1. EM485E Sustainable Energy

2. Credit Hours (3) / Contact Hours (4)

3. Course Director – Ethan Lust

4. There is no textbook for the course. Instead a variety of sources are used from government websites, reports, standards, journal articles, videos, and other online resources.

5. Specific course information
   a. This course begins with a summary of current global electricity demand and production technologies, and a description of the modern electrical grid. Next, the driving forces behind the transition to sustainable energy are considered. Current sustainable energy conversion technologies are examined in detail and demonstrated through hands-on modules. Future energy conversion technologies, including their potential timelines and impact, are also discussed. The course will conclude with modeling energy systems, illustrating how to incorporate intermittent resources like wind and solar with more conventional sources and energy storage to meet the growing global demand for electricity, sustainably.
   b. Prereq: EM317 or EM319 and EM316, EM324 or EA301.
   c. Senior engineering elective course

6. Educational objectives
   a. Define sustainability in the context of energy; to examine the motivations for transitioning to sustainable energy sources, and evaluate the advantages and disadvantages of doing so.
   b. Describe how sustainable energy systems operate, including solar, wind, geothermal, and nuclear, and to analyze their performance.
   c. Describe energy storage technologies and analyze their performance.
   d. Develop transient models of energy systems based on meteorological data and system power demand to determine required generation and storage capacity.
   e. Review next-generation and future-generation energy conversion technologies and consider their potential impact on the transition to a sustainable energy infrastructure.

7. Specific program outcomes addressed by this course

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Reinforced							
Mastered	X			X			

8. Brief list of topics to be covered
   a. Module 1: Understanding Power Consumption (Demand)
   b. Module 2: Understanding Conventional Power Production (Generation)
   c. Module 3: Understanding the U.S. Bulk Electricity System
   d. Module 4: Understanding the Problem
   e. Module 5: Understanding Solar Power
   f. Module 6: Understanding Wind Power
   g. Module 7: Understanding Other Sources of Sustainable Power
   h. Module 8: Understanding Energy Storage
   i. Module 9: Special Topics in Sustainable Energy
   j. Module 10: Understanding the Solution(s)