Course Syllabus – DRAFT

ISEN 463 Circular Economy

Northwestern University

Course Synopsis: This class will cover the core principles of a circular economy. It will use systems thinking to understand the technological, economic and policy implications of circular economies. It will focus on real-world applications, testing the feasibility of circular systems and analyzing their design.

Course Goals: Students will develop a solid foundation in:

- **Systems Thinking and Circular Design:** This paradigm underlies much of the development of CEs and is an effective professional tool. Through this course, students will develop the necessary skills to be able to integrate a systems-based perspective in their analyses of situations. Systems Thinking will be cultivated through case studies and analysis projects.

- **Material Flows:** A basic understanding of the technological aspects of a circular economy are essential to its design. This course will impart an understanding of topics such as the biological cycle, energy flows and industrial ecology. Through the medium of case studies, it will also explore properties of common materials such as metals, rubber and plastic—focusing on the manner in which these properties can aid the integration into a circular system.

- **Business Models:** A circular economy requires new and changed business models to function. We will analyze models of financing and running a circular system. We will also look at the bigger picture, exploring how global supply chains can scale up to faster implement and accommodate circular economies.

- **Incentivizing and Measuring the Circular Economy:** Policy considerations are important to the success of a circular economy. This course will consider the practicalities of delivering a circular economy, addressing the key incentives of all stakeholders involved. It will also consider the available tools to measure the impact and circularity of such systems.

Grading/Assessment:

Grading will be based on the following rubric:

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<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
<th>Due</th>
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<tr>
<td>Quizzes</td>
<td>20%</td>
<td>Conventional in class quizzes based on the content. These will be declared beforehand and will focus on the theoretical frameworks explored in class. Questions may include definitions, analyses, etc</td>
<td>Week #4, Week #7</td>
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<tr>
<td>Case Study</td>
<td>40%</td>
<td>There will be four case studies assigned. Students will read the case materials and then submit 3-4 pages of written, individual analysis in MS Word to answer the assigned case questions (usually 2-3 questions). Topics</td>
<td>Week #3 Week #6 Week #8 Week #9</td>
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will vary but may include circular potential, design and implementation or assessment of solutions. The case will be distributed during the first class of the week to be submitted by 8am on the day of the second class that week. The second class will often be used to discuss the case.

An example case might be Karma, the Swedish food-waste management company. Case questions could include:

1. What is Karma’s business model? What are its shortcomings and what are the positive externalities it produces?
2. How does Karma account for packaging waste produced by its operations? Does this detract from Karma’s circularity? What are the negative environmental effects of Karma’s model?

| Final Presentation | 40% | Final presentations will be applications of the material covered in class—groups will have to identify an industry with potential for circular disruption, design a circular solution and consider the aspects of its implementation. The final project will be done in groups of 3-4 students. Students will be expected to deliver:

1. 10-minute Elevator Pitch of Solution (Powerpoint Presentation in Class)
2. A written, 10 page paper submitted at 8am on the morning of the last class.

Students will be assessed in the following ways:

1. Peer Ratings: Group members will rate each other’s contributions. (5%)
2. In-Class Presentation: The group will receive a team grade based on the clarity of the message and the quality of presentation (10%)
3. Written Project: The instructor will provide a grade to the group based on the assessment of the issue / opportunity for a circular solution, the quality of the recommendation/solution and the depth of implementation planning and risk assessment. Further details on expectations for the project will be shared when teams are formed (25%)

All students will be expected to be involved and engaged in presentations of others. Failure attend or show respect

**Week #10**
during the presentation of the others could result in a reduction in the team grade on the final project.

Grading Policy:
Grades will be assigned based on all the work you have completed during the semester following the traditional practice of A=90-100, B=80-89, C=70-79, D=60-69, F<60.

Course Readings:

Required readings are outlined below.

