

Energy Conversion, Spring 2021
EML 6451 (Sections 1FE2, 2FED, CAMP, HYBR)
9th Period (4:05 pm – 4:55 pm) MWF

1. Catalog Description: Credits: 3; Introduction to principles, theories and processes of devices and systems that convert thermal, chemical, nuclear, and electromagnetic 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 CO₂ 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: Monday and Wednesday 9th period.

7. Teaching Assistants: Jinze Yu, MAE-B 331, 352-392-4617

e-mail : yu.jinze@ufl.edu
Office Hours : Tuesday and Thursday, 8th period.

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

9. Meeting Location: On-Line except for the EML6451 HYBR section. The HYBR section requires an in-person requirement of at least 1% which is equivalent to one class period.

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:

Unit	Topics
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#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	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 3, Wednesday, 3-5 pm.

Final Exam : April 27, Tuesday, 5:30 pm – 7:30 pm.

Exam window for Edge students : One day ahead and one day after the on-campus exam. Or by special arrangement.

16. Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

17. Attendance and Expectations:

Due to the on-line instruction mode, students are reminded to watch the lectures on video tapes regularly according to the posted schedule. **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/>.

Academic Resources

E-learning technical support, 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>.