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CHE 724-851: Sustainable Energy

Xianqin Wang

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CHE 724: Sustainable Energy
On-line Course
Fall 2019

Course Time/Location:

Instructor: Xianqin Wang

Lecture Materials will be uploaded to NJIT Moodle.

<https://njit2.mrooms.net/mod/forum/view.php?id=8817>

Office Hours: You can ask questions by email (xianqin@njit.edu) or Skype ([xianqin@njit.edu](https://www.skype.com/join/31222222222222222222)) or through Moodle anytime. I will try to answer all your questions by every Friday evening if I can not respond you right away due to other activities.

Prerequisite(s):

Required Materials: The materials covered are mainly from recent papers, government policies, and the following text books:

1. Tester, J. W., E. M. Drake, M. W. Golay, M. J. Driscoll, and W. A. Peters. *Sustainable Energy: Choosing Among Options*. Cambridge, MA: MIT Press, 2005. ISBN: 9780262201537.
2. [Fundamentals of Renewable Energy Processes, Second Edition](#) by Aldo V. da Rosa (Hardcover - April 15, 2009) (recommend, but not mandatory)
3. [Godfrey Boyle](#), et.al. *Renewable energy*, 2ed, 2004, 0199261784, Oxford

Computer Usage/Accessibility:

Latest versions of Matlab or other math software, MS Office, Adobe Reader (all can be downloaded from NJIT IST webpage). Student Mall labs and ChE department PC lab have most of the software. Please see Highlander Pipeline for Matlab tutorial and example programs.

Course Description: The top five issues we are facing now and in the future 50 years are: energy, water, environment, food and health. Among these, energy is the NUMBER ONE issue due to diminishing availability of fossil fuel and the environmental impact from the use of fossil fuels. Therefore, it is critical to develop or produce energy from sustainable resources. The main goals of this course are to gain an understanding of the cost-benefit ratio of various alternative energy sources and to understand some of the various obstacles associated with actual implementation of production line in sustainable energy facilities. Different renewable and conventional energy technologies will be discussed in the class. Materials include biomass energy, fossil fuels, geothermal energy, nuclear power, wind power, solar energy, hydrogen fuel, and fuel cells.

This course is intended for MS and PhD students. It will benefit students who intend to seek employment in companies involved in supplying energy services to households, firms, and other customers. It will also benefit students who may work for firms in energy-intensive or energy-related industries, including transportation companies, vehicle manufacturers, and suppliers to producers of oil, gas, and electricity. More broadly, students interested in questions of international political economy and in the economics of strategic competition will benefit from the course.

Course Outcomes (CO): By the end of the course students should be able to:

1. Explain energy principles and their sustainability.
2. Describe the technology, environmental impact and safety of each sustainable resource.
3. Explain economic and political issues around sustainable energy sources.
4. Evaluate, compare and select energy systems based on economic and environmental considerations.
5. Evaluate and compare energy efficiency for each different type of energy resources.

Assignments:

Homework:

Each HW work assignment is in the final slide from each lecture.

Group Project:

Each group will design a creative system or unit using renewable energy for daily life or for the industry. The project should include a description of the design (draw pictures if necessary) (**written report**), and be presented to the whole class via **Skype (presentation)**. **The files must to be sent to the instructor one day before the presentation.**

Written report: 15-20 page technical paper on approved topic with overview, presentation of present status and issues, analysis of sustainability options for the future, and references. All pages must be formatted to fit on 8-1/2 by 11 inch paper with no smaller than 12 point font and margins not less than one inch on every side.

Oral presentation: 25 minute formal oral presentation of the topic selected for the term paper plus 5 minutes of Q&A. **The files must be sent to the instructor one day before the presentation.**

Grading:

Homework: 30% (300 pts) (individual effort)

Group design project: (group effort)

 Written report: 20% (200 pts)

 Oral presentation: 20% (200 pts)

Final exam (take home): 30% (300 pts) (individual effort)

Letter grades will be awarded for the following totals:

A	900 - 1000 pts
B+	825 - 899 "
B	750 - 824 "
C+	700 - 749 "
C	650 - 699 "
F	less than 650 "

NJIT HONOR CODE: The NJIT honor code is being upheld on all issues related to the course. Students are expected to be familiar with the code and conduct themselves accordingly.

