

**University of Southern California**  
Viterbi School of Engineering

<b>Course Number &amp; Title:</b>	AME577/EE626: Survey of Energy and Power for a Sustainable Future
<b>Units:</b>	4
<b>Semester:</b>	Spring
<b>Schedule:</b>	Class: M, W 12:00-1:50 pm
<b>Location:</b>	OHE 100C and DEN
<b>Instructor:</b>	Wei Wu
<b>Office:</b>	PHE 632
<b>Office Hours:</b>	T 4-5 pm
<b>Contact Information:</b>	<a href="mailto:wu.w@usc.edu">wu.w@usc.edu</a> , 213-740-3085
<b>Teaching Assistant:</b>	Sushmit Hossain, <a href="mailto:hossains@usc.edu">hossains@usc.edu</a>

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**Catalog Description:**

Power production includes conventional fossil fuels, synthetic fuels, hydroelectric, tidal, solar, wind, geothermal, biomass, and nuclear. The environmental consequences of various energy sources are discussed.

**Course Description:**

Providing Energy for the world to use in a sustainable fashion is a major challenge for humanity. Energy is also an essential scientific topic studied intensively for over a few thousand years. Therefore, this survey class will start with fundamental sciences relating to energy and power issues and then study the technologies relating to energy/power production, transmission, and storage. Moreover, the externalities of those technologies will be discussed, too.

**Learning Objectives:**

By the end of the course, the student will be able to:

- 1) Build the scientific foundations needed to understand energy- and power-related technologies.

- 2) Know the landscape of state-of-the-art energy/power generation, transmission and storage technologies.
- 3) Apply the fundamental sciences behind the above technologies to sample problems reflecting real-world implementation.
- 4) Apply the fundamental sciences behind the above technologies to investigate the impacts of those technologies on the sustainability of humanity.
- 5) Acquire basic knowledge to start sustainable energy-related research.

**Prerequisite:** Graduate standing in Engineering, Physics, or Chemistry

**Required Main Textbook:**

“Energy of Physics”, by Robert L. Jaffe and Washington Taylor, Publisher: Cambridge University Press; 1st edition (January 25, 2018), 894 pages, ISBN-13: 978-1107016651

**Supplementary Texts:** Handout slides and reading assignments are provided in class.

**Readings:** All lecture notes will be available on DEN.

**Grading:**

Homework	10%
Presentation	20%
Midterm Exam	30%
Final exam	40%

**Weekly Schedule**

Week	Subject	Readings	HW
1	Introduction and overview	Chapters 1, 5	
2	Thermal dynamics laws, state functions, and thermal engines	Chapter 6,8,9,10	W: HW 1 Assign
3	Energy conversion, internal combustion engine, steam turbine, gas turbine	Chapter 11,12,13	W: HW 1 Due
4	Nuclear power introduction, structure, properties, and decay of nuclei	Chapter 16, 17	M: HW 2 Assign
5	Fission and fusion, nuclear power plant, nuclear power externalities	Chapter 18, 19	M: HW 2 Due W: HW 3 Assign
6	Solar energy fundamentals, solar thermal	Chapters 20, 21, 22, 23, 24	W: HW 3 Due
7	Photovoltaic, biological Energy, biomass, biofuel	Chapter 25	M: HW 4 Assign
8	Ocean energy flow, Wind resources	Chapters 26, 27, 28	M: HW 4 Due
9	<b>Midterm Exam:</b> basic fluid dynamics	Chapter 29	
10	Wind turbines, hydro, wave, tidal, and marine current	Chapter 30, 31	M: HW 5 Assign
11	Geothermal energy, fossil Fuels	Chapter 32, 33	M: HW 5 Due, HW 6 Assign
12	Energy and climate, earth’s climate: past, present, and future	Chapter 34,35	M: HW 6 Due W: HW 7 Assign
13	Energy efficiency and conservation, storage	Chapter 36,37	W: HW 7 Due
14	Electricity generation and transmission, smart grid	Chapter 38	W: HW 8 Assign
15	Student presentations		HW 8 Due

**Final exam:** Refer to the final exam schedule in the USC Schedule of Classes at <http://www.usc.edu/soc>

**Homework**

Some homework questions are from the textbook, and some homework questions (mainly something to think about) are from the instructor.

**Final presentation:**

Every two students form a team to perform literature research on a topic relating to power and energy. The topic is selected by each team based on their interest. At the end of the semester, each team gives a 10-minute presentation to report their literature research to the class. All presentations are graded by other students.

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

### Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](http://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

### Support Systems:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](http://studenthealth.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call*

[suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call*

[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086*

[eeotix.usc.edu](http://eeotix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*

[usc-advocate.symplcity.com/care\\_report](http://usc-advocate.symplcity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

*The Office of Student Accessibility Services (OSAS) - (213) 740-0776*

[osas.usc.edu](http://osas.usc.edu)

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

*USC Campus Support and Intervention - (213) 821-4710*

[campussupport.usc.edu](http://campussupport.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity, Equity and Inclusion - (213) 740-2101*

[diversity.usc.edu](http://diversity.usc.edu)

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu)

Non-emergency assistance or information.

*Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)*

[ombuds.usc.edu](http://ombuds.usc.edu)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

*Occupational Therapy Faculty Practice - (323) 442-3340 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)*

[chan.usc.edu/otfp](http://chan.usc.edu/otfp)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.