

SUSTAINABLE ENGINEERING PROCESS DESIGN - CERTIFICATE

The undergraduate certificate in Sustainable Process Design equips students to assess and evaluate the sustainability and circularity of processes involved in the production and utilization of energy carriers, materials, and chemical products. Students employ engineering calculations and analysis methods to quantify economic and environmental impacts of competing processes. Process modeling tools are applied to complex problems that represent grand challenges for society, such as mitigating the accumulation of plastic waste, the production of abundant clean energy, and the efficient utilization of scarce minerals. Through elective courses, students tailor their training to deepen their analysis of electrochemical, polymeric, and energy systems and with cross-disciplinary approaches to considering sustainability in existing and proposed processes.

Requirements

Certificate Requirements

Code	Title	Credit Hours
Required Courses		
CHEN 3660	Energy Fundamentals	3
CHEN 3670	Sustainable Design (Required)	3
Choose one of the following:		3
CHEN 4460	Polymer Engineering	
CHEN 4450	Polymer Chemistry	
CHEN 4480	Solar Cells and Optical Devices for Sustainable Buildings	
CHEN 4490	Electrochemical Engineering	
Choose one of the following:		3
CHEN 4450	Polymer Chemistry	
CHEN 4460	Polymer Engineering	
CHEN 4480	Solar Cells and Optical Devices for Sustainable Buildings	
CHEN 4490	Electrochemical Engineering	
CVEN 3414	Fundamentals of Environmental Engineering	
CVEN 4834/5544	Special Topics	
EVEN 3550	Sustainability Principles for Engineers	
EVEN 4494	Contaminant Fate and Transport	
EVEN 4969	Water Security, Sanitation & Hygiene	
CHEM 1011	Environmental Chemistry 1	
CHEM 1031	Environmental Chemistry 2	
CHEM 3151	Air Chemistry and Pollution	
CHEM 3251	Sustainable Energy from a Chemistry Perspective	
CHEM 4141	Environmental Water and Soil Chemistry	
CHEM 4271	Chemistry of Solar Energy	
ECEN 4555	Principles of Energy Systems and Devices	

ENVS 1001	Introduction to Human Dimensions of Environmental Studies
ENVS 3525	Intermediate Environmental Problem Analysis: Topical Cornerstones
ENVS 3555	Sustainable Economies
ENVS 3525	Intermediate Environmental Problem Analysis: Topical Cornerstones
ATOC 1060	Our Changing Environment: El Nino, Ozone, and Climate
ATOC 4800	Policy Implications of Climate Controversies
SOCY 4117	Food and Society

Total Credit Hours

12

Learning Outcomes

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

- Describe major energy sources, storage mechanisms, and transformations, articulating tradeoffs in costs and efficiency across different technologies.
- Evaluate economic and environmental impacts for competing routes to the manufacture and use of energy carriers, materials, and chemicals.
- Utilize common software tools and relevant algorithms to quantitatively assess key sustainability metrics for a process.
- Identify key technological limitations and specific opportunities for addressing modern sustainability challenges.