



AMERICAN UNIVERSITY
WASHINGTON, DC

Syllabus: Independent Study - Industrial Decarbonization (ENVS-490)

Course Information

Industrial Decarbonization Independent Study

ENVS-490-003

Credits: 3

Summer 2021

Asynchronous

Instructor Information

Instructor: Dr. Sauleh Siddiqui

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Office Hours: By appointment

Course Overview

The industrial sector is a primary driver of growing GHG emissions, they are some of the most difficult emissions to address, and mitigating them is critical to achieving a global zero-carbon energy system. This independent study will focus on deep decarbonization pathways for the emissions-intensive industrial processes of concrete, steel, and industrial-chemicals (plastics, fertilizers, etc.). The objective of the project will be to outline a specific research question, in the context of industrial decarbonization, that has yet to be addressed by the scientific community and to create a project report or deliverable that summarizes the research.

Student Learning Outcomes

- Identify the life-cycle GHG emission sources of the most energy and emissions intensive industrial process.
- Evaluate strategies and technologies that can accelerate industrial decarbonization.
- Understand the impact technological, economic, social, and political factors have on industrial decarbonization.
- Identify potential decarbonization pathways for the industrial sector.
- Explore a specific issue or topic relevant to industrial decarbonization.

Grading and Assessment

Grading Scale

Final Percent	Grade
93%-100%	A
90%-92%	A-
87%-89%	B+
83%-86%	B
80%-82%	B-
77%-79%	C+
73%-76%	C
70%-72%	C-
60%-69%	D
Under 60%	F

Final Grade Calculation

Project Proposal	10%
Project First Draft	15%
Preliminary Project	20%
Final Project	25%
Weekly Research Journals (5% each)	30%
	100% Total

Course Outline

Days	Deliverable/Topic
6/30	Project Proposal/Deliverables
7/02 (12:00 pm)	Weekly Research Journal #1
7/09 (12:00 pm)	Weekly Research Journal #2
7/16 (12:00 pm)	Weekly Research Journal #3
7/23 (12:00 pm)	Weekly Research Journal #4
7/28	Project First Draft
7/30 (12:00 pm)	Weekly Research Journal #5
8/04	Preliminary Project Deliverable

8/06	Weekly Research Journal #6
8/11	Final Project Deliverable
8/14	End of Term Grades Due

Final Project Deliverable

Working Bibliography

- Cao, Z., Masanet, E., Tiwari, A., Akolawala, S. (2021) Decarbonizing Concrete: Deep decarbonization pathways for the cement and concrete cycle in the United States, India, and China. *Industrial Sustainability Analysis Laboratory, Northwestern University*. Evanston, IL. <https://www.climateworks.org/report/decarbonizing-concrete/>
- Dell, R. (2020). Build Clean: Industrial Policy for Climate and Justice. *ClimateWorks Foundation*. <https://www.climateworks.org/report/build-clean-industrial-policy-for-climate-and-justice>
- Friedmann, S. J., Fan, Z., & Tang, K. (2019). Low-Carbon heat solutions for heavy industry: sources, options, and costs today. *Columbia Center on Global Energy Policy*, (October), 44–49. https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/LowCarbonHeat-CGEP_Report_100219-2_0.pdf
- Hasanbeigi, A., Kirshbaum, L., Collison, B., Gardiner, D. (2021) Electrifying U.S. Industry: A Technology- and Process-Based Approach to Decarbonization. *Renewable Thermal Collaborative*. <https://www.renewablethermal.org/wp-content/uploads/2018/06/Electrifying-U.S.-Industry-2.1.21-1.pdf>
- Nelson, L., Lin, J. et al. (2020) Green Hydrogen Guidebook. *Green Hydrogen Coalition*. www.ghcoalition.org/education
- Rissman, J., Bataille, C., Masanet, E., Aden, N., Morrow, W. R., Zhou, N., ... Helseth, J. (2020). Technologies and policies to decarbonize global industry: Review and assessment of mitigation drivers through 2070. *Applied Energy*, 114848. <https://doi.org/10.1016/j.apenergy.2020.114848>
- Roelofsen, O., Somers, K., Speelman, E., & Witteveen, M. (2020). Plugging in: What electrification can do for industry. *McKinsey & Company*.

<https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/plugging-in-what-electrification-can-do-for-industry>