

Applications of Life Cycle Assessment in Biological Engineering

ABE 4932 Section: 10105

Class Periods: MWF Period 3, 9:35 – 10:25 am

Location: Frazier Rogers Hall Rm. 211

Academic Term: Spring 202X

Instructors:

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Office Hours: Friday 10:30-11:30 am or by appointment.

Course Description

Introduction and application of life cycle assessment (LCA) to evaluate the environmental impacts of various products, processes, or services related to the water-energy-food nexus. Additional topics include planetary boundaries, systems thinking, circular economy, mass and energy balances, life-cycle costing, social LCA and sensitivity and uncertainty analysis. This is an interdisciplinary course open to students from any major. (3 credits)

Course Pre-Requisites / Co-Requisites

MAC1147 Precalculus Algebra and Trigonometry & Junior Standing

Course Objectives

After completing this course students will be able to:

- Recognize global sustainability challenges within the water-energy-food nexus.
- Explain what life cycle assessment is and how it is applied.
- Investigate the environmental impacts of a product, process or service within water-energy-food systems using life cycle assessment, including sensitivity and uncertainty analysis.
- Analyze, evaluate and communicate life-cycle assessment results via oral presentation and written report.

Materials and Supply Fees - None

Required Textbooks and Software

There is no required textbook for this course. Access to all readings and course materials will be provided to students on Canvas. Students will be able to access the LCA software to be used in this course via the ABE virtual workstation.

Attendance Policy, Class Expectations, and Make-Up Policy

- 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/>
<https://catalog.ufl.edu/graduate/regulations>
- All assignments/class deliverables are due by 11:59 pm on the day specified for full credit. 10% deduction/day thereafter. Maximum deduction is 50%.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Assignments (9)	225	45%
Quizzes (3)	75	15%
Midterm Presentation	50	10%
Final Presentation	50	10%
Final Report	100	20%
	500	100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Course Schedule

<u>Week</u>	<u>Topic</u>	<u>Due</u>
1	Class Overview, Planetary Boundaries, Sustainability	--
2	Overview and Applications of LCA	Assignment 1
3	Goal, Scope & System Boundary	Assignment 2
4	Life-cycle Inventory	Quiz 1 & Assignment 3
5	Data Quality and Life-cycle Impact Assessment	Assignment 4
6	Working in SimaPro	Assignment 5
7	Sensitivity and Uncertainty Analysis	Assignment 6
8	Project Work Week	Quiz 2 & Assignment 7
9	Mid-term Project Presentations	Midterm Presentation
10	Life Cycle Costing, and Social LCA	--
11	Presenting and Communicating Results	Assignment 8
12	Project Work Week	Quiz 3 & Assignment 9
13	Project Work Week	--
14	Final Project Presentations	Final Presentation
15	Finalize Project Reports	Project Report

Description of Course Elements:

Lectures: The course is divided into weekly modules. Each week's topic and supporting information will be introduced using a lecture format, and supported with in-class activities, small and large-group discussions, readings, videos, and an assignment. Lecture slides and other supporting material will be provided on the week's Canvas page.

Assignments: There will be an assignment each week related to the weekly topic. In some cases, we will start the assignment in class on Fridays, and all assignments will be due the following Thursday by 11:59 pm. Most assignments will directly relate to a component of the LCA class project. Others will serve to emphasize sustainability related concepts. Prior to the Friday class meetings, students may be required to complete a reading or watch a video to prepare for the in-class activity/assignment.

Quizzes: Three quizzes will be given in class throughout the semester to assess students' understanding and application of the lecture material.

Class Project and Deliverables: Over the course of the semester, students will carry-out an LCA on a topic/system of their choice. Several of the weekly assignments will serve as building blocks toward completion of the LCA project. Students will work as individuals or in teams depending on the number of students in the class. If working in teams, each student will complete a mid-term and final peer evaluation to provide feedback on individual performance within the team. As the project comes together, students will be required to complete three project deliverables:

- Midterm Oral Presentation - describing the goal, scope, and system boundary of the LCA.
- Final Oral Presentation - providing an overview of the complete LCA project and interpretation of results.
- Final Written Report - describing the complete LCA in detail and formatted as a scientific manuscript.

Project Work Weeks: Time will be given in class to work on the LCA projects and ask questions. Guest presentations and supplementary lectures may also be given during these weeks.

Relation to Program Outcomes (ABET):

This course is not used for ABET assessment.

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	Low
3. An ability to communicate effectively with a range of audiences	High
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate/Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Pamela Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/state-authorization-status/#student-complaint>.