ISyE 4803 Design for Humans, Environment and Economy

Georgia Tech Early Summer Session, 2026

Day and Time

Monday, Tuesday, Wednesday and Thursday 9:30 – 11:40

May 18 to June 24

Instructor and email

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Prerequisite

ISYE 2027, ECON 2100 or ECON 2101 or ECON 2105 or ECON 2106

Course Description

This course introduces how industrial and systems engineers (ISE) apply systems thinking to design solutions that create economic value while meeting human needs and minimizing environmental impacts. Human considerations include both workers within the system and the customers or clients it serves, with topics covering cognition, behavior, safety, and human-in-the-loop design in the age of artificial intelligence. Environmental considerations address material use, emissions, and their implications for human health and sustainable development, with an emphasis on life cycle assessment (LCA) as a tool for evaluating impacts across a system's full life cycle, including extended approaches that incorporate social and economic dimensions. The economic value of design alternatives is assessed using cash flow analysis, incorporating the time value of money, rates of return, depreciation, and taxes.

Course Learning Outcomes

At the end of this course, the students will be able to:

1. Understand the roles of methodologies in industrial and systems engineering in all sectors of the economy through the lens of supply and value chains;
2. Articulate the cognitions and its impact on human decision, behavior, intellectual development in the design process;
3. Articulate the role of engineers and human centricity in the human-in-the-loop in design in the age of Generative AI;
4. Understand the industrial standards for work design relevant to human mental and physical capabilities;

5. Basic knowledge of life cycle assessment (LCA) and system thinking through case studies and USEEIO;
6. Manipulate cash flows to obtain equivalent values for a different time point or time frame;
7. Understand engineering economic decision criteria, including net present value, internal rate of return, and benefit cost ratio.
8. From alternatives and derive valid cost/benefit estimations from available data.
9. Compare alternatives that have unequal economic lives.
10. Perform after tax cash flow analysis, applying standard depreciation accounting rules.
11. Reflect inflation and uncertainty in analyses.
12. Work in teams effectively on a project.

Required Course Materials

Course Notes, to be available on Canvas.

Grading Policy

This course is graded on a letter grade basis. $A \geq 90, B \geq 80, C \geq 70, D \geq 60$. The weights of graded components are:

- 6 assignments 10%, the lowest grade will be dropped.
- 4 quizzes, each account for 10%. The total will be 40 %.
- Team project 15%
- Final Exam, 35%

Description of Graded Components

There will be 6 assignments. You can submit your completed assignments to Canvas.

There will be 4 quizzes. You will be given 1.5 hours during a 24-hour period to complete if not in residence.

There will be a team project in which you design alternatives to existing systems and evaluate your alternative for the customer/user, environmental impact and financial performance.

The final exam is comprehensive. The format is the same as quizzes but 2-hour duration in a 24-hour window.

USG required Course Policies

Attendance and/or Participation

You are encouraged to join the class during class if you are in a similar time zone and join the discussion.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Please review Georgia Tech's Honor Code, the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable

Additional Georgia Tech Required Policies

Accommodation for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Collaborations, Group Work

You are allowed to work in groups on assignments, but any submission must be written in your own work. The assignments are for learning so that you can demonstrate your understanding on the test without these assistances. class tests and exams will be closed book and notes, but I will provide an equation sheet.

Use of Generative AI

Generative Artificial Intelligence (Gen AI, or AI) has changed how we learn and work in the human-in-the-loop decision or design process. You can use Chatbots to achieve better results and to develop your own intellectual capabilities. You can also take the path of minimum effort to achieve plausible result without learning. Your own contribution during your career will depend on your own capabilities in asking good questions, solid command of fundamentals, critical thinking of the AI generated results, logical thinking to link the fundamentals to the results, and the ability to judge your final submission. The discussion in human cognition, cognitive capacity, human behavior, human decision and intellectual development in this class will help you be more conscientious about how to use these tools to improve results and your intellectual development.

In this course, you can use any AI tools for learning. However, you must report

1. Which tool and how you used to tool on which problem in what way.
2. How the use of tools helped you to better understand the fundamentals, critical and logical thinking.