COLUMBIA UNIVERSITY
School of Professional Studies

Master of Science in Sustainability Management

SUMA PS5172 Sustainable Operations- Supply Chain Management
Scheduled Meeting Times: TBD
Number of Credits (3)
Elective

Instructor: Catarina Carvalho, aa4097@columbia.edu
Office Hours: By appointment. Please provide a 24 hours' notice to schedule an appointment.
Response Policy: Responds within 24 hours during the workweek.

Teaching Assistants: TBD
Office Hours: TBD
Response Policy: TBD

Course Overview

In an era of growing environmental and social awareness, supply chains have emerged as a powerful lever for driving sustainability in operations. Supply chain emissions are, on average, 11.4 times higher than operational emissions [(1)], making them a critical focal point for impactful change in operations. This course explores the essential role of supply chains in achieving sustainable outcomes and equips students with the tools and insights needed to transform conventional practices into innovative, responsible, and efficient systems. This course is part of a broader curriculum aimed at cultivating leaders who can integrate sustainability into the heart of business strategy. It is designed for students from diverse professional and academic backgrounds, no prior experience in operations or supply chain management is required to excel in this course.

Through this interdisciplinary journey, students will gain a robust foundation in supply chain management, learning to integrate sustainability principles across operations. The course balances analytical skills with creative problem-solving, preparing students to address real-world challenges. Upon completing this course, students will gain a comprehensive skill set to analyze, design, and implement sustainable operations solutions in their future careers. Students will gain a comprehensive understanding of the strategic role of supply chains in modern economies, including their critical impact in decarbonization efforts. Students will also learn to apply key analytical tools such as demand forecasting and risk assessment, while mastering strategies for sourcing, supplier management, and logistics optimization.

Adapted from: **The Course Syllabus: A Learning-Centered Approach, 2nd Edition,** Judith Grunert O'Brien, Barbara J. Millis, Margaret W. Cohen. ISBN: 978-0-470-60549-3. Available as an E-Book from Wiley at:
https://www.wiley.com/en-us/The+Course+Syllabus%3A+A+Learning+Centered+Approach%2C+2nd+Edition-p-9780470605493
(1)CPD "Transparency to Transformation: A Chain Reaction. CPD Global Supply Chain Report 2020"

Learning Objectives

Sustainable Operations is a broad topic, applicable to nearly all sectors and organizations both public and private. Supply chain emissions are responsible for most of all operational emissions which elevates them to one of the most impactful areas for action. This course will focus primarily on sustainable supply chains.

Key learning objectives:
L1: Explain the critical role of supply chains in modern life and demonstrate their connection to sustainability.
L2: Utilize basic forecasting methods and implement demand-influencing tools effectively.
L3: Develop and apply segmentation strategies for sourcing and supplier management.
L4: Identify the key steps for planning and controlling manufacturing production, and manage inventory across the supply chain.
L5: Evaluate trade-offs between transportation modes and apply appropriate distribution and warehousing strategies within the supply chain.
L6: Interpret and utilize industry-standard dashboards, scorecards, and key performance indicators to support sustainable supply chain practices.
L7: Conduct holistic analysis and evaluation of supply chains to identify areas for improvement and innovation.

Readings

This course has materials developed specifically to support the learning objectives of the course, that will be made available and discussed in each class. Students are expected to engage with the class materials thoroughly, as they form the foundation for assignments, discussions, and quizzes. Additional reading include:

Required:

- Bowman, B., Timmermans, K., Pollman-Larsen, M. (2022). *How supply chains embrace sustainability?* Supply Chain Brain.
- Arp, R. (2020). *Future proofing supply chains for climate resilience,* World Wide Fund for Nature
- Winston, A. (2011). *Excess inventory wastes carbon and energy, not just money*. Harvard Business Review.
- Carbon Disclosure Project, Boston Consulting Group. (2023). *Scoping Out: Tracking Nature Across the Supply Chain – Global Supply Chain Report 2022*, CDP (pages 2-9).
- Moret, B., Schwertner, A. (2020). *Why sustainable manufacturing makes economic as well as ethical sense*. World Economic Forum.
- Tinnes, E., Perez, F., Kandel, M. (2024). *Decarbonizing Logistics: Chartering the path ahead.* McKinsey
- Myerson, A.P. (2024). *Sustain the Chain with Technology*. Inbound Logistics.
- Velázquez Martinez, J.C, Cottrill, K. (2025), *Towards more accurate Scope 3 emissions accounting*, Supply Chain Management Review.
- Deloitte, Making an Impact that Matters. (2023). *Supply Chain Risk Management*. Deloitte. (pages 3-7).
- Circular Supply Chain Network. (2023). *Building a Circular Supply Chain*. Ellen MacArthur Foundation.

