DCP 6931: (SPECIAL TOPICS) LIFE CYCLE ASSESSMENT

Spring 2025 | 3 Credits

Instructor: Dr. Patricia Kio, LEED GA, MNIA

Program in Sustainability & the Built Environment (SBE), Construction and Planning (DCP) | University of Florida.

Instructor's Office: AH 132 (Antevy Hall) | Phone: 352 294 1425
Instructor's Contacts: p.kio@ufl.edu
Office Hours: Tuesdays (12:00 PM –2:00 PM) and Thursdays (10:00 AM –12:00 PM)
Other times: By appointment (virtual & in-person)
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Course Time & Location: Monday (12:50 PM - 1:40 PM) | Wednesday (12:50 PM - 2:45 PM) at RNK 0220 (Rinker Hall)
Corequisite and/or Prerequisite: None
General Education Credit: None
Final Exam Schedule: No final exam for this course.

CATALOG DESCRIPTION

This course provides an in-depth understanding of Life Cycle Analysis (LCA) and its applications in the built environment. Students will learn to evaluate the environmental impacts of building materials, construction processes, and building operations from an LCA perspective. The course emphasizes the importance of LCA in promoting sustainable building practices and decision-making. This is a co-listed course, and two levels (graduate and undergraduate) are included in the same classes.

COURSE OBJECTIVES

- Identify the principles and methodology of LCA.
- Apply LCA to evaluate the environmental impacts of building materials and processes.
- Explain LCA results to inform sustainable design and construction practices.
- Develop skills to conduct LCA studies and communicate effectively.

STUDENT LEARNING OUTCOMES (SLOs)

Upon completion of this course, the students will be able to:
- Recognize the importance of LCA in evaluating the environmental impacts of products and processes.
- Describe the key stages of the life cycle (Raw Material Extraction, Production, Use, End-of-Life) and their associated environmental impacts.
- Practice the principles of Life Cycle Inventory (LCI) and its utility in tracking material and energy flows associated with products.
- Calculate and interpret LCI databases and evaluate the accuracy of LCI data.

- Explain the differences between midpoint and endpoint approaches in LCIA.
- Evaluate the environmental impacts of products and processes through impact categories (e.g., climate change, eutrophication, human toxicity).

REQUIRED TEXT/READING

Pati, S. N. (2022). *Life Cycle Assessment: Future Challenges*. CRC Press.

Recommended Readings:

❖ Curran, M. A. (2020). Life-cycle Assessment: Inventory Guidelines and Principles. CRC Press.

❖ In addition to the required textbook and recommended reading, other readings including book chapters, reports, and articles from academic journals and industry magazines will be assigned throughout the semester. Students are expected to complete readings as advance preparation for class discussions and project goals.

ADDITIONAL RESOURCES

❖ Life Cycle Assessment and Techno-Economic Analysis
https://www.energy.gov/eere/iedo/life-cycle-assessment-and-techno-economic-analysis-training

❖ Life Cycle Initiative
https://www.lifecycleinitiative.org/activities/e-learning-modules/

❖ Reducing Embodied Energy and Decreasing Emissions (REMADE)
https://www.energy.gov/eere/ammto/reducing-embodied-energy-and-decreasing-emissions-remade

INSTRUCTIONAL METHODS AND EXPECTATIONS

This course includes lectures, readings and reflections, multimedia materials, in-class engagement activities individually and in groups, research-based writing, and two projects. The following is a summary of expectations:

- Student expectations of instructor: enthusiasm for the course; engaging lectures; application of knowledge through classroom activities and fieldwork; easy to access course materials; clear guidance and assessment rubric; openness and encouragement of critical thoughts and new ideas; constructive feedback, and reasonable flexibility to meet with students outside of class.
- Instructor expectations of students: compassionate curiosity; positive attention and intention; enthusiasm about learning new ideas and contribution to the learning environment, consistent attendance; punctual arrival; active participation in class discussions and activities; advance-reading and note preparation of assigned reading; on-time completion/submission of all assignments; proper citation management; professional attitude, adherence to proper netiquette and all University rules and regulations.

COURSE COMMUNICATIONS AND E-LEARNING/ CANVAS PORTAL

This class will be delivered in person. The instructor will utilize the UF Canvas e-Learning portal as the primary medium to send announcements and to distribute course information, assignments, reading materials, resources, and grading. Students are responsible for checking Canvas portal regularly for announcements, course content, access to all supplemental readings, and to submit assignments and projects.

Lecture slides will be posted on Canvas in advance of each scheduled lecture. Reviewing materials online is not a substitute for class attendance. Lectures posted on Canvas by the instructor are not intended to be a complete study aid and should be viewed as supplementary to personal notes.

