EE 322-A: Engineering Design VI
School of Engineering and Science
2021 Fall

Meeting Time:	Monday 10:00 AM to 11:50 AM
Classroom Location:	Gateway South GS021
Instructor:	Kevin Lu
Contact Information:	Burchard B210, kevin.lu@stevens.edu
Office Hours:	Tuesday and Thursday 9:00 AM to 12:00 PM
Text Book:	*Engineering by Design* by Gerard Voland
Course Web Address:	https://sites.google.com/view/ece322
Prerequisite(s):	E 321 Engineering Design V
Corequisite(s):	EE 345 Modeling and Simulation
Cross-listed with:	None

COURSE DESCRIPTION

This course introduces students to critical engineering design topics such as needs assessment, problem formulation, modeling, patents, abstraction and synthesis, economic analysis, product liability, ergonomics, engineering ethics, hazards analysis, design for X, material selection, and manufacturing processes. Students learn that engineering is a service profession, dedicated to satisfying humanity's needs through responsible, methodical, and creative problem solving.

LEARNING OBJECTIVES

After successful completion of this course, students will be able to:
- Formulate problems correctly
- Work successfully in interdisciplinary teams
- Develop creativity, imagination, and analytical skills
- Incorporate appropriate engineering standards and multiple constraints
- Apply the knowledge and skills acquired in earlier course work
- Make informed ethical decisions
- Hone written and oral communication skills

OUTCOMES

Program Outcome 1: (*Complex Problem Solving*)
1.1 (Engineering foundations) Students will be able to use block diagrams and a hierarchical representation of the project and use detailed circuit diagrams and interconnected component diagrams with technical specifications on inputs, outputs, and control to describe the detailed operation of components in the project.

Program Outcome 2: (*Design*)

2.1 (Design assessment) Students will be able to design a system or process with considerations of economic, environmental, health and safety, manufacturability and sustainability constraints.

2.2 (Technical design) Students will be able to explore the design space of performance, features, and cost to determine the cost (fixed and operating) of a given project "product."

2.3 (Technical design) Students will be able to adjust the overall design of a project by changing or adding a component, developing a representation of the initial understanding of the project design and evolving it to a detailed representation that establishes a "design, test, and build" process based on inputs, outputs, and variables defined by successive levels (hierarchical) of components and subsystems.

2.4 (Design assessment) Students will be able to critically evaluate the impact of cost, features, and performance on the useful functionality of a project "product" from the perspective of a non-technical customer and will understand the importance of critically challenging his/her design and use assumptions to ensure exploration of alternative designs & features from the perspective of a final customer product.

2.5 (Technical design) Students will be able to develop the design for a project using a hierarchical approach (top-down) and to apply successive refinement to their design, incorporating new information and insights into your design while adjusting the overall design for necessary changes.

2.6 (Design assessment) Students will be able to understand and apply the principles of concurrent design in the breakdown of tasks and project plans and will understand and apply Gantt chart and PERT/CPM (either or both) in the creation of a breakdown of tasks and planning the activities to complete the project.

4.3 (Social issues) Students will be able to explore the non-technical space of social requirements, with a particular concern for the social impacts (both favorable and unfavorable) of their project "product."

Program Outcome 3: (*Communications*)

3.1 (Communication) Students will be able to write technical reports with sufficient clarity and accuracy.

Program Outcome 4: (*Ethical and Professional Conduct*)

4.1 (Ethics and morals) Students will be able to understand the associated ethical issues.

4.2 (Professionalism) Students will be able to understand the associated professional responsibilities.

Program Outcome 5: (*Teaming and Leadership*)

5.1 (Teamwork) Students will be prepared to effectively participate in and manage a multidisciplinary design team.

5.2 (Teamwork) Students will participate in a modest-sized team to develop initial ideas into a full project, with the final objectives of the team evolving from the collaboration rather than being defined a-priori.

Program Outcome 7: (*Ability to Learn*)

1.2 (Tools) Students will be able to efficiently locate information describing and assessing software tools for exploring the mathematical algorithms and techniques which are embedded in a student project.

1.3 (Tools) Students will be familiar with the use of standard search engines and keywords for an undirected search for information relevant to a specific project, familiar with the use of directed searches, starting from a known-good site and searching for information at that site relevant to a specific project and familiar with resources for compression/decompression of information.

FORMAT AND STRUCTURE
This course is comprised of lessons, hands-on exercises, and design project.

COURSE MATERIALS
GitHub repository: https://github.com/kevinwlu/iot

GRADING PROCEDURES
Grades will be based on:
Attendance: 15%
Outcomes: 75%
Presentation: 10%
Total: 100%

COURSE SCHEDULE
2021-08-30 Lesson 0: Syllabus
2021-09-06 No Class (Labor Day)
2021-09-13 Lesson 1: Overview
2021-09-20 Lesson 2: Needs Assessment
2021-09-27 Lesson 3: Structuring the Search for the Problem
2021-10-04 Lesson 4: Structuring the Search for a Solution
2021-10-12 (Tuesday) Lesson 5: Acquiring, Applying, and Protecting Technical Knowledge
2021-10-18 Lesson 6: Abstraction and Modeling
2021-10-25 Lesson 7: Synthesis
2021-11-01 Lesson 8: Ethics and Product Liability
2021-11-08 Lesson 9: Hazards Analysis and Failure Analysis
2021-11-15 Lesson 10: Design Analysis
2021-11-22 Lesson 11: Implementation
2021-11-29 Review
2021-12-06 Review
2021-12-13 Final Exam Schedule 8:00 AM - 11:00 AM

ACADEMIC INTEGRITY
Undergraduate Honor System
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 to uphold the ideals set forth in the Honor System Constitution (Links to an external site.). 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/ (Links to an external site.)

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) that is 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.*"

<u>Reporting Honor System Violations</u>
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 is dedicated to providing 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 in order 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.

Disability Services Confidentiality Policy
Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

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.

INCLUSIVITY
Name and Pronoun Usage
As this course includes group work and in-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.

Inclusion Statement
Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments

are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

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.