

The University of Texas at El Paso
Industrial, Manufacturing, and Systems Engineering (IMSE) Department

IE 3331 Systems Engineering

Fall 2024 - Syllabus

COURSE INFORMATION

IE 3331: Systems Engineering, CRN: 10861

Delivery Method: In-person

Meeting Day and Time: Monday and Wednesday, 1:30 pm – 2:50 pm

Location: Education Building, Room 203

INSTRUCTOR INFORMATION

Instructor: Sergio Luna Fong, Ph.D.

Written Communication: (1) MS Teams, (2) Email

Phone Number: (915) 747-7450

Office Location: Engineering Annex 242

Office Hours: Wednesday, 8:00 am to 9:30 am, or by appointment. In-person or MS Teams

COURSE DESCRIPTION

Systems engineering is a multidisciplinary approach that incorporates a *holistic* perspective to developing complex systems. This discipline presents the community with methods, tools, and processes that facilitate the transformation of stakeholder needs into operational solutions that effectively meet such needs. In this course, Systems Engineering Fundamentals, students are introduced to the system development lifecycle, starting with understanding the problem space, capturing and decomposing system requirements, exploration of design and cost trade-offs, system architecture, integration and testing of systems and legacy systems, verification and validation of system's behavior, system maintenance, and retirement, among others.

The course acquaints students with both the theory and practice of the systems engineering discipline by developing and presenting a multidisciplinary group project aiming to meet a particular stakeholder need. Students will be implementing learned concepts through the development of a system where they will be required to apply systems thinking to transform customer needs into system requirements, identify the proper system development process, create potential design solutions, present conceptual architectures, describe the plan for interface integration, discuss the proposed testing, verification, and validation strategies, and review the planned maintenance and retirement activities.

Students enrolled in IE 3331 should have successfully completed BE 3373 or IE 3373 Engr Probability & Stat Models.





COURSE OBJECTIVES

By the end of the course, students will be able to:

- Define the systems engineering process and its application to complex systems.
- Derive and analyze system requirements for complex systems.
- Derive subsystems from a cohesive system-level perspective
- Communicate systems engineering concepts and project results effectively.
- Apply systems engineering methods, tools, and processes to the design of complex systems

EDGE ADVANTAGES

This course is designed to equip students with essential Edge Advantages that contribute to their professional and personal development. Through the completion of course requirements and assignments, such as team projects, presentations, and essays, students will develop the following Edge Advantages:

	Problem-Solving	Assignments will challenge students to identify and address complex issues using innovative and analytical approaches.
	Communication	Class discussions and written assignments will improve students' skills in articulating ideas clearly and persuasively in both oral and written forms.
	Confidence	By actively participating and successfully completing assignments, students will build self-assurance in their abilities to tackle academic and real-world challenges.
	Critical Thinking	The course's emphasis on analysis and synthesis of information will strengthen students' abilities to think critically and make informed decisions.

ABET Engineering Accreditation Commission (EAC) 2024-2025

IE 3331 Outcomes Covered

Student Outcomes		
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.		
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.		X
3. an ability to communicate effectively with a range of audiences.		X
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.		X
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.		X
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.		
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.		X

ABET – Program Criteria: Systems Engineering Programs

Topics Included for ABET		
Advanced mathematics, including probability and statistics, and computing fundamentals, with practical applications thereof.		
Engineering topics necessary to define, synthesize, analyze, design, and evaluate complex systems containing hardware and software, and human elements (where appropriate), in a holistic manner across the lifecycle.		
Systems design and analysis topics, such as decision analysis, risk analysis (cost, schedule, and performance), trade-off analysis, optimization, modeling based engineering, simulation, sensitivity analysis techniques, or requirements engineering.		

REFERENCE MATERIALS

- **Systems Engineering Principles and Practice**
Kossiakoff, A., Biemer, S. M., Seymour, S. J., & Flanigan, D. A. (2020). *Systems engineering principles and practice*. John Wiley & Sons. Print ISBN:9780470405482 | Online ISBN:9781118001028
- **INCOSE Handbook 4th Edition**
[Link to INCOSE Store](#) UTEP is a CAB Member, you can access the material at no cost.
- **NASA Systems Engineering Handbook**
Link to NASA SE Handbook [Link to NASA SE Handbook](#)
- **Supplementary Readings:** Articles and case studies will be provided throughout the semester
- **Systems Engineering Book of Knowledge (SEBoK)**
Key knowledge sources and references in systems engineering. Link to SEBoK [SEBoK website](#)

