Energy Conversion
EML 4450 (Section CAMP)
MWF 9th Period (4:05 pm – 4:55 pm)
NEB 201
Spring 2026

Instructor:
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Office Hours: WF 7th period or by appointment.

Teaching Assistants:
Aayushma Aashu, email: Aayushma.aashu@ufl.edu, Office Location: TBD, Office Hour: TBD.

Course Description: This course provides fundamentals of thermodynamics, chemistry, and transport physics applied to energy conversion systems. Analysis of energy conversion and storage in thermal, mechanical, nuclear, and chemical processes in power systems, with emphasis on efficiency, performance and environmental impact. Topics include fossil and nuclear power systems, solar energy, wind energy, biomass energy, and CO_2 separation and capture.

Catalog Description: Credits: 3; Introduction to principles, theories and processes of devices and systems that convert thermal, chemical, nuclear, electromagnetic, and wind energy to electrical, mechanical and alternative chemical form. Energy conversion performance characteristics and sources of inefficiencies are explored for a variety of applications that include conventional fossil energy combustion-based systems, nuclear, solar, wind, and biomass systems.

Course Pre-requisites and Co-requisites*: Engineering Thermodynamics (EML3100), Fluid Dynamics (EGN3353C) and Heat Transfer (EML4140).*

Course Objectives: The purpose of this course is to critically examine the technology of energy systems that will be acceptable in a world faced with global warming, local pollution, and declining supplies of oil. The focus is on renewable energy resources (wind, solar, biomass), but other non-carbon emitting sources (nuclear) and reduced carbon sources (co-generative gas turbine plants) are also studied. Both the devices and the overall systems are analyzed.

Materials and Supply Fees: None

Relationship to Program Outcome (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	Low
4. An 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	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Not covered
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Not covered
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

Required Textbooks and Software:

Energy Systems Engineering, F.M. Vanek, L.D. Albright, and Largus Angenent, **Second Edition**, McGraw-Hill, Inc., 2012, ISBN: 9780071787789

Recommended materials:

1. Energy Conversion, Edited by D.Y. Goswami and F. Kreith, CRC Press, 2008.

Required Computer:

None

Course Outline and Schedule:

Unit	Topics
#1 Weeks 1-2	Outline of the course. Introduction and scope of energy conversion. World Energy Production and Balance. Motivations for studying future energy systems (e.g. pollution, climate change, energy security).
#2 Weeks 3-5	Fossil Energy: Overview of fossil fuel resources and energy contents. Cycle analysis (Rankine, Brayton, combined cycles, cogeneration).
#3 Weeks 5-7	Nuclear Energy: nuclear reaction and energy conversion physics (fission and fusion), nuclear power systems.
#4 Weeks 7-9	Solar-thermal energy: solar thermal radiation physics, Active and passive solar-thermal energy collection and conversion systems.
#5 Weeks 10-12	Solar photoelectric energy: Photoelectric physics. Solar photovoltaic cell materials and technology.
#6 Weeks 13-14	Wind Energy: Wind interaction with objects fluid dynamics. Wind harvesting devices and systems.

Important Dates:

Mid-Term Exam: March 11, Wednesday, 4-7 pm in NEB 201.
Final Exam: April 30, Thursday, 5:30-8:30 pm in NEB 201.

Evaluation of Grades:

Homework	30%
Mid-Term Exam	35%
Final Exam	35%

Grading Policy (department and college standard, used as a reference):

Percent	Grade	Grade Points
93.4 - 100	**A**	**4.00**
90.0 - 93.3	**A-**	**3.67**
86.7 - 89.9	**B+**	**3.33**
83.4 - 86.6	**B**	**3.00**
80.0 - 83.3	**B-**	**2.67**
76.7 - 79.9	**C+**	**2.33**
73.4 - 76.6	**C**	**2.00**
70.0 - 73.3	**C-**	**1.67**
66.7 - 69.9	**D+**	**1.33**
63.4 - 66.6	**D**	**1.00**
60.0 - 63.3	**D-**	**0.67**

0 - 59.9	E	0.00

Attendance, Class Polices, and Expectations:
Attending classes regularly is strongly encouraged. Student performance is always strongly associated with class attendance. **Re-grading Policy:** Any re-grade requests must be submitted in writing within two weeks after return of the graded paper. The written request must explain in detail what you want the grader to do and where you believe a mistake in grading was made. These requests will be accepted by Dr. Chung only. The request must have a date on the top of the page, your name, your telephone number(s), and e-mail address. **Policy on Homework Assignments:** Homework problem sets will be assigned during the semester with due dates indicated. All students turn in scanned copies on CANVAS. Submission window will be set up for each HW set three days before due date. Late homework is not accepted without a legitimate reason. Homework handed in after solutions are posted will not be accepted. **Miscellaneous Policies:** Students will be held responsible for knowledge of all scheduling and policy announcements made **in class**. You may contact Dr. Chung or send him an e-mail 24 hours a day, 7 days a week. Please make sure you leave a phone number if you call and can't find him. If you send an e-mail, please also list a phone number where you could be reached. Sending a text message or an e-mail along with the voice message can also help alert him to your request.

Make-up Exam Policy: There will be no make-up exams. Unless there is a **documentable extreme medical or family emergency**, you must contact the instructor prior to the exam, or no credit will be given for a missed exam. It is the student's responsibility to make sure he/she is available to take the exam.

Academic Policies & Resources:
https://go.ufl.edu/syllabuspolicies.

Commitment to a Positive Learning Environment:
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:
• Your academic advisor or Undergraduate Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu