SUSTAINABLE ENGINEERING - MASTER OF SCIENCE (MSSE)

The MS degree in sustainable engineering will equip students with the skills to impact sustainable engineering decisions. This ten-month program includes extensive coursework and an application of materials, preparing students for a range of job opportunities. In addition to the academic coursework, enrichment seminars in topics ranging from teamwork and leadership to career exploration to support our commitment to developing the "whole student" by incorporating professional development into the academic experience.

Students will cover a spectrum of topics from sustainable systems and natural processes, to design, measurement and accounting for sustainable systems with focused engineering coursework in sustainability that will help them leverage the skills to meet current and future demands for sustainability-related careers. Students should expect to gain expertise in key areas like sustainability and life cycle assessments, renewable energy, water resources, data analysis, visualization and storytelling, sustainable design and project implementation, and managing sustainable process and technology transitions. The interdisciplinary nature of the integrated core will prepare students with breadth and depth to drive innovations in sustainability and position them to be thought leaders within their organizations. The program will foster a deep connection to community needs while equipping students with the practical skills necessary to implement sustainable solutions across both public and private sectors. Additionally, graduates will be driven by a commitment to positively impact humanity through sustainable development efforts. They will be well-prepared to advocate for and contribute to sustainability initiatives at local, national, and global levels—serving as agents of positive change and progress in the field of sustainability. Finally, students will learn to work across disciplines strengthening sustainability practices that will shape and influence future initiatives.

The MS in Sustainable Engineering is a highly immersive program designed to equip students with the skills and expertise needed to drive sustainable change. To ensure all students—regardless of background—are fully equipped for the interdisciplinary coursework ahead, the program begins with up to three credit hours of specialized, intensive coursework in programming languages, statistics, and durable skills. These foundational courses will help students from both the MS in Sustainable Engineering and MS in Sustainable Business develop the necessary analytical and technical competencies to excel in the integrated program.

Requirements

Code	Title	Credit Hours
Required Courses		
ENVS 5005	Natural Processes of Sustainability Systems	2.5
ENVS 5006	Sustainability Policy and Regulations	2.5
MSBC 5710	Assessing Sustainability Performance	2.5
MSBC 5715	Leading Sustainability Transitions	2.5
CVEN 5009	Sustainability Analytics: From Data Inference to Visualization and Storytelling	2.5
CVEN 5019	Principles for the Design of Sustainable Technologies	2.5
MSBC 5790	Sustainability Capstone	3
Electives		
EVEN 5584	Sustainable Engineering Design	
EMEN 5215	Applied Sustainability for Engineering Managers	
AREN 5660	Embodied Carbon in Buildings	
AREN 5890	Sustainable Building Design	
CVEN 5909	Hazards, Resilience, and Sustainability for the Natural and Built Environments	
CVEN 5919	Global Development for Engineers	
MCEN 5299	Household Energy Systems	
CVEN 5969	Water Security, Sanitation & Hygiene	

The program does not require a culminating final examination with committee.

Plan(s) of Study

In the fall semester, students will transition into the integrated core curriculum, a collaborative and interdisciplinary learning experience developed by three partner schools: the College of Arts and Sciences; the College of Engineering and Applied Science; and the Leeds School of Business. Each college/school offers two, 2.5-credit-hour courses, totaling six courses (15 credit hours) across two 7-week terms within the 14-week fall semester. This first-of-its-kind integrated curriculum blends sustainability knowledge with business and policy, scientific processes and engineering principles. This integrated core will include integration days providing experiential learning projects, industry panels, and policy discussions tying together the more theoretical course content with practical application

In the spring semester, students will shift from the integrated core to 12 credit hours of engineering-specific sustainability courses. These courses will provide a deeper dive into renewable water and energy resources, life-cycle assessment, sustainable infrastructure design, resilience and sustainability in the natural environment, and global engineering. The program culminates in a three-credit-hour capstone project, where business and engineering students will collaborate on a real-world, project-based sustainability challenge. This hands-on experience allows students to apply and integrate their skills, preparing them to innovate, lead and drive change in sustainability-focused careers.

Year One		
Fall Semester		**Credit Hours**
Term A		
ENVS 5005	Natural Processes of Sustainability Systems	2.5
MSBC 5710	Assessing Sustainability Performance	2.5
CVEN 5009	Sustainability Analytics: From Data Inference to Visualization and Storytelling	2.5
Term B		
ENVS 5006	Sustainability Policy and Regulations	2.5
CVEN 5019	Principles for the Design of Sustainable Technologies	2.5

MSBC 5715	Leading Sustainability Transitions	2.5
	Credit Hours	**15**
Spring Semester		
Electives		12
MSBC 5790	Sustainability Capstone	3
	Credit Hours	**15**
	Total Credit Hours	**30**

Students will select four of the 3 credit-hour electives from the course list in the spring semester to satisfy program requirements.

Learning Outcomes

By the completion of the program, students will be able to:

- Apply advanced statistical inference techniques to extract meaningful insights from diverse sustainability datasets.
- Develop and implement machine learning models for predictive analytics and pattern recognition in civil engineering applications.
- Utilize GIS and remote sensing data for spatial analysis and environmental monitoring.
- Create interactive and informative data visualizations using modern visualization tools and libraries.
- Effectively communicate complex sustainability data through compelling narratives and data-driven storytelling.
- Evaluate the ethical implications of data collection, analysis, and communication in the context of sustainability.
- Critically assess the role of data in informing sustainable infrastructure development and policy decisions.
- Integrate data-driven approaches into real-world sustainability projects.
- Apply life cycle assessment (LCA) techniques to evaluate the environmental impacts of civil engineering technologies.
- Integrate circular economy principles into the design of sustainable infrastructure systems.
- Employ biomimicry and ecological engineering principles to develop nature-inspired solutions.
- Evaluate and select sustainable materials for infrastructure applications.
- Design and analyze renewable energy systems for civil engineering projects.
- Develop sustainable water resource management strategies.
- Assess the social and economic impacts of sustainable technologies.
- Apply systems-thinking approaches to address complex sustainability challenges.
- Effectively communicate the principles and benefits of sustainable technological design.
- Critically evaluate the ethical considerations associated with the development and deployment of sustainable technologies.