TENTATIVE COURSE SCHEDULE

Module	Date	Topic(s)	Reading	Assignment Quizzes due Sunday at 11:59pm
Week 01	Aug 26 th – Aug 28 th , 2024	Orientation & Introduction to Systems Engineering	Student Introduction	Quiz #1: SE Principles
Week 02	Sept 2 nd – Sept 4 th	Systems Engineering Principles	INCOSE SE Handbook: Ch. 1, 2 NASA SE Handbook: Ch. 1, 2	Quiz #2: SE Principles
Week 03	Sep 9 th – 11 th	Systems Engineering Processes and Life Cycles	INCOSE SE Handbook: Ch. 3 NASA SE Handbook: Ch. 3	Quiz #3: SE Processes Disseminate Team Members
Week 04	Sep 16 th – 18 th	Mission and Business Analysis Stakeholders and CONOPS	INCOSE Handbook: Ch. 4.1 - 4.2 NASA SE Handbook: Ch. 4.1	Quiz #4: Mission and Business Analysis
Week 05	Sep 23 rd – 25 th	System Requirements Elicitation	INCOSE Handbook: Ch. 4.3 NASA SE Handbook: Ch. 4.2, 6.2, App. C	Quiz #5: Requirements Elicitation Exam #1 Project Update #1: Project Description
Week 06	Sept 30 th – Oct 2 nd , 2024	System Requirements Management	INCOSE Handbook: Ch. 9.3 NASA SE Handbook: Ch. 4.3	Quiz #6: Requirements Management
Week 07	Oct 7 th – Oct 9 th , 2024	Functional Analysis	INCOSE Handbook: Ch. 4.4 – 4.5 NASA SE Handbook: Ch. 4.4	Quiz #6: Functional Analysis

Week 08	Oct 14 th – 16 th , 2024	Architecture Definition	INCOSE Handbook: Ch. 4.6, 5.2 – 5.7 and 9.1 NASA SE Handbook: Ch. 6.3 – 6.7, App. L	Quiz #7: Architecture Definition
Week 09	Oct 21st – 23rd, 2024	System Analysis		Mid Term due: 10/25
Week 10	Oct 28 th – Oct 30 th , 2024	Implementation and Integration	INCOSE Handbook: Ch. 4.7, 4.8, 4.10, 5.8, 9.6-9.7 NASA SE Handbook: Ch. 5.1 – 5.2, 5.5, App H	Quiz #8: Implementation and Integration Project Update #2: Project Implementation
Week 11	Nov 4 th – Nov 6 th , 2024	Testing, Verification, Validation, Quality	INCOSE Handbook: Ch. 4.9, 4.11 NASA SE Handbook: Ch. 5.3-5.4, App D, E, I	Quiz #9: Testing, VVQ
Week 12	Nov 11 th – 13 th	Specialty Engineering	INCOSE Handbook: Ch. 5.3, 10 NASA SE Handbook: Ch. 6.8	Quiz #10: Specialty Engineering Exam #2
Week 13	Nov 18 th – 20 th	Model-Based Systems Engineering (MBSE) & Operation	INCOSE Handbook: Ch. 4.12 – 4.14, 9.1- 9.2 NASA SE Handbook: Ch. 6.8	Project Update #3: Project Implementation
Week 14	Nov 25 th – Nov 27 th	Maintenance and Disposal		Quiz #11: Maintenance and Disposal
Week 15	Dec 2nd – Dec 4th, 2024	Final Project – MBSE Model	Final Project Presentations	Final Project Report (12/8th)

ASSIGNMENTS AND GRADING

Assignments for this course are assessed according to rubrics. You can find these rubrics by clicking on the appropriate assignment link in Blackboard and choosing to “View Rubric” from the button beneath the Points Possible for the assignment.

Grade Distribution:

100-90 = A 89.9-80 = B 79.9-70 = C 69.9-60 = D 59.9 and Below = F

Class assignments are described by the following breakdown:

- (20%) – Quizzes
- (20%) - Exams
- (15%) – Project Updates
- (20%) – Mid-term project – Lectures 2 to 8
- (20%) – Final Project
- (5%) – Team Presentation

TECHNOLOGY REQUIREMENTS

Some course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Technology Support](#) as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

COURSE COMMUNICATION: How we will stay in contact with each other

Here are the ways we can keep the communication channels open:

- Office Hours: I will have office hours for your questions and comments about the course. My office hours are in-person, however, you can request a virtual meeting and we can meet in MS Teams. Please see the days and times at the top of this syllabus.
- MS Teams: Teams is the best way to contact me. I will make every attempt to respond to your question within 24 hours of receipt. When messaging me, be sure to message me from your UTEP student e-mail account and please include the course number in the conversation.
- Announcements: Check Blackboard, Email, and MS Teams announcements frequently for any updates, deadlines, or other important messages.

