



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Principles of Sustainable Engineering

## CBE 5772

### Credit Hours:

3.00 - 3.00

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### Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

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### Course Components:

Lecture

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### Course Description:

Introduces the principles, techniques, and challenges of environmentally conscious decision making in chemical engineering. A study of systematic methods for the analysis and development of sustainable industrial products and processes.

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### Prerequisites and Co-requisites:

Prereq: 3508 or equivalent, Grad standing, or permission of instructor.

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### Course Goals / Objectives:

- Learn about the state of our environment and the impact of chemical engineering
  - Discuss the meaning of sustainability and the challenges in using this concept for engineering decisions
  - Learn about life cycle oriented methods including energy, exergy and emergy analysis, and life cycle assessment
  - Develop the techniques, skills and concepts for using thermodynamics for ecologically and economically conscious process design and retrofits
  - Learn about the concepts and tools of industrial ecology and the design of self-reliant industrial and ecological networks
  - Understand basic principles of macroeconomics, its underlying assumptions, and impact on the environment
  - Gain insight into the behavior of ecological and economic systems, and appreciate the similarities and relationships between them
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### **Course Topics:**

- Motivation: What do human activities depend on?; global trends; Millenium Ecosystem Assessment
  - Reason for apparent unsustainability Sustainability analysis-general principles
  - Sustainability analysis - Thermodynamics of industrial and ecological systems
  - Sustainability analysis- assessing the impact of emissions: Life cycle impact assessment ,Mid-point assessment methods ,End-point assessment methods
  - Sustainability analysis-Tools and case studies: tools, inventories(NREL, Ecoinvent, EIO), Software (SimaPro, GaBi, EIOLCA, Eco-LCA), transportation fuels, nanotechnology
  - Approaches to sustainability-integrated technological and ecological systems
  - Approaches to sustainability-economics
  - Other relevant topics, challenges, and opportunities: Uncertainty, Dynamics, Nonlinearity, Complexity; Resilience of ecological, social, economic systems; Challenges and opportunities for the future
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### **Designation:**

Elective