

GEOS 5308 Sustainable Energy
Spring 2026
MW 11:30 AM-12:45 PM
Instructor: Professor Robert J. Stern (remote)
TA: Clinton Crowley (ROC 1.201)
Mode: on-line **except for exams** (in-person, on campus in ROC 2.103)
Credit Hours: 3

Microsoft Teams meeting link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZmVlZmE0OTYtZjgzNC00YzEwLTgyMWMtODY2ZTNiYTg0NDYy%40thread.v2/0?context=%7b%22Tid%22%3a%228d281d1d-9c4d-4bf7-b16e-032d15de9f6c%22%2c%22Oid%22%3a%228078e4d8-9f28-4446-83d5-2bd0c96706e0%22%7d

If Teams meeting does not open directly from this link, copy the link text and paste it into a browser (Firefox, Safari, etc.).

Lectures are on Microsoft TEAMS: Your camera must be on and your face visible or you will be counted as absent.



GEOS 5308 Sustainable Energy (3 hrs): Ensuring sustainable supplies of energy for the future will require a mix of fossil fuels and increasing amounts of renewable energy. This course is an introduction to sustainable energy and will cover economics of energy generation and conservation, energy systems analysis methodologies; electricity use and efficiency in buildings and industry; electricity supply systems; fossil fuels; wind energy; fundamentals of solar radiation; photovoltaics; solar thermal collectors and systems; ocean, hydropower, and geothermal energy; storage technologies; and transportation. No prerequisites.

Required textbook:

“Principles of Sustainable Energy Systems, 3rd edition” by Charles F. Kutscher, Jana B. Milford, and Frank Kreith. ISBN 978-1-487-8892-2. This is a high-level book, written for engineers. **I do not expect you to master the material covered but I do expect you to read the book. I follow the book in my lectures. All test questions come from the book.**

Suggested reading:

Maury Klein 2008 “The Power Makers: Steam, Electricity and the Men who made Modern America” Bloomsbury Press, 543p.

Vaclav Smil 2022 “How the World Really Works: The Science Behind How We Got Here and Where We’re Going” This book explains seven of the most fundamental realities governing our survival and prosperity. From energy and food production, through our material world and its globalization, to risks, our environment and its future Viking Press, 326 p.

Vaclav Smil 2017 “Energy and Civilization”

A comprehensive account of how energy has shaped society throughout history, from pre-agricultural foraging societies through today’s fossil fuel driven civilization. MIT Press, 552 p.

Grade will be based on best 3 of 4 multiple-choice exams (3 midterms and 1 final) and class project. Low test score will be dropped or one test may be missed.

Grading:

25% for each of 3 exams. (2 midterms, 1 final), questions are from the book and supplementary lectures and especially study guides posted on e-learning.

5% for 1 paragraph proposal for presentation (due Oct. 20)

15 % for oral presentation

5% for class participation

EXTRA CREDIT:

2 points extra credit is offered for UTD students who complete the on-line course evaluation.

- **INFO ABOUT PRESENTATIONS:** Oral presentation will be one talk given on some problem in Sustainable Energy. You will identify a problem and submit a short (few sentences) written proposal on March 11. After approval by professor, you will present this to the class on Dec. 8. **Each presentation must consist of a total of exactly 8 powerpoint slides. *The other 6 slides must be made by the student and each must contain one and only figure.*** Figures do not need to be computer-generated, they can be sketched or traced but they **must** be generated by the student; points will be taken off if any figures are not made by student presenter. The total presentation can take no more than 10 minutes plus 5 minutes for questions.
- **INFO ABOUT EXAMS:** Exams are multiple choice, questions are from the book. Powerpoints will be posted on e-learning. Video recordings will also be posted on Youtube. Exams will be handed back and gone over in class but no recordings are allowed. All exams must be returned. Anyone not returning their exam will receive a zero for that test.

★★★ Tests are in-person, on campus, in ROC 2.103! ★★★

You may want to join Facebook group “Sustainable Energy”. I set this group up and post things there from time to time.

Syllabus (following Kutsher et al.):

W Jan. 21: Course Introduction (syllabus review) and Introduction to Sustainable Energy (Ch 1, 55 p) 110 slides

M Jan. 26: Introduction to Sustainable Energy (cont’d.)

W Jan. 28: Intro to Sustainable Energy (cont'd.) Economics of Energy Generation and Conservation (Ch. 2, 22p) 22 slides

M Feb 2: Energy Systems Analysis Methodologies (Ch. 3, 30 p) (43 slides)

W Feb. 4: Energy Use and Efficiency in Buildings and Industry (Ch. 4, 52 p)(78 slides)

M Feb. 9: Energy Use and Efficiency in Buildings and Industry (cont'd.); Electricity Supply Systems (Ch. 5, 36 p.)(66 slides);

W. Feb. 11: **Midterm 1 (Chs 1-4)**

M Feb. 16: Electricity Supply Systems (cont'd.); Fossil Fuels (Ch. 6; 28 p) (67 slides)

W Feb. 18: Fossil Fuels (cont'd.)

M Feb. 23: Nuclear Energy (Ch. 7; 22 p.) (74 slides);

REPORT: Deploying a World-Renowned Advanced Nuclear Industry in Texas (Nov. 2024; 68 p.)

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extension://efaidnbmnnnibpcajpcgiclfndmkaj/https://gov.texas.gov/uploads/files/press/TAN

RWG_Advanced_Nuclear_Report_v11.17.24c_.pdf

W Feb. 25: Nuclear Energy (cont'd.)

M Mar. 2: Wind Energy (Ch. 8; 62 p) (98 slides)

W Mar. 4: Wind Energy (cont'd.)

M Mar. 9: VALERIO IUNGO AGREED – need to schedule

W Mar. 11: **Midterm 2 (Chs. 5-8); (1 paragraph project proposal due)**

March 16, 18: NO CLASS SPRING BREAK

M Mar. 23: Fundamentals of Solar Radiation (Ch. 10, 46 p) (51 slides)

W Mar. 25: Photovoltaics (Ch. 11, 50 p)(63 slides)

M Mar 30: MAYBE PETER SULLIVAN (LONGROAD ENERGY) “TBA”

W Apr 1: Solar Thermal Collectors and Systems (Ch. 12, 55 p)

M Apr 6: Ocean, Hydropower, and Geothermal Energy Conversion (Ch. 13, 35 p)(59 slides)

W Apr 8: **Midterm 3 (Ch. 10-12)**

M Apr 13: Storage Technologies (Ch. 14, 44 p)(72 slides)

W Apr 15: Hydrogen

M Apr 20: Transportation (Ch. 15, 28 p);

W Apr. 22: TBA

M Apr. 27: TBA

W. April 29: Student Presentations 1

M May 4: Student Presentations 2

W May 6: Final Exam

POSSIBLE GUEST LECTURERS:

PETER SULLIVAN (LONGROAD ENERGY) – WEST TEXAS SOLAR ENERGY PROJECTS

peter.sullivan@longroadenergy.com

Teague Egan, CEO LithiumX Teague@energyx.com

Someone from ERCOT?

MARK STOVER Executive Director

Texas Solar Power Association

Valerio Iungo (UTD Mechanical Engineering)

Websites:

“Geothermal Energy gets a new look” (6.24) <https://andthewest.stanford.edu/category/energy-the-west/>