METHODS BY WHICH STUDENTS WILL BE EVALUATED OUT OF 1000

	Item	Points & Percentage	Description	Deadlines
1.	Attendance	50 (5%)	For regular class attendance	Every class
2.	Discussions	150 (15%)	Contribute to discussion threads on Canvas	Every class
3.	Reading presentation	50 (5%)	Presentations of sections of book chapters using template	Schedule of presentation
4.	Assignments	150 (15%)	Ten assignments to be uploaded on Canvas	See schedule below for details
5.	Project 1	100 (10%)	Evaluate LCA in the built environment	Mar 15, 2024
6.	Project 2	200 (20%)	Comparative LCA analyses for different scenarios	Apr 23, 2024
7.	Quizzes	200 (20%)	Four quizzes (Open book online via canvas)	• Quiz 1- Jan 27 • Quiz 2 - Feb 24 • Quiz 3 - Mar 24 • Quiz 4 - Apr 14
8.	Final report	100 (10%)	Report on Project 2 (4,000 words minimum)	Apr 23, 2024
	Total	1000 (100%)		

ATTENDANCE

Attendance will be kept. Students are expected to attend classes regularly. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

DISCUSSION SCALE

Your participation in Canvas and class discussions will be evaluated using this percentage scale for points towards your final grade for the semester.

1. 100 = Student often contributes thoughtful comments and insights based on class materials and has been a catalyst for other student comments as well as instructor response; listens to the comments and insights of others with respect and attention.

2. 80 = Student regularly contributes thoughtful comments and insights based on class materials, which results in student as well as instructor response; listens to the comments and insights of others with respect and attention.

3. 60 = Student sometimes contributes comments and insights based on class materials, more often at instructor's prompting; generally polite but could be more engaged in class discussions.

4. 40= Student seldom contributes comments and insights of her/his own volition; comments are not always relevant to materials or discussion at hand; needs to pay more attention to the contributions of the instructor and peers.

5. 0= Student rarely and reluctantly contributes to class discussions; comments minimal and/or disrespectful; often noticeably disinterested in instructor's and peers' contributions.

READING PRESENTATION

Students will pair up and summarize assigned course readings from the textbook. Please check the schedule for your assigned reading presentation of a book chapter. Prepare your presentation with this template. The presentation should be 15-20 minutes long.

ASSIGNMENTS

The grades for the ten assignments will be based on the quality and completeness of work, the clarity and rigor of your ideas, and your contribution to the ongoing public dialogue that is integral to the practice of sustainability. Day-to-day interactions in class and during presentations are noted and will have a significant impact on your final grade. Interim grades will be issued and will include comments on progress to that point. If you have questions at any point, make an appointment to meet with the faculty instructor. The assignments and poster will be graded with this rubric.

PROJECT 1

Students will evaluate the LCA of an emerging product in the built environment and submit final individual projects in a poster format. Templates for posters will be provided on Canvas. See rubric for assignment and project below.

PROJECT 2

Student teams will collaborate on a comparative life cycle assessment of an existing building and propose alternate materials for the building envelope. Group submissions comprise results of two life cycle analyses (before and after scenarios), reports (4000 words minimum) and presentation slides in PowerPoint. The presentation should be 15-20 minutes long. Templates for the report and slides will be provided on Canvas.

QUIZZES

Quizzes will be made available on Canvas and they are open book. Students are expected to take quizzes individually and not collaborate with others. There will be 4 quizzes worth 50 points each. Each quiz comprises 10 questions and the quizzes are non-cumulative.

FINAL REPORT

Students will complete a final report (4000 words minimum) on Project 2 to be submitted on Canvas. You are welcome to submit earlier than the deadline. Plagiarism will result in a grade of 0 (this includes self-plagiarism). Students agree that by taking this course all required papers may be subject to submission for a textual similarity review to Turnitin.com via Canvas for the detection of plagiarism. All submitted reports will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

The maximum Turnitin similarity index report of submissions is 20% and the report will be graded with this rubric.

GROUP WORK RULES

Students will work in teams using folders in OneDrive. The instructor will create folders for each group and check the log for the documents to assess individual contribution to the group project. Each student will complete an allocated task that contributes to the final group outcomes and gets the grade for that task. In addition, team members will complete a peer evaluation form for group processes. The last page of your report should be titled "Group work" where you will submit a list of all your team members and state each team member's contribution. The contribution of team members will be assessed with this rubric.

GRADING

Grading Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
93–100	90–92.99	87–89.99	83–86.99	80–82.99	77–79.99	73–76.99	70–72.99	67–69.99	63–66.99	60–62.99	0–59.99
4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0

OTHER IMPORTANT COURSE INFORMATION

Late Work Policy

Students are to present a legitimate reason for late work. There will be a deduction of 10% of the points for every day that work is late. The maximum deduction is 50%. This is to be fair to other students who turned in their work by the deadline. Once Canvas assignment closes, we do not accept any assignments, unless you have a legitimate reason for late or missed work.

Classroom Etiquette

Talking to each other and disrupting the class violates your fellow students' right to have a good learning experience in the class. If a student must say something to another person or persons

besides the instructor, that student is free to leave the room. Students need to be considerate that others must be able to hear the instructor clearly without being disturbed by unnecessary conversations or disruptions. Cell phones and all noise-making devices must be silent during class times as well. Cell phones and all noise-making devices must be silent during class times as well.