ATTENDANCE AND PARTICIPATION

Our class meetings are in-person at **Education Building, Room 203**, every Monday and Wednesday from 12:30 pm to 1:50 pm, beginning August 26 through December 4.

Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important not only for your learning and success but also to create a community of learners. Participation is determined by the completion of the following activities:

- Reading/Viewing all course materials to ensure understanding of assignment requirements
- Participating in engaging discussions with your peers
- Other activities as indicated in the weekly modules

Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

ILLNESS PRECAUTIONS

Please stay home if you have symptoms of a communicable illness. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations.

EXCUSED ABSENCES AND/OR COURSE DROP POLICY

According to UTEP Catalog, "At the discretion of the instructor, a student can be dropped from a course because of excessive absences or lack of effort. A grade of "W" will be assigned before the course drop deadline and a grade of "F" after the course drop deadline." See Policies and Regulations in the UTEP Undergraduate Catalog for a list of excuse

absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24 hours advance notice via email.

OR

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the [Registration and Records Office](#) to initiate the drop process. If you do not, you are at risk of receiving an “F” for the course.

DEADLINES, LATE WORK, AND ABSENCE POLICY

Assignments

Writing assignments will be due on Sundays at midnight (11:59 PM) via Blackboard. No late work will be accepted if the reason is not considered excusable.

MAKE-UP WORK

Make-up work will be given *only* in the case of a *documented* emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a backup. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through Blackboard, please contact the UTEP Help Desk. You can email me your backup document as a last resort.

INCOMPLETE GRADE POLICY

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations to students with documented disabilities. Students who become pregnant may also request reasonable accommodations, in accordance with state and federal laws and regulations and University policy. Accommodations that constitute undue hardship are not reasonable. To make a request, please register with the UTEP Center for Accommodations and Support Services (CASS). Contact CASS at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, **cheating, plagiarism, and collusion**. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Community Standards](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#)

GUIDANCE ON ARTIFICIAL INTELLIGENCE

AI prohibited

Use of AI technologies or automated tools, particularly generative AI such as ChatGPT or DALL-E, is **not allowed** for assignments in this class. Each student is expected to use critical and creative thinking skills to complete tasks and not rely on computer-generated ideas. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the [Office of Community Standards](#).

AI allowed only with prior permission from instructor

Use of AI technologies or automated tools, particularly generative AI such as ChatGPT or [DALL-E](#), is **only allowed with approval from the instructor BEFORE being used**. Without permission, you will be expected to think creatively and critically to complete assignments without assistance from these tools.

If given permission to use any of these tools, students must properly cite and give full credit to the program used upon submission of every relevant assignment. For example, text generated using ChatGPT must be cited:

Chat-GPT(version). Date of query (year/month/day). "Text of your query."
Generated using OpenAI. <https://chat.openai.com/>

A short paragraph describing how the tool(s) was/were used for the assignment must be included.

AI allowed with proper acknowledgement

Use of AI technologies or automated tools, particularly generative AI such as ChatGPT or DALL-E, is **only allowed with proper attribution given for its use**.

Students must properly cite and give full credit to the program used upon submission of every relevant assignment. For example, text generated using ChatGPT must be cited:

Chat-GPT(version). Date of query (year/month/day). "Text of your query."
Generated using OpenAI. <https://chat.openai.com/>

A short paragraph describing how the tool(s) was/were used for the assignment must be included.

Using AI for brainstorming

Some AI technologies or automated tools, particularly generative AI such as ChatGPT or DALL-E, can be beneficial during the early brainstorming stages of an activity, and you are welcome to explore them for that purpose. However, keep in mind that AI-generated ideas are not your own and may hinder your ability to think critically and creatively about a problem. It is also important to remember that these technologies often "hallucinate" or produce materials and information that are inaccurate or incomplete—even providing false citations for use.

That said, you are not allowed to submit any AI-generated work in this course as your own. If you use any information or materials created by AI technology, you are required to cite it like you would any other source. Consider how this will affect your credibility as a writer and scholar before doing so. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the [Office of Community Standards](#).

Free use of AI without acknowledgement

Use of AI technologies or automated tools, including generative AI such as ChatGPT or DALL-E, is permitted in this class. Students must include a short paragraph, with each relevant assignment, explaining how the tool was used.

PLAGIARISM DETECTING SOFTWARE

Some of your course work and assessments may be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.