

Course Number: MAE 133A

Course Name: Engineering Thermodynamics

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COURSE CONTENT DESCRIPTION

- Description of specific societal impact topics or ethics issues that are addressed in the course:

The class will be assigned a design problem as a culminating assignment completed by groups of 3-4 at the end of the course. The problem involves the design of a 'microgrid' process to convert fuel from methane to hydrogen. Students will be asked to develop an exergy analysis of two designs, where the reduction of exergy destruction will be the objective (note: exergy is a metric that indicates the possible amount of useful energy that can be extracted from a process; destroyed exergy is waste that takes the form of extra pollution and unused heat.).

- Time dedicated to cover this content through lecture and other in-class learning activities:

One, 100-minute lecture in Week 10 will cover the societal considerations associated with the designs: How will produced solid carbon be handled at the local level? What are the costs of the energy produced and exergy destroyed? Students will answer such questions in short essay form at the end of the assignment. Specific questions will include:

- How does the second design option decrease exergy destruction?
- What are the technical and societal benefits, if any, of using solar heating in this design, as compared to burning methane or hydrogen for pyrolysis?
- More broadly, what are the technical and societal benefits and drawbacks of microgrids?

OUTCOMES

- Provide at least one or two course student learning outcomes aligned with the [ABET Student Outcome Criteria #4](#): **The ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.**

Outcome 1: Students will understand the engineering approaches and challenges of integrating renewable and clean energy systems into communities, including the associated benefits and complications.