

Applications of Life Cycle Assessment in Biological Engineering

ABE 4932 Section: 10188

ABE 6933 Section: 10197

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

Location: Frazier Rogers Hall Rm. 211

Academic Term: Spring 2022

Instructors:

Dr. Ana Martin-Ryals

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Office Hours: MW 10:30-11:30 am or by appointment. Office hours will be held online via Zoom.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

None

Course Description

This is a special topics course that will explore the topic of life-cycle assessment (LCA) in relation to biological engineering design. The course will be project based with students working in teams to identify a current challenge within water-energy-food systems and develop an engineering solution to address this challenge. A key component of this course will be applying LCA as a tool for informing the design process and evaluating the environmental impacts of engineered products and processes. Through the course, students will be introduced to additional concepts including circular economy, mass and energy balances, and life-cycle costing. Students will examine these concepts through case studies and apply them in a team design project. (3 credits.)

Course Pre-Requisites / Co-Requisites

MAC1147 Precalculus Algebra and Trigonometry

Course Objectives

After completing this course students will be able to:

- Identify challenges and potential biological engineering solutions within the water-energy-food nexus
- Utilize a mass and energy balance approach to develop a life cycle inventory for a product or process
- Carry-out a life-cycle assessment for a product or process using the ISO14044 framework
- Conduct uncertainty and sensitivity analysis to identify key design parameters that affect the environmental and economic impact of a product or process

Materials and Supply Fees

N/A

Relation to Program Outcomes (ABET):

This course will not be 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,	Medium

as well as global, cultural, social, environmental, and economic factors	
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	High
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	High
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

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 remotely via the ABE virtual workstation.

Course Schedule*

<u>Week</u>	<u>Topic</u>	<u>Due</u>
1	Introductions, Class Overview, LCA and Sustainability concepts	--
2	Grand Challenges, Nexus Thinking, Circular Economy EN Roads Climate Simulation, Teams	Assignment 1
3	Life-cycle Assessment: Overview, Project brainstorming	Team Update 1 (Team Selection and Project Concept)
4	Life-cycle Assessment: Goal and Scope, Project Proposals	Assignment 2
5	Life-cycle Assessment: System Boundaries, Process Flow Diagrams, Modeling with Excel	Team Update 2
6	Life-cycle Assessment: Life-cycle Inventory and Environmental Impact Assessment	Assignment 3
7	Life-cycle Assessment: Working in SimaPro	Team Update 3
8	Life-cycle Costing	Assignment 4
9	Uncertainty and Sensitivity Analysis	Team Update 4
10	Spring Break – No Class	–
11	Presenting and Communicating Results	Assignment 5
12	Work on Projects	Team Update 5
13	Work on Projects	Assignment 6
14	Work on Projects	ABE6933 presentation and Team Update 6
15	Work on Projects	--
16	Project Presentations	--

*The course schedule is subject to change

Attendance Policy, Class Expectations, and Make-Up Policy

- This course will utilize a [Team-Based Learning](#) approach. Therefore, attendance in class is very important. Attendance will be taken for each class session. You will achieve up to full credit for your performance with no more than 5 absences. With 6 to 10 absences, you will receive the next lower grade. With 10 to 15 absences you will receive the second lower grade. 16 or more absences will result in an E grade for the course.
- Excused absences must be consistent with university policies in the undergraduate or graduate catalog and require appropriate documentation:
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>
- Class meetings will be recorded. See the Online Course Recoding Policy on the next page. Links to class recordings will be posted on the course Canvas site for students to refer back to and for students who are unable to attend live.
- 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%.
- 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 (Undergraduate Section ABE4932)

Assignment	Total Points	Percentage of Final Grade
Assignments (6)	300	30%
Weekly Team Reports (6)	300	30%
Team Project	400	40%
	1000	100%

Evaluation of Grades (Graduate Section ABE6933)

Assignment	Total Points	Percentage of Final Grade
Assignments (6)	300	25%
Weekly Team Reports (6)	300	25%
Team Project	400	33%
Research Presentation and Abstract	200	17%
	1200	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>

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 Conduct 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. 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 Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@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/>.

COVID-19

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

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 Resource 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: <http://www.distance.ufl.edu/student-complaint-process>.