Some additional suggested readings include:

4. DG Environment Consortium. “Scoping study to identify potential circular economy actions, priority sectors, material flows & value chains”

**Websites:**

At points you may be required to watch videos, read blogs, or explore websites outside of class. Below are some interesting resources on circular economies:

- [https://www.circulardesignguide.com](https://www.circulardesignguide.com)
- [http://www.symbiosis.dk/en/](http://www.symbiosis.dk/en/)
- [https://kumu.io/ellenmacarthurfoundation/educational-resources#circular-economy-general-resources-map/key-for-general](https://kumu.io/ellenmacarthurfoundation/educational-resources#circular-economy-general-resources-map/key-for-general)
- [https://thesystemsthinker.com](https://thesystemsthinker.com)

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**CLASS OUTLINE**

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<tr>
<th>Weekly Topic</th>
<th>Description</th>
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| 1: Intro to Circular Economy, Course Logistics                              | • Introduction to course, its objectives and expectations of students  
• Measures of success: GDP vs. Human prosperity  
• What is a circular economy?  
• What is the economic rationale behind a circular economy? What are its theoretical foundations and current applications? |
| 2: Systems Thinking Paradigm                                                 | • What is systems thinking?  
• Discuss the theoretical foundations of systems-level thinking and its application to circular economy concepts  
• Importance of systems approach & key tools  
• How / where systems thinking is applied in today’s market |
| 3: Consumer Behavior and the Circular Economy                               | **QUIZ #1: Circular Economy & Systems Thinking Basics**  
• General fundamentals of consumer behavior  
• Changing consumer norms in the US & beyond  
• Key drivers of change in consumer behavior  
• Role of consumers to influence circular economy: barriers and opportunities |
| 4: Circular Design and Possible Business Models                              | • What is circular design? Where is it used today?  
• Applying systems thinking to circular design  
• Exploring possible business models in a circular economy  
• Integrating design and business models to get a more complete picture |

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### Announcement of groups for final project, review of final project objectives and output, discussion of potential topics. Select and submit topic to instructor by end of week

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<tr>
<td>● Define “flows” and outline major types of flows</td>
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<td>● Explore the circular potential of specific common materials such as plastics, cloth, rubber and metals through case studies and research papers</td>
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<td>● Review the role of waste as a resource in the circular economy</td>
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<td>● Consider impacts of flows beyond raw materials such as transportation, energy</td>
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<td>● How can various types of flows be measured and managed</td>
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**CASE STUDY #2: Flow measurement**

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<th>6: Policy Considerations</th>
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<tr>
<td><strong>QUIZ #2: Defining, calculating and managing CE Flows</strong></td>
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<tr>
<td>● Introduction to the policy considerations and incentives for circular economies</td>
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<td>● Consider the role of government, regulatory authorities and other stakeholders</td>
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<td>● Review examples of success and failure in circular economy policies</td>
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**CASE STUDY #3: Policy & Circular Economy**

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<th>7: Implementation and Measurement</th>
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<tr>
<td>● How can we transition to circular models?</td>
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<td>● Methods for implementing circular systems</td>
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<td>● Best practices &amp; learnings from case examples</td>
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<td>● Measure circularity and quantitatively assess potential for a circular system</td>
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**FINAL PROJECT OUTLINE DUE**

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<th>8: Leading Markets for Circular: Fashion &amp; Packaging</th>
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<tr>
<td>● Overview of industries &amp; their progress in circular economy</td>
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<td>● Review of fashion and plastics industries as opportunities for circular disruption</td>
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<td>● Discussion of new business models (e.g. Thred Up, Rent the Runway, TRR) and assessment of modifications in traditional components such as textiles</td>
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<tr>
<td>● Evaluate evolutionary changes in packaging / plastics</td>
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<td>● Assess more revolutionary changes in the packaging industry</td>
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<td>● Analyze the business models of these industries and use the frameworks developed in class to analyze circular potential</td>
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<th>9: Circularity Across the Globe</th>
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<td>● Assess the relative uptake of circular concepts on a global basis</td>
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<td>● Discuss role of cities in moving to circular systems</td>
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- Identify breakthrough innovations and stakeholders that are driving change
- Consider the components necessary (economic, technical, policy) required to move to a circular model
- Review the potential global impact of moving from GDP to a human prosperity model using circular economy as a tool

**10: Final Presentations**

Groups will present the 10-minute elevator pitches of their final presentations. They will field questions for 5 minutes. Grading rubric outlined above. Detailed project requirements will be shared on Week 3.

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**Source:** Ellen MacArthur Foundation, 2019