



EM 385

Innovative Systems Design

School of Systems & Enterprises
Spring 2024

Time: 9:30 – 10:45 AM Tuesday/Thursday

Location: Gateway South 025

Instructor: Dr. Ting Liao (tliao@stevens.edu)

Course Website: Canvas

Office Hours: 2:00 – 3:30 PM on Tuesday or by appointment

Book a 15-minute time via <https://calendly.com/tliao-01/15min>

TA: Hossein Taramsari (hbasereh@stevens.edu)

TA Office Hour: TBA

Pre-/Corequisite(s): EM 365 Statistics for Engineers and an EM major

Course Overview

This project-based course addresses the early innovation part of the Systems Engineering process. This starts with using a systems approach to identify opportunities for new and improved products and services. Based on this, principles and concepts from Systems Engineering will be applied throughout the course to a student-selected team project. Using the project, the students will develop a conceptual solution to address the chosen opportunity, resulting in a System Specification. The initial focus is on the understanding of business drivers for systems engineering and the needs and expectations of potential customers and other stakeholders. Based on this, we generate innovative ideas for a solution and start an evaluation process to determine the winning concept for further development. Students then engage in analysis, synthesis, and evaluation activities as they progress through the conceptual design phase. Emphasis is placed on tools and methodologies for system evaluation during all phases of the design process with the goal of enhancing the effectiveness and efficiency of deployed systems as well as reducing operational and support costs.

Learning Objectives

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

- Understand the problem to be solved before defining the solution.
- Apply the systems engineering process to develop and document a system concept.
- Design a system concept based on a thorough analysis and understanding of the problem or an opportunity at hand.
- Analyze the merit of alternative system design concepts against technical and non-technical criteria derived from stakeholder needs and requirements.
- Understand the spectrum of activities needed for total design and the systems engineering approach.
- Demonstrate the ability to communicate a system design concept and its rationale in writing and presentation form.
- Contribute as a productive member of a small product or system development team, whose members may be from different disciplines and may have different goals.
- Gain the ability to identify a need or an opportunity, assess customer needs and requirements, and translate them into system objectives.

Course Logistics

Course Format

- Thursdays are generally for lecturing on new topics and introducing assignments for the upcoming week. The assignments are normally due the next Thursday. The assignments are due for peer review in class on Tuesday and via Canvas on Thursday.
- Tuesdays are generally for Q&As and peer review of the work from Thursday with the goals of better understanding the content and improving the submission on Thursday.

Office Hour

- Office hours will be held at 2:00-3:30 PM EST on Tuesday or by appointment. For weekly OH, students can book a time via <https://calendly.com/tliao-01/15min>. Office hours can be in person or virtual.
- Please email tliao@stevens.edu to schedule additional office hours.
- TA office hours are TBA. Please email hbasereh@stevens.edu to schedule additional TA office hours.

Tentative Course Schedule

W	Date	Topic
1	1/18, (2/23)	Course Logistics and Team Formation Introduce Systems Engineering
2	1/25, 1/30	Identify Opportunities and Associated Primary Stakeholders
3	2/1, 2/6	Analyze the Opportunity Domain and Primary Stakeholders' Needs and Desires
4	2/8, 2/13	Get the "lay of the land"
5	2/15, 2/20	Identify Root Causes and Leverage Points

6	2/22, 2/27	Disruptive Innovation
7	2/29, 3/5	Develop and Evaluate System Behavior aka. Concept of Operations
8	(3/7), 3/19	Midterm Presentation (after Spring Break)
9	-	Spring Break
10	3/21, 3/26	Develop and Evaluate System High-level Conceptual System Design
11	3/28, 4/2	Identify Additional Stakeholders and Formalize Stakeholder Requirements
12	4/4, 4/9	Specify System Behavior
13	4/11, 4/16	Specify Key Technical System Requirements
14	4/18, 4/23	Refine the System Concept to a High-level System Architecture
15	4/25	Identify Risks & Plan the Development Project
16	4/30	(Tentative) Final Presentation

There are no meetups on 2/23 and 3/7. However, there may be assignments due on those dates.

Grading Policy

The grade will be based on the following criteria and weights:

Individual Assignments	15%
Team Assignment	15%
Midterm Team Project	25%
Final Team Project	35%
Participation	10%

Grade	Percentage
A	93-100
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D+	67-69.9
D	60-66.9
F	< 60

Participation

Each student has three “grace” days of absence. After that, each absence will deduct 10% of the participation score (1% of the final grade). Being late for more than 15 minutes may count as an absence. This is regardless of the underlying reason for the absence. Exceptions, such as severe sickness and job interviews, will be discussed case by case along with written notice (e.g., doctor’s notice, copy of interview invitation).

Late Policy

Late submissions will be accepted up to 48 hours after the due date. However, 25% of the maximum grade will be deducted after the due date, and 50% will be deducted after 24 hours.

Exceptions will be provided to the student only if there is a situation of unavoidable emergency (for example, being hospitalized, illness, death in the family, etc.). Documentation of the emergency is required, and the award of points back is based on the instructor's discretion. If a student is granted an exception for a due date, the assignment must still be submitted to receive any credit for the submittal.

Academic Integrity

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and uphold the ideals set forth in the Honor System Constitution. More information about the Honor System, including the constitution, bylaws, investigative procedures, and the penalty matrix, can be found online at <http://web.stevens.edu/honor/>.

The following pledge shall be written in full and signed by every student on all submitted work, including, but not limited to, homework, projects, lab reports, code, quizzes, and exams assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

“I pledge my honor that I have abided by the Stevens Honor System.”

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

Learning Accommodations

Stevens Institute of Technology provides appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services>. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Mental Health Resources

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression) and who can visit the office in person. CAPS is open from 9:00 am – 5:00 pm Mondays, Wednesdays, Thursdays and Fridays and from 9:00 am – 7:00 pm on Tuesdays during the Fall and Spring semesters; appointments are highly encouraged. For those students who cannot visit the Stevens campus for an in-person appointment, you can contact a local mental health care provider for an in-person appointment, or if you are enrolled in the Stevens Student Health Insurance, you may call Care Connect for 24/7 mental health support at 1-888-857-5462.

For further information please visit the CAPS webpage on Seeking Help Off-Campus.

Emergency Information

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year-round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is not urgent or time sensitive, please email the CARE Team at care@stevens.edu.