Email Policy

E-mail is appropriate only for quick messages and replies. You are welcome to e-mail me with brief questions or comments (e.g., a request for an appointment, a question that can be answered in a sentence or two). I will answer your messages as I have the opportunity but cannot guarantee immediate responses. Note also that e-mail messages (particularly last-minute e-mail messages) cannot be accepted as fulfilling class obligations or providing excuses for failing to do so.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://disability.ufl.edu/ by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with any disability should follow this procedure as early as possible in the semester.

University of Florida Student Honor Code, Original Work, And Plagiarism

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 specifies a number of behaviors that are in violation of this code and the possible sanctions. See the UF Conduct Code website for more information. If you have any questions or concerns, please consult with the instructor or TAs in this class.

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.aa.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.aa.ufl.edu/public-results/

Materials and Supplies Fee

There are no additional fees for this course.

COURSE MODULES AND TOPICS

Detailed weekly plans, readings, quizzes, and course content will be available on Canvas throughout the semester and will be announced in class.

Semester Schedule (subject to modification)

Week	Lecture Topics / Questions addressed	Assessment
January 13	Introduction to LCA • Definition and importance of LCA • Historical development and standards • Overview of LCA methodology • Life cycle thinking	
January 20	Environmental Management System • Background • Necessity of Environmental Management System • International Standards • Reduction of carbon and water footprints • Project 1	Reflections from textbook -*Life-cycle Assessment: Inventory Guidelines and Principles* – Presentation Schedule • Discussion 1 (10 points), Book Chapter 1 • Assignment 1: Project context analysis with Climate Consultant and Climate Scout
January 27	LCA Framework and Phases • Goal and scope definition • Life cycle inventory (LCI) • Life cycle impact assessment (LCIA) • Interpretation and reporting	• Quiz 1 (50 points) • Assignment 2: Project data inquiry for existing conditions with ArcGISOnline and Google Earth
February 3	Data Collection and Inventory Analysis • Data sources and quality • Inventory data collection methods • Handling data gaps and uncertainties	• Discussion 2 (10 points), Book Chapter 2 • Literature review sessions on February 5, with Ann Baird – AFA conference room • Assignment 3: Case studies from literature reviews
February 10	Impact Assessment Methods • Classification and characterization • Impact categories (e.g., global warming potential, resource depletion) • Normalization and weighting	• Discussion 3 (10 points), Book Chapter 3 • Assignment 4: Databases – LCA Commons, openLCA, and U.S. Life Cycle Inventory Database

February 17	LCA Software and Tools • Introduction to LCA software (e.g., openLCA) • Hands-on training with LCA tools • Case studies using LCA software	• Discussion 4 (10 points), Book Chapter 4 • Assignment 5: LCI for Project 1
February 24	LCA in Building Materials • Environmental impacts of common building materials • Comparative LCA of traditional vs. sustainable materials • Case studies of material selection using LCA	• Quiz 2 (50 points) • Assignment 6: LCA with openLCA
March 3	LCA in Construction Processes • Environmental impacts of construction activities • LCA of different construction methods • Strategies for reducing construction impacts	• Discussion 5 (10 points), Book Chapter 5 • Assignment 7: Explore impacts with WARM tool
March 5	***Project 1 Final - Individual Project Presentations***	
March 10	LCA in Building Operations • Operational energy and water use • Maintenance and renovation impacts • End-of-life scenarios and deconstruction • Project 2	• Discussion 6 (10 points), Book Chapter 6 • Assignment 8: Upload building for comparative LCA and alternate building envelope options.
March 17	Spring Break	
March 24	Policy and Regulation • Government policies and regulations related to LCA • Building codes and standards • Incentives for LCA adoption	• Quiz 3 (50 points) • Discussion 7 (10 points), Book Chapter 7

March 31	Life Cycle Interpretation • Introduction • Evaluation • Sensitivity and consistency check • Interpretation	• Discussion 8 (10 points), Book Chapter 8 • Assignment 9: Upload building for comparative LCA and alternate building envelope options
April 7	Case Studies and Best Practices • Analysis of successful LCA projects • Lessons learned and best practices	• Discussion 9 (10 points), Book Chapter 9 • Assignment 10: Explore sustainability goals with Tally
April 14	• First group presentations on Project 2 • Project 2 analyses in openLCA	• Quiz 4 (50 points) • Discussion 10 (10 points), Book Chapter 10
April 21	Future Trends and Opportunities • Emerging trends in LCA • Advances in LCA methodology and tools • Opportunities for further research and development	
April 23	• Final presentations for Project 2	
April 30	• Final report upload	

The final project presentation will take place on the last day of classes. The final assignments/presentations do not serve as a final exam and final work will be submitted during exam week.

CAMPUS RESOURCES

- Health and Wellness U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: https://counseling.ufl.edu/, 392-1575 Sexual Assault Recovery Services (SARS): Student Health Care Center, 392-1161.
- University Police Department: 392-1111 (or 9-1-1 for emergencies). http://www.police.ufl.edu/ UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

- Academic Resources E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learningsupport@ufl.edu. Visit the website at https://training.it.ufl.edu/services/elearning-tools--services/
- 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. http://teachingcenter.ufl.edu/
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. http://writing.ufl.edu/writing-studio/
- On-Line Students Complaints: https://distance.ufl.edu/student-complaint-process/