

Fall 2020

Instructor: Sergio Luna, Ph.D.

Course Web Address: https://blackboardlearn.utep.edu/ultra/courses/_116073_1/cl/outline

Course Schedule: Thursday (6:30 pm – 8:00 pm MST)

Contact Information: salunafong@utep.edu

Virtual Office Hours: Tuesday 12:00pm - 1:00 p.m. MST or by appointment

Virtual session URL: [Link to Weekly Zoom meeting](#)

COURSE DESCRIPTION

Systems engineering is a multidisciplinary approach that incorporates a *holistic* perspective to the development of 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 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 Systems Engineering Management Plan (SEMP) where they will be required to apply systems thinking in order 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.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to:

- Think holistically and systematically when developing complex systems
- Understand systems engineering concepts, terms, and system lifecycle stages
- Understand the value that systems engineering brings to enterprises
- Implement systems engineering principles to the design of complex systems

COURSE FORMAT AND STRUCTURE

- Our weeks will run from **Thursday** to **Wednesday**. I will post information (online activities, discussion starters, etc.) on Blackboard for the upcoming week by **Thursday** evening, so that when you log in on **Thursday**, you can begin the new week and submit your deliverables, if any, by the following Wednesday.
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 - Virtual session URL: [Link to Weekly Zoom meeting](#)

- Virtual office hours will be held Tuesday 12:00 p.m. - 1:00 p.m. MST or by appointment. Please email me at salunafong@utep.edu to schedule a meeting.
- Assignments are due by 11:59 p.m. MST on the due date listed in the course schedule.
- An assignment file should be appended by the respective assignment number, your Last Name and First Name, such as "assignment1_LastName_FirstName.pdf". This make it easier for me to manage assignment files when downloading to my computer.

COURSE MATERIALS

- The following materials are **required**:
 1. INCOSE Handbook. International Council on Systems Engineering, *Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities*. 4th Edition, Wiley 2015.
 - [Link to Amazon.com: INCOSE SE Handbook \(Hardcover / Paperback\)](#)

A handbook's electronic version is included with the INCOSE student and professional's membership. It is also available, free of charge, to INCOSE's Corporate Advisory Board (CAB) limited members. Several organizations in industry, academia, and government are INCOSE's CAB members. To join INCOSE or confirm that your organization is a CAB member please visit the following link:

 - [Join INCOSE - International Council on Systems Engineering](#)
 2. NASA *Systems Engineering Handbook* (NASA SP-2016-6105 Revision 2)
 - https://www.nasa.gov/sites/default/files/atoms/files/nasa_systems_engineering_handbook_0.pdf
 3. Defense Acquisition University. *Systems Engineering Fundamentals*. Jan 2001.
 - [Link 1 to DAU Systems Engineering Fundamentals](#)
 - [Link 2 to DAU Systems Engineering Fundamentals](#)
- The following materials are **recommended**:
 - **Books**
 4. Kossiakoff, A., Biemer, S. M., Seymour, S. J., & Flanigan, D. A. (2020). *Systems engineering principles and practice* (2nd ed.). John Wiley & Sons.
 5. Blanchard, B. S., & Fabrycky, W. J. (2010). *Systems engineering and analysis* (5th ed.). Pearson College Division.
 - **Knowledge Repository**
 6. SEBoK Link - [SEBoK - Systems Engineering Body of Knowledge](#)

TENTATIVE COURSE SCHEDULE

The schedule below is subject to change. If for any reason I am required to make any amendments, I will be informing you via Blackboard, email and MS Teams.

Assignments are due by 11:59 p.m. MST on the day specified in the “Assignment” column seen below.

