

Theme: Energy & Climate

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The course consists of fourteen lectures given alternately by the two instructors and complemented with several TED-like presentations by guest scientists from Stony Brook University and Brookhaven National Laboratory.

Class hours: Thursdays, 4:00 pm to 4:55 pm in **Frey 211**

The lectures will be broadcast live via Zoom to students at the Monterrey Institute of Technology in Mexico.

First day of class: August 30

Last day of class: December 6

No class on November 23

Office hours: Thursdays, 2:45 pm to 3:45 pm, or by appointment

Course Objectives

- Learn about the connections among multiple branches of science and of these with social sciences (economics, sociology and policy), using Energy and Climate as a paradigmatic topic.
- Understand the science behind the energy challenge and climate change
- Enhance written communication skills

Students' Work

- Pre-lecture readings/videos
- Weekly problem assignments
- Periodic reading and writing assignments

Course Grading

70 % problem sets

30% written assignments

Attendance

Mandatory. A full letter grade lowered for every three lectures missed.

Resources

Introductory Physics. Any college-level textbook can do it.

An Inconvenient Truth, Al Gore, Rodale, New York, 2006

Hot, Flat, and Crowded, Thomas L. Friedman, Farrar, Straus and Giroux, New York, 2008

Sustainable Energy – without the hot air, David JC MacKay, UIT, Cambridge, 2009

Available free online at <http://www.withouthotair.com/download.html>

Beyond Smoke and Mirrors, Burton Richter, Cambridge U. Press, 2010

The Quest, Daniel Yergin, Penguin, New York, 2011

Energy for Future Presidents, Richard Muller, W. W. Norton, New York, 2012

Energy Information Administration – *National data center for energy*

Online at <https://www.eia.gov/>

International Energy Agency – *world energy statistics*

Online at <http://iea.org>

New York State Independent System Operator (*NYISO*) – *NY electric system and market*

Online at <http://www.nyiso.com/public/index.jsp>

Intergovernmental Panel on Climate Change (*IPCC*) – *Periodic reports*

Online at <http://www.ipcc.ch>

Articles from scientific journals (e.g., Science, Nature), magazines (e.g., from The New Yorker, The Atlantic) and newspapers (e.g., New York Times, Washington Post) on Energy or Climate

Energy and Climate

Syllabus

- A. Introduction: the Present
 - 1. Energy and energy consumption
 - 2. Climate and factors that affect it. The greenhouse effect
- B. Evolutionary Changes
 - 1. Better transportation. Efficiency and thermodynamics
 - 2. Better fossil fuels and more efficient processes. Catalysis
 - 3. Better heating and better gadgets. Heat transfer
- C. Drastic Changes
 - 1. Solar energy. The photoelectric effect
 - 2. Nuclear energy. Nuclear physics
 - 3. Other renewable sources: wind, biofuels, hydro-electric, etc
- D. Roadblocks
 - 1. Energy storage. Batteries and capacitors
 - 2. Energy transmission. Superconductivity
- E. Other Elements in the Equation
 - 1. The economics of Energy
 - 2. Energy & Climate Policy

| Lecture | Date | Topic | Lecturer |
|---------|----------|--|----------|
| 1 | Aug. 30 | <i>Energy and energy consumption</i> | Mendez |
| 2 | Sept. 6 | <i>Climate and factors affecting it</i> | Mendez |
| 3 | Sept. 13 | <i>Better transportation</i> | Misewich |
| 4 | Sept. 20 | <i>Better fossil fuels/catalysis</i> | Misewich |
| 5 | Sept. 27 | <i>Better heating and better gadgets</i> | Mendez |
| 6 | Oct. 4 | <i>Solar energy 1</i> | Misewich |
| 7 | Oct. 11 | <i>Solar energy 2</i> | Misewich |
| 8 | Oct. 18 | <i>Other renewable energy sources</i> | Mendez |
| 9 | Oct. 25 | <i>Nuclear energy 1</i> | Mendez |
| 10 | Nov. 1 | <i>Nuclear energy 2</i> | Mendez |
| 11 | Nov. 8 | <i>Energy and climate policy</i> | Misewich |
| 12 | Nov. 15 | <i>The economics of energy</i> | Mendez |
| 13 | Nov. 29 | <i>Energy transmission</i> | Misewich |
| 14 | Dec. 6 | <i>Energy storage</i> | Misewich |

