DCP 4930/ EUS 4930**: Circular Economy**

Fall 2024 | **3 Credits** [Circular Product Design through Industrial Symbiosis]

Instructor: Patricia Kio, PhD, LEED GA, MNIA | Sustainability & the Built Environment
(SBE), Construction and Planning (DCP) | University of Florida.

Instructor's Office: AH 132
Instructor's Contacts: p.kio@ufl.edu
Office Hours: Tuesdays and Wednesdays (**1:00 - 3:00 pm**)
Alternative: | or by appointment (virtual & in-person)

Course Time & Location: M (12:50 – 1:40 pm) | W (12:50 – 2:45 pm) | ARC 411

Co/Prerequisite: None

General Education Credit: None

Final Exam Schedule: No final exam for this course. Final project is due on 9th December, 2024.

==IT IS IMPORTANT TO READ THIS ENTIRE SYLLABUS ON YOUR FIRST DAY OF CLASS==
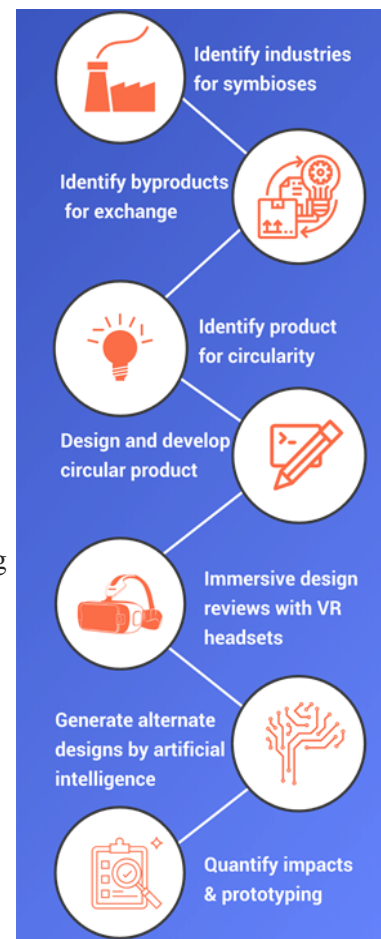
SPECIAL TOPICS' CATALOG DESCRIPTION

The linear model creates negative social and environmental externalities, including climate change, biodiversity loss, and pollution. Its alternative, the circular economy, reduces waste and pollution by emulating nature (i.e., carrying capacity and symbiosis). Circularity makes waste a resource. The circular economy is an interdisciplinary concept that cuts across natural and social science.e.

COURSE DESCRIPTION

This interdisciplinary course enables students to learn about the key principles of circular economy and how they differ from the traditional linear economy. They will also explore case studies and real-world examples of circular economy practices and strategies, and learn how circular economy can be implemented in different industries and sectors. The course includes a combination of lectures, readings, and group projects. The course is designed to encourage critical thinking and problem solving skills, as well as a deep understanding of circular economy concepts and practices.

COURSE OVERVIEW AND OBJECTIVES

The goal of the course is to understand the principles of a circular economy and carry out real world investigations towards promoting circularity. Students select byproducts and transform them into novel products that could be substituted for their traditional counterparts. Students will apply prior knowledge to course projects towards developing circular business models for sustainability. Activities comprise resource mapping, idea generation, application of circular economy principles, design, characterization and quantifying impacts of their chosen interventions.

Identify industries for symbioses

Identify byproducts for exchange

Identify product for circularity

Design and develop circular product

Immersive design reviews with VR headsets

Generate alternate designs by artificial intelligence

Quantify impacts & prototyping

STUDENT LEARNING OUTCOMES (SLO)

Upon completion of this course, the students will be able to:

A comprehensive understanding of the principles and benefits of a circular economy.

• Knowledge of different business models that promote circularity and how they can be implemented in different industries and sectors.

• An understanding of the importance of sustainable consumption and production and how it can be achieved through circular economy practices.

• Skills in designing for circularity, including the ability to identify and apply circular design principles.

• Knowledge of the role of policy and regulation in promoting the circular economy and the ability to assess and analyze the effectiveness of different policies and regulations.

• An understanding of the challenges and opportunities in transitioning to a circular economy

Assessment:

The students will be assessed through a variety of assignments and assessments, including:

• Class participation and engagement

• Individual assignments, including research papers, case study analysis, and short answer questions

• Group project, where students will be required to analyze a real-world business or industry and develop a circular economy plan for it.

REQUIRED TEXT/READING

McDonough, W., & Braungart, M. (2010). *Cradle to cradle: Remaking the way we make things*. North point press.

Recommended Readings:

❖ Nielsen, S., & Jensen, K. G. (2024). Circular Construction for Urban Development: A System. *Danish Architectural Press*

❖ Ali, A. K., Layton, A., Kio, P., & Williams, J. (2021). Matrix Trays: From waste to opportunities. *Journal of Cleaner Production*, *300*, 126813.

❖ Kio, P.N. and Anumba, C. (2024), "Circularity: a workflow for reusing waste wind turbine blades", Built Environment Project and Asset Management, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/BEPAM-07-2023-0137

❖ 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.
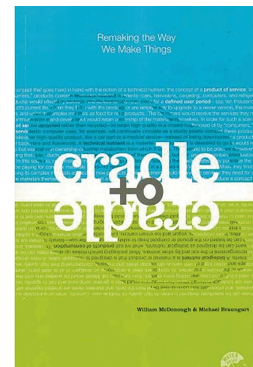
ADDITIONAL RESOURCES

❖ Ellen MacArthur Foundation > Circular Economy Introduction
https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

❖ Doughnut Economics

https://doughnuteconomics.org/
https://doughnuteconomics.org/tools/get-animated-introducing-the-seven-ways

ADDITIONAL EXPENSES

Not applicable. However, students are expected to procure and use their own mobile file storage and transfer device (e.g., USB thumb drive) or web-based service to present and share information in class.

