ISYE 4501 ENERGY, EFFICIENCY AND SUSTAINABILITY

BSIE Concentration Breadth Elective

Credit: 3-0-3

Course Coordinators: Constance Crozier, Valerie Thomas, 2025

Prerequisites: ISyE 3025 Eng Economy or MGT 3076 Investment; PHYS 2211 Intro to Physics I; MGT 2255 Quantitative Analysis of Business or MATH 2551 or MATH 2550

Text and readings:
Lecture notes will be posted, supplemented by articles.

Catalog Description: Analysis and modeling of energy production and use, material and energy efficiency, sustainability, and cost for systems, products, and services.

Course Description
This course focuses on techno-economic analysis and environmental modelling. Students will learn how to assess efficiency and impacts of industrial systems such as power generation, transportation, manufacturing, and building operation. Through case studies and individual projects, students will assess cost and performance analysis of competing technologies.

Topical outline, each topic is 1 week, with the remaining weeks for project presentations and/or Midterms

Core Topics
- Energy
- Transport
- Cost benefit analysis
- Life cycle analysis
- Product supply chains
- Electricity
- Air pollution and greenhouse gas accounting

Special Topics (some are covered)
- Food and farming
- Building heating and cooling
- Energy storage
- Box models
- Integrated assessment models
- Water

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

1. Evaluate costs and benefits a product or service using cost and impact metrics (by exams)
2. Use knowledge of industrial systems to scope and develop multi-criteria assessments (by project)
3. Evaluate costs and benefits of technology choices using several metrics (by exams)

Student Outcome Assessment Plan

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Evaluate Lifecycle environmental impacts of a product or service		H		H			
2. Use knowledge of industrial and systems engineering to cope and develop environmental assessment		H		H			M
3. Evaluate monetary and environmental costs and benefits of technology choices (by exam)		H		H			

Evaluation of the important course outcomes

The course outcomes 1 and 3 will be assessed by final exam and2 will be assessed by course projects.