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Suggested:

- The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition), World Business
- Council for Sustainable Development and World Resources Institute (pages 8-17)
- Bové, A., Swartz, S. (2016). *Starting at the Source: Sustainability in Supply Chains*, McKinsey
- Deloitte, Making an Impact that Matters. (2023). *Sustainable Supply Chain Transformation,* Deloitte
- Carvalho, C. (2023). *Advancing city logistics and sustainability with urban consolidation centers*. Supply Chain Management Review
- Dull., D. (2024). Ep:148: Scaling Supply Chains in the Circular Economy, Ellen Macarthur Foundation (26 min)
- Christopher, M. (1994). *Logistics & Supply Chain Management.* Pearson Education.
- Meadows, D. (2008). *Thinking in Systems.* Chelsea Green Publishing.
- Knaflic, C. (2015). *Storytelling with Data.* Wiley.

Assignments and Assessments

This course has seven assignments. Four are individual written assignments (40% of final course grade), two are individual quiz assignments (30% of final course grade), and one is a group presentation assignment (30% of final course grade).

1: Supply chain article review (submitted on Canvas): select a recent news article related to supply chain management. Analyze and discuss the article's content, focusing on its significance in promoting sustainability within operations. Provide your perspective on why this topic matters and propose potential strategies or solutions to drive more sustainable supply chain practices. [L1]

2: Forecasting model and sourcing strategy (submitted on Canvas): apply the concepts learned in class to practice a forecasting model and analyze a sourcing strategy. [L2, L3]

3: Decarbonizing last mile logistics (submitted on Canvas): apply the concepts learned in class to evaluate various transportation modes for last-mile delivery. The goal of the assignment is to analyze options that balance business needs and customer expectations while minimizing carbon impact. [L5]

4: Midterm quiz (in class): complete a series of multiple-choice questions designed to assess your understanding of the concepts and knowledge covered in the coursework to date. [L1, L2, L3, L4]

5: Sustainable supply chain scorecard (submitted on Canvas): Create a comprehensive scorecard that incorporates sustainable supply chain metrics. The scorecard should evaluate the efficiency and resiliency of the supply chain while also measuring its impact on sustainable outcomes. [L6]

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6: Final quiz (in class): complete a series of multiple-choice questions designed to assess your understanding of the concepts and knowledge covered in the coursework to date. [L1, L2, L3, L4, L5, L6, L7]

7: Sustainable supply chain case study presentation (in class): Analyze a real-world case study of a company's supply chain. Provide well-reasoned recommendations that align with both business objectives and sustainability goals. [L7]

Grading

The final grade will be calculated as described below:

FINAL GRADING SCALE

Grade	Percentage
A+	98–100 %
A	93–97.9 %
A-	90–92.9 %
B+	87–89.9 %
B	83–86.9 %
B-	80–82.9 %
C+	77–79.9 %
C	73–76.9 %
C-	70–72.9 %
D	60–69.9 %
F	59.9% and below

The specific assignments and weights associated is as follows:

Assignment/Assessment	% Weight	Individual or Group/Team Grade
1: Supply chain article review	10%	Individual
2: Forecasting model and sourcing strategy	10%	Individual
3: Decarbonizing last mile logistics	10%	Individual
4: Midterm quiz	15%	Individual
5: Sustainable supply chain scorecard	10%	Individual
6: Final quiz	15%	Individual
7: Sustainable supply chain case study presentation	30%	Group

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Course Schedule/Course Calendar

Week	Topics and Activities	Readings (due on this day)	Assignments
1	Course introduction	Bowman, B., Timmermans, K., Pollman-Larsen, M. (2022). *How supply chains embrace sustainability?* Supply Chain Brain.	
2	Supply chain entities and flows	Arp, R. (2020). *Future proofing supply chains for climate resilience*, World Wide Fund for Nature	
3	Demand planning	Winston, A. (2011). *Excess inventory wastes carbon and energy, not just money*. Harvard Business Review.	1: Supply chain article review due
4	Sourcing	Carbon Disclosure Project, Boston Consulting Group. (2023). *Scoping Out: Tracking Nature Across the Supply Chain – Global Supply Chain Report 2022*, CDP (pages 2-9)	
5	Internal Operations	Moret, B., Schwertner, A. (2020). *Why sustainable manufacturing makes economic as well as ethical sense*. World Economic Forum.	2: Forecasting model and sourcing strategy due
6	Logistics	Tinnes, E., Perez, F., Kandel, M. (2024). *Decarbonizing Logistics: Chartering the path ahead.* McKinsey	
7	Systems and technology	Myerson, A.P. (2024). *Sustain the Chain with Technology*. Inbound Logistics.	3: Decarbonizing last mile logistics due
8	Midterm quiz	No readings.	4: Midterm quiz in class
9	Academic Holiday		
10	Monitoring and metrics	Velázquez Martinez, J.C, Cottrill, K. (2025), *Towards more accurate Scope 3 emissions accounting*, Supply Chain Management Review	
11	Risk management	Deloitte, Making an Impact that Matters. (2023). *Supply Chain Risk Management*. Deloitte. (pages 3-7)	5: Sustainable supply chain scorecard due
12	Capturing sustainable value	Circular Supply Chain Network. (2023). *Building a Circular Supply Chain*. Ellen MacArthur Foundation	
13	Course summary	No readings.	
14	Final quiz	No readings.	6: Final quiz in class