Group activities policy: Each student will be asked at the end of the semester to confidentially rate his/her performance/effort as well as that of all his/her groupmates. This rating will reflect the performance when the members were actually present. Attached is the evaluation form. The completed evaluation form has to be submitted either as a hard copy in a sealed envelope or as a word-file attached to an e-mail to the instructor. Evaluation forms (attached in the end) are due on **reading day. Submissions of forms after the due date but before the final exam will result in a 75% reduction of credit that the student would have received if the form was submitted timely.**

Tentative Course Schedule

		Tentative discussion topics	HW assignment	HW due date
1	9/2/2019	Introduce yourself	Bonus HW	9/9/2019
2	9/9/2019	Sustainable Energy Introduction	(HW#1)	9/16/2019
3	9/16/2019	Future Fossil Fuels	(HW#2)	9/23/2019
4	9/23/2019	Carbon Management Techniques	(HW#3)	9/30/2019
5	9/30/2019	Hydrogen Energy and Fuel cells	(HW#4)	10/7/2019
6	10/7/2019	Biomass, Biofuel	(HW#5)	10/14/2019
7	10/14/2019	Solar Energy	(HW#6)	10/21/2019
8	10/21/2019	Nuclear energy	(HW#7)	10/28/2019
9	10/28/2019	Nuclear energy	(HW#8)	11/4/2019
10	11/4/2019	Hydropower and Wind	(HW#9)	11/11/2019
11	11/11/2019	Geothermal Energy and Ocean Energy	(HW#10)	11/18/2019
12	11/18/2019	Catalysis in Sustainable energy	Bonus HW	11/25/2019
13	11/25/2019	Thanksgiving, no discussion		
14	12/2/2019	Group Presentations (Skype)		
15	12/9/2019	Final Exam (take home)	group report due	
16	12/16/2019	Final exam due		
	12/22/2019	Final grade due		

Student Resources:

[Academic Advising Success Center](#)

“...assist in the advisement of students who are undecided in their major, transitioning into another major at NJIT, and those students who need additional support to graduate successfully and in a timely manner.”

[Academic Integrity](#)

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted.

[Academic Support and Student Affairs](#)

“From questions about becoming a student at NJIT – to student engagement – to searching for information on career development, the Division of Academic Support and Student Affairs Staff is here to help.”

[Additional Tutoring Centers](#)

[Math Learning Center](#); [Chemistry Learning Center](#); [The Writing Center](#); [ECE Study Groups](#)

[Bookstore](#)

“Show your New Jersey Institute Of Technology pride all year long with our authentic assortment of New Jersey Institute Of Technology collegiate apparel...Plus, our selection of [textbooks](#), [computers](#), and [supplies](#) will ensure every New Jersey Institute Of Technology student is prepared for success.”

[Center for Counseling and Psychological Services](#)

“The NJIT Center for Counseling and Psychological Services (C-CAPS) is committed to assisting students in the achievement of their academic goals as well as benefiting from their personal experience on campus. College life can be personally challenging and stressful at times. We believe that the educational process is an important component of the development of the individual as a whole person. Our goal is to optimize the college experience and improve the quality of the lives of our students by promoting their mental health and facilitating students' personal, academic and professional growth.”

[Disability Support Services](#)

“The Disability Support Services office works in partnership with administrators, faculty and staff to provide reasonable accommodations and support services for students with disabilities that have provided our office with documentation to receive services.”

[IST Service Desk](#)

“The IST Service Desk is the central hub for computing information and first point of contact for getting help and reporting issues related to computing technology at NJIT.

There is much technology here at NJIT, and many ways to find information or get help with it.”

[The Learning Center](#)

“Our mission is to assist students both in the classroom and beyond by providing tutorial services, academic coaching, academic and personal enrichment workshops and staff and peer support so students can meet the demands of their coursework and are prepared for life after graduation.”

[Moodle Help Page](#)

Tutorials for students.

[Robert W. Van Houten Library](#)

“The Van Houten Library offers electronic and print resources essential to the mission of New Jersey's science and technology university, including a core collection of academic books, databases, and journals, as well as research and consultation services.”

[Student Financial Aid Services](#)

“Student Financial Aid Services (SFAS) at NJIT is committed to providing you with every opportunity to obtain funding to support your undergraduate educational costs at NJIT.”

ChE 724 Sustainable Energy

Self and Peer Rating of Project Team Members

Name _____

Group # _____

Please write the names of all of your team members, **INCLUDING YOURSELF**, and rate the degree to which each member fulfilled his/her responsibilities in completing the project assignment. The possible ratings are as follows:

- | | |
|-----------------------|--|
| Excellent | Consistently went above and beyond (tutored teammates, carried more than his/her fair share of the load) |
| Very good | Consistently did what he/she was supposed to do, very well prepared and cooperative |
| Satisfactory | Usually did what he/she was supposed to do, acceptably prepared and cooperative |
| Ordinary | Often did what he/she was supposed to do, minimally prepared and cooperative |
| Marginal | Sometimes failed to show up or complete assignments, rarely prepared |
| Deficient | Often failed to show up or complete assignments, rarely prepared |
| Unsatisfactory | Consistently failed to show up or complete assignments, unprepared |
| Superficial | Practically no participation |
| No show | No participation at all |

*These ratings should reflect each individual's level of participation, effort, and sense of responsibility, **NOT** his or her academic ability.*

NAME OF TEAM MEMBER

RATING

Your signature: _____