Tentative Schedule

Module	Date	Topic(s)	Assignment
Week 01	Aug 27 th – Sept 2 nd , 2020	Orientation & Introduction	Student Introduction
Week 02	Sept 3 rd – Sep 9 th , 2020	Introduction to Systems Engineering	INCOSE SE Handbook: Ch. 1, 2 DoD SE Fundamentals: Ch. 1, 2 NASA SE Handbook: Ch. 1, 2 Quiz deadline Sept 9: Quiz #1 - Week 2 materials
Week 03	Sep 10 th – 16 th , 2020	Systems Engineering Processes and Life Cycles	INCOSE SE Handbook: Ch. 3 DoD SE Fundamentals: Ch. 3 NASA SE Handbook: Ch. 3 Quiz deadline Sept 16: Quiz #2 - Week 3 materials Describe Group Project – Disseminate team members
Week 04	Sep 17 th – 23 rd , 2020	Mission and Business Analysis Stakeholders and CONOPS	INCOSE Handbook: Ch. 4.1 - 4.2 DoD SE Fundamentals: Ch. 4.1 NASA SE Handbook: Ch. 4.1 Quiz deadline Sept 23: Quiz #3 : Week 4 materials
Week 05	Sep 24 th – 30 th , 2020	System Requirements	INCOSE Handbook: Ch. 4.3 DoD SE Fundamentals: Ch. 4 NASA SE Handbook: Ch. 4.2, 6.2, App. C Quiz deadline Sept 30: Quiz #4 : Week 5 materials
Week 06	Oct 1 st – 7 th , 2020	Functional Analysis and Allocation	INCOSE Handbook: Ch. 9.3 DoD SE Fundamentals: Ch. 5 NASA SE Handbook: Ch. 4.3 Quiz deadline Oct 7: Quiz #5 : Week 6 materials
Week 07	Oct 8 th – 14 th , 2020	Architecture Definition and Design definition	INCOSE Handbook: Ch. 4.4 – 4.5 DoD SE Fundamentals: Ch. 6 NASA SE Handbook: Ch. 4.4 Quiz deadline Oct 14: Quiz #6 : Week 7 materials Release Mid-Term

Week 08	Oct 15 th – 21 st , 2020	System Analysis and Control	INCOSE Handbook: Ch. 4.6, 5.2 – 5.7 and 9.1 DoD SE Fundamentals: Ch. 10, 12-15 NASA SE Handbook: Ch. 6.3 – 6.7, App. L Quiz deadline Oct 21: Quiz #7: Week 8 materials Students: Add team recording on Team Project (SEMP)
Week 09	Oct 22nd – 28th, 2020	Mid Term	Mid Term due: 10/15
Week 10	Oct 29 th – Nov 4 th , 2020	Implementation, Integration, & Transition, Interface Analysis	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 deadline Nov 4: Quiz #8: Week 10 materials
Week 11	Nov 5 th – 11 th , 2020	Verification, Validation, Quality, Test	INCOSE Handbook: Ch. 4.9, 4.11 DoD SE Fundamentals: Ch. 7 NASA SE Handbook: Ch. 5.3-5.4, App D, E, I Quiz deadline Nov 11: Quiz #9: Week 11 materials
Week 12	Nov 12 th – 18 th , 2020	Specialty Engineering Decision Analysis and Value Functions	INCOSE Handbook: Ch. 5.3, 10 NASA SE Handbook: Ch. 6.8 Quiz deadline Nov 18: Quiz #10: Week 12 materials
Week 13	Nov 19 th – 25 th , 2020	Model-Based Systems Engineering (MBSE)	INCOSE Handbook: Ch. 9.1, 9.2 Quiz deadline Nov 25: Quiz #11: Week 13 materials Release Final Exam
Week 14	Nov 26 th – Dec 2 nd , 2020	Operation, Maintenance, Disposal	INCOSE Handbook: Ch. 4.12 – 4.14 Quiz deadline Dec 2: Quiz #12: Week 14 materials
Week 15	Dec 3rd – Dec 9th, 2020	Final Project	Final Project due: 12/9 Students: Add recording on Team Project (complete SEMP)

COURSE REQUIREMENTS

- **Attendance:** Attendance is not mandatory but recommended.
- **Assignments**
 - Class assignments are described by the following breakdown:
 - (30%) – 12 homework assignments (quizzes)
 - (20%) – Mid-term exam (open book) – Lectures 1 to 7
 - (20%) – Final exam (open book) - Comprehensive
 - (30%) – Team Project (SEMP presentation and document)

- **Team Project – Development of Systems Engineering Management Plan (SEMP)**

- Students will work in multidisciplinary teams to develop a Systems Engineering Management Plan (SEMP). This document sets the foundation to establishing how a system will come to life by describing the technical project planning and control, systems engineering process, and engineering specialty integration. We will be using real-life Request for Proposals to develop potential solutions that meets stakeholder’s needs.
- Each team member will be asked to assess each other’s contribution to the team’s contribution

GRADING PROCEDURES

Grades will be based on the following weights:

Homework assignments	30%
Mid-term	20%
Final Exam	20%
Team Project	30%

Final grading rubric will be as followed:

A	90 - 100
B	80-89
C	70 - 79
D	60 – 69
F	< 60

LEARNING ACCOMMODATIONS

The Center for Accommodations and Support Services (CASS) aspires to provide students with disabilities, accommodations and support services to help them pursue their academic, graduation, and career goals. For more information concerning services for students with disabilities, please contact the Center for Accommodations and Support Services at <https://www.utep.edu/student-affairs/cass/>

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.