DCP 4930/ EUS 4930 COURSE MODULES AND TOPICS*

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

Preliminary Semester Schedule (subject to modification)

Week	Dates	Lecture Topics / Questions addressed	Assessment
Week 1 *8/26- Introduction* *8/28 - Project 1*	● Overview of the course ● History and evolution of the circular economy	
Week 2 *9/2 - Holiday* *9/4*	● Key principles and benefits of the circular economy ● Product as a service | Quiz 1	Quiz 1 (25 points) Circular Economy Principles
Week 3 *9/9* *9/11*	● Closed-loop supply chains ● Sharing economy ● *Project 1 - Accessory Dwelling Units*	Reflection 1 (25 points) | Chapter 1 - A Question of Design
Week 4 *9/16* *9/18*	● Remanufacturing	Quiz 2 (25 points) Material: Supply, Demand & Properties
Week 5 *9/23* *9/25*	● Circular design (modularity, design for disassembly, etc)	Reflection 2 (25 points) Chapter 2 - Why Being "Less Bad" Is No Good
Week 6 *9/30* *10/2 (Field trip)*	● Circular design principles and strategies	Quiz 3 (25 points) Circular Product
Week 7 *10/7*	● Case studies in circular design	Reflection 3 (25 points) Chapter 3 - Eco-Effectiveness
Project 1 Final *10/9*	*Group Presentations*	
Week 8 *10/14* *10/16*	● The impact of consumer behavior on the environment ● *Project 2 - Circular Product (Building Envelopes)*	Quiz 4 (25 points)

| Week 9
10/21
10/23 | • The importance of sustainable production | Reflection 4 (25 points)
Chapter 4 - Waste Equals Food |
|---|---|---|
| Week 10|
10/28
10/30 | • Extended producer responsibility | Quiz 5 (25 points)
Innovation |
| Week 11|
11/4
11/6 | • Product standards and labeling
• Waste management policies | Reflection 5 (25 points)
Chapter 5 - Respect Diversity |
| Week 12
11/11 - Holiday
11/13 | • Economic, environmental, and social benefits of the circular economy | Quiz 6 (25 points)
Four threads (Planet/ People/ Purpose/ Prosperity) |
| Week 13
11/18
11/20 | • Challenges and barriers to adoption | Reflection 6 (25 points)
Chapter 6 - Putting Eco-Effectiveness into Practice |
| *11/25 - 11/30 (Thanksgiving Break)* | | |
| Week 14
12/2
12/4 | • Life Cycle Analysis
• System Boundaries & Functional Unit
• **Project 2** | |
| ***Finals- Project 2 Presentation and Report by 10:00 am to noon on 12/9*** | | |

Disclaimer: This syllabus represents current plans and objectives. Throughout the semester, we may need to adjust with unforeseen events and conditions. Such adjustments would be communicated clearly in class and via written announcements on Canvas.

CLASS PROJECTS

Project 1: Students will develop a product with alternate materials and compare two scenarios (novel product vs traditional) in an accessory dwelling unit.

Project 2: Students will develop a novel building envelope for a mixed use building with alternate materials while responding to the needs of the community.

The steps included in the projects are
1) Identify and map resources.
2) Identify circular products.
3) Generate ideas for novel products.
4) Design iterations for novel products.
5) Have fun reviewing design iterations with Virtual Reality.
6) Generate alternate designs using Artificial Intelligence tools.
7) Conduct Life Cycle Analysis for impacts of the novel products.

No prior knowledge of software is required. We will learn to use the following tools
• Autodesk Forma

- Veras
- Waste Reduction excel tool from the United States Environmental Protection Agency
- Climate Consultant

ATTENDANCE POLICY, CLASS EXPECTATIONS AND MAKE-UP POLICY
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

- Attendance is mandatory and participation is graded based on each class period (i.e., missing a multi-period day of class will count as multiple absences in accordance with the number of periods).

ASSIGNMENTS AND GRADING
Assignment details, deliverables, due dates, and grades are published on Canvas and may be subject to change.

Grading Category	*Points*
Attendance & Punctuality	5
Readings (individual)	15
Discussion (individual)	15
Presentation 1	25
Presentation 2	40
Total	**100**

GRADE AND GRADING POLICY

Letter grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Numeric grade	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59
Quality points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0

Final student grades will follow University of Florida grades and grading policies.

SEE CANVAS FOR ADDITIONAL COURSE INFORMATION

Additional information about the course is available on Canvas, including; instructional methods, tips for success, personal conduct policies, mobile communications and computing policies, and/or other relevant studentS.

GETTING HELP
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: http://www.counseling.ufl.edu/cwc/Default.aspx/, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

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/

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/

UNIVERSITY POLICIES

Online course evaluation/feedback

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/

Students with Disabilities:

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. Click here to get started with the Disability Resource Center. 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.

Student Honor Code and Academic Honesty

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 (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions.

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. As such, violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Religious Observances:

Please inform the instructor of any religious holidays or other days of special religious significance that may interfere with your participation in this class so that appropriate accommodations can be made.

Sexual Harassment:

Sexual harassment is reprehensible and will not be tolerated by the University. It subverts our academic mission and threatens the careers, educational experience, and well-being of students, faculty, and staff. The University will not tolerate behavior between, nor among, members of this community that creates an unacceptable working environment.

OTHER CAMPUS RESOURCES

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. http://www.crc.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/

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf/
On-Line Students Complaints: http://www.distance.ufl.edu/student-complaint-process/