	04/15 - 04/19	Module #4 Practicum
16	04/22 - 04/26	Final Exam

HOMEWORK DUE DATES

HW	Due	Topics
1	02/09	Module 1 Weeks 2-5
2	03/08	Module 2 Weeks 6-10
3	03/29	Module 3 Weeks 11-12
4	04/19	Module 4 Weeks 13-15

SCHEDULE AND DUE DATES ARE SUBJECT TO CHANGE

Canvas will always have the
most up-to-date version
of this schedule.

All changes will be communicated!

All submissions are due at 11:55 PM on Canvas

QUIZ DATES

Quiz	Due	Topics
1	02/09	Module 1 Weeks 2-5
2	03/01	Module 2 Weeks 6-10
3	03/29	Module 3 Weeks 11-12
4	04/19	Module 4 Weeks 13-15

All quizzes are completed on Gradescope

PROJECT DATES

Date	Event
03/18	Assignment and Formation of Groups
04/19	Final Report
04/20	Peer Evaluations

Do not hesitate to send any questions you may have to pedro.huebner@utah.edu. I am here to help you succeed! 😊
I also appreciate feedback. Let me know if things are going well for you. We will work together to resolve any issues.