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15	Group presentations	No readings.	7: Sustainable supply chain case study due

Course Policies

Participation and Attendance
Students are expected to arrive on time and come to class prepared. The class goal is to foster lively, engaging and open discussions with the materials, which depends on everyone's participation. If you are unable to attend, please inform the Teaching Assistants and the Instructor in advance.

Late work
There will be no credit granted to any written assignment that is not submitted on the due date noted in the course syllabus without advance notice and permission from the Instructor.

Citation & Submission
All written assignments must use standard citation format (e.g., MLA, APA, Chicago), cite sources, and be submitted to the course website (not via email).

Statement Restricting Artificial Intelligence Usage
Students may use AI tools to support their learning such as exploring course concepts or conducting research, but not to complete any graded assignment or deliverable. In accordance with Columbia University's academic integrity policy, individuals must complete their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Students are responsible for verifying the accuracy of any AI-generated information.

School and University Policies and Resources

Copyright Policy
Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

> The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

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Academic Integrity
Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at https://sps.columbia.edu/students/student-support/academic-integrity-community-standards. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

Diversity Statement
It is our intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture.

Accessibility
Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: https://health.columbia.edu/content/disability-services.

Class Recordings
All or portions of the class may be recorded at the discretion of the Instructor to support your learning. At any point, the Instructor has the right to discontinue the recording if it is deemed to be obstructive to the learning process.

If the recording is posted, it is confidential and it is prohibited to share the recording outside of the class.

SPS Academic Resources
The Division of Student Affairs provides students with academic counseling and support services such as online tutoring and career coaching: https://sps.columbia.edu/students/student-support/student-support-resources.

Columbia University Information Technology
Columbia University Information Technology (CUIT) provides Columbia University students, faculty and staff with central computing and communications services. Students, faculty and staff may access University-provided and discounted software downloads.

Columbia University Library
Columbia's extensive library system ranks in the top five academic libraries in the nation, with many of its services and resources available online.

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The Writing Center
The Writing Center provides writing support to undergraduate and graduate students through one-on-one consultations and workshops. They provide support at every stage of your writing, from brainstorming to final drafts. If you would like writing support, please visit the following site to learn about services offered and steps for scheduling an appointment. This resource is open to Columbia graduate students at no additional charge. Visit http://www.college.columbia.edu/core/uwp/writing-center.

Career Design Lab
The Career Design Lab supports current students and alumni with individualized career coaching including career assessment, resume & cover letter writing, agile internship job search strategy, personal branding, interview skills, career transitions, salary negotiations, and much more. Wherever you are in your career journey, the Career Design Lab team is here to support you. Link to https://careerdesignlab.sps.columbia.edu/

Netiquette
[Only applies to courses using online platforms]

Online sessions in this course will be offered through Zoom, accessible through Canvas. A reliable Internet connection and functioning webcam and microphone are required. It is your responsibility to resolve any known technical issues prior to class. Your webcam should remain turned on for the duration of each class, and you should expect to be present the entire time. Avoid distractions and maintain professional etiquette.

Please note: Instructors may use Canvas or Zoom analytics in evaluating your online participation.

More guidance can be found at: https://jolt.merlot.org/vol6no1/mintu-wimsatt_0310.htm

Netiquette is a way of defining professionalism for collaborations and communication that take place in online environments. Here are some Student Guidelines for this class:

- Avoid using offensive language or language that is not appropriate for a professional setting.
- Do not criticize or mock someone's abilities or skills.
- Communicate in a way that is clear, accurate and easy for others to understand.
- Balance collegiality with academic honesty.
- Keep an open-mind and be willing to express your opinion.
- Reflect on your statements and how they might impact others.
- Do not hesitate to ask for feedback.
- When in doubt, always check with your instructor for clarification.

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