Sustainable engineering ECH4905

Class Periods: Tuesday, period 4-5, 10:40 AM - 12:35 PM
Thursday, period 4, 10:40 AM - 11:30 AM

Location: BLK 0315

Academic Term: Fall/ 2025

Instructor:

Juan Manuel Restrepo-Flórez
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Office Hours: Tuesday, 12:40-1:40, NEB 553
Thursday, 11:40-12:40, NEB 553

Course Description

Special Problems in Chemical Engineering-Sustainable engineering. In this course, we will cover the fundamentals of sustainable engineering, including life cycle analysis and other environmental sustainability assessment techniques such as environmentally extended input-output analysis, emergy analysis, and the planetary boundaries framework.

Course Pre-Requisites / Co-Requisites

None

Course Objectives

1. To learn the fundamentals of environmental assessment tools such as life cycle analysis and input-output analysis.
2. To learn how to use some environmental sustainability software for the analysis of environmental impacts.
3. To learn how to estimate the cost of a chemical process

Relation to Program Outcomes (ABET):

Outcome	Coverage
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

Recommended Materials

Books

- Bakshi B, Sustainable engineering principles and practice, Cambridge, 1st edition.
- Heijungs R and Suh S, The Computational Structure of Life Cycle Assessment, Springer Science, 1st ed.
- Lorenz T Biegler, Ignacio E Grossmann, Arthur W Westerberg. Systematic methods for chemical process design. Prentice Hall, Old Tappan, NJ (United States).

Software

- For the solution of LCA problems we will be using OpenLCA or GaBi

Required Computer

UF student computing requirement: *https://news.it.ufl.edu/education/student-computing-requirements-for-uf/* .

Course Schedule

CHAPTER 1 The definition of sustainability and our status
CHAPTER 2 Reasons for unsustainability
CHAPTER 3 Life cycle assessment fundamentals (HM1)
CHAPTER 4 Environmentally extended input-output analysis (HW2)
CHAPTER 5 Hybrid models (HM3)
CHAPTER 6 Energy and material flow analysis (HW4)
CHAPTER 7 Exergy Analysis (HW5)
CHAPTER 8 Emergy Analyses (HW 6)
CHAPTER 9 Absolute sustainability the planetary boundaries framework
CHAPTER 10 Absolute sustainability accounting for Ecosystem services (HW7)
CHAPTER 11 Technoeconomic Analysis (HW8)

Date	Topic	Homework	Project
26-Aug	chapter 1		
28-Aug	chapter 1		
2-Sep	chapter 2		
4-Sep	chapter 2		
9-Sep	chapter 3		
11-Sep	chapter 3		
16-Sep	chapter 3		
18-Sep	chapter 3	HW1	
23-Sep	chapter 4		
25-Sep	chapter 4	HW2	
30-Sep	chapter 5		
2-Oct	chapter 5	HW3	
7-Oct	chapter 6		
9-Oct	chapter 6	HW4	
14-Oct	chapter 7		
16-Oct	chapter 7	HW5	
21-Oct	chapter 8		
23-Oct	chapter 8	HW6	
28-Oct	chapter 9		
30-Oct	chapter 9		
4-Nov	chapter 10		
6-Nov	chapter 10	HW7	
11-Nov	chapter 11		
13-Nov	chapter 11		
18-Nov	chapter 11		
20-Nov	chapter 11	HW8	

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is expected. Homework will be assigned with sufficient time to allow for the work to be completed, we will not grant extensions for any reason, we will not accept late homework either.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets 1-7	11.42 each	80%
Homework Set 8 (miniproject)	20	20%

Grading Policy

A	grade>90
A-	85<grade<=90
B+	80<grade<=85
B	75<grade<=80
B-	70<grade<=75

C+	65<grade<=70
C	60<grade<=65
C-	55<grade<=60
D+	50<grade<=55
D	45<grade<=50
D-	0<grade<=45

More information on UF university policies as well as academic and wellness resources can be found at:
https://syllabus.ufl.edu/syllabus-policy/uf-policy-on-course-syllabuses/