Energy Conversion, Spring 2024
EML 6451 (Sections 1FE2, 2FED, CAMP)
9th Period (4:05 pm – 4:55 pm) in NEB 201, MWF

1. 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, fuel cell, and biomass systems.

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

3. 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, chemical, and electrochemical 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, fuel cell systems, and CO_2 separation and capture.

4. 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 sources (wind, solar, biomass), but other non-carbon emitting sources (nuclear) and reduced carbon sources (co-generative gas turbine plants, fuel cells) are also studied. Both the devices and the overall systems are analyzed.

5. Course Outcomes:

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	Medium

consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
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

6. Instructor: Dr. J. N. Chung, Professor
Department of Mechanical and Aerospace Engineering
332 MAE Bldg. B, P.O. Box 116300
Gainesville, FL 32611-6300
Tel (352) 392-9607/Fax (352) 392-1071, e-mail : jnchung@ufl.edu
Office Hours: MW 2-3 pm

7. Teaching Assistants: Jimmy Almacddissi,
jimmyalmacddissi@ufl.edu, PERC 121, 2-3 pm Tu, Th

8. Meeting Times: MWF 4:05 pm – 4:55 pm (9th Period)

9. Lecture Video: Available on Canvas

10. Class Homepage: On Canvas

11. Material and Supply Fees: None

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

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

14. 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. Fuel Cell : Introduction and Fundamentals of Fuel Cell Energy Conversion.
Weeks 13-14	Wind Energy: Wind interaction with objects fluid dynamics. Wind harvesting devices and systems.
#7 Week 15	Biomass and Waste to Energy : Potential and resources of biomass and waste energy. Thermal-chemical and bio-chemical conversion methods.
#8 Week 15	Overview of Climate Control, CO_2 Sequestration and Energy Sustainability.

15. Exam Schedule

Mid-Term Exam : March 6, Wednesday, 3-6 pm.
Final Exam : April 29, Monday, 3 pm – 5 pm.
Exam window for Edge students : One day ahead and one day after the on-campus exam. Or by special arrangement.

16. In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format

or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

17. Attendance and Expectations:
Attending classes regularly is strongly encouraged. **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. You may not turn homework assignments in early. 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 an e-mail along with the voice message can also help alert him to your request.

18. 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.

19. Grading:

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

20. Grading Scale (department 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

21. Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

22. **Course Evaluation**
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

23. University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

24. Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu

•Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

25. Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

26. Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

27. Campus Resources

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

COVID-19
- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.

- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://care.dso.ufl.edu.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.