

Syllabus & Schedule

Location: 210 Stone

Instructor: Nikhil Kaza

Office hours: Mon 2 PM-3 PM (or by appt.) NE 315

Time: MW 11:00 AM – 12:15PM

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Objective

Recent interest in climate change, in general, as well as large projects like Keystone XL. in particular, has focussed the attention of urban planners on the impacts of land use and transportation planning on energy use. This course seeks to explore the reciprocal connections between all aspects of energy (production/conversion, distribution and use), land use, environment and transportation. Evaluation of Federal, state and local policies on energy conservation, alternative energy sources are emphasised. At the end of the course, the students are expected to have learnt the skills to critically analyse impacts, interdependencies and uncertainties of various energy conservation measures and production technologies on different sectors, organisations and communities

Student Responsibilities

This class is meant for upper class undergraduates and beginning graduate students interested in issues of energy planning. There are no prerequisites for the class, however, you are required to be familiar with basic principles of energy, economics and public policy.

The main course website is <https://sakai.unc.edu/portal/site/plan547>. The course materials and assignments, announcements are all posted there. You should be familiar with using Sakai including submitting assignments and editing Wiki. If in doubt, please ask for help.

In addition, the Philip McDaniel has kindly created a library website for the course at <http://guides.lib.unc.edu/plan547>. This is a very useful resource that will list information of various data sources. It also has information on how to cite various resources.

You are responsible for reading the assigned readings **before** the class. The lectures proceed quickly and cover only the main topics and therefore are not exhaustive. Please be prepared to take notes as I do not usually provide powerpoint slides. It is your responsibility to keep up and/or request additional clarification on particular topics and techniques. The problem sets and assignments are meant to supplement lectures and discussion and build skills. You are expected to do research, make assumptions, find data, to figure out the problem sets.

My calendar is available at <http://meetme.so/nikhilkaza>. You can directly setup an appointment for a time that is mutually convenient. I will automatically get a email when you set a meeting up, so please add a title as to the purpose of the meeting so that I can know it is you (Rm 315).

A Google group is set up for use in this course. You can email the entire class at plan547_fall14@googlegroups.com. You can choose your own email delivery settings, however, it is expected that most of the course business is conducted via email. Any other email to me should include “PLAN547” in the subject for easy filtering.

Course calendar is at <http://tinyurl.com/plan547-calendar>. You can subscribe to it using any calendar program such as Microsoft Outlook, Apple iCal, Mozilla Sunbird etc. I will keep this

calendar up to date with dates for seminars on campus, guest lectures in class and field visits. I strongly urge you to subscribe to it and keep an eye on it. This calendar is also visible through Sakai. The dates mentioned in the attached schedule are tentative. This calendar is the most up-to-date calendar and should be viewed as definitive for due dates, topics, field trips and guest lectures.

You are accountable to the integrity of the work you submit. You are allowed and encouraged to consult with your peers and use the resources in the library and on the web for many of your assignments. However, all help (including your peers), all verbatim text and images that are not your own should be explicitly acknowledged. Non-attribution carries severe penalties.

I am in the process of setting up various field visits as well as guest lectures by eminent experts and practitioners. Since these depend on others' schedules, the class schedule will adapt. Logistical details about the field visit will be provided later.

In addition, you are required to attend any three of the four Energy and Environment lunches sponsored by Institute for the Environment. They are usually (not necessarily) second Tuesday every month in Toy Lounge, Dey Hall. More details will follow shortly. If you have heard of other events and lectures that will be of interest to the class, please share them via google groups.

Grading and Assignments

The course grade is based on three problem sets, quizzes, blog posts and two group projects.

On random days, a total of 6, short quizzes are administered in the class. The top five count towards the grade. In total, these account for 10% of the grade. Absolutely, no make up quizzes.

The problem sets provide practise for analytical techniques described in the class and in the textbook. You are expected to use spreadsheet and other statistical software for completing the problem sets. It is expected that you are familiar with these software, or would avail yourself of the resources on the web and at the university to troubleshoot. If you do not have access to a computer with required software, please let me or Udo (reisinge (at) unc (dot) edu) know. Each of the problem sets accounts for 10% of the grade.

A submission to a problem set is a single document (pdf). Emphasis is placed on the readability of your argument and solution. Points will be deducted, if the information is scattered in multiple places and files. I strongly suggest that you get familiar with writing math equations in electronic documents. All equations, data, tables, research and help should be cited. Follow a consistent citation style. I recommend UNC citation builder <http://library.unc.edu/citationbuilder/>.

As part of your problem set 1, you will have to keep a travel diary for a week, monitor energy consumption of various appliances. I will loan you a "Kill-A-Watt" meter that you can use for 3 weeks to monitor specific appliances. In addition, you will need to access to 12 months of utility bills for your house/apartment.

For the two projects, the students work in groups of two and each student should be part of two distinct groups. The first term paper is of any topic related to the production, conversion and transmission of energy and the second should be of use and conservation of energy. Each of these papers are preceded by presentations, where your work will be critiqued by the rest of the class. Each of the term papers account for 20% of the grade. Both presentations and reports are evaluated.

The remaining 20% of the grade is based on participation in the class, including attendance and engagement, and will be evaluated throughout the semester. Part of this participation grade is based on blog postings on Sakai. Each student is expected to post at least 10 blog posts during

the semester. These blogs are short responses (~ 400 words) to a talk you attended, a newspaper article you read, a point you want to elaborate on or a critique you want to express. I expect that these posts are spread relatively evenly throughout the semester. The quality of each blog post is more important than the number of posts. These blogs serve as a out-of-class online interaction and is viewable by everyone in the class.

If you are a graduate student taking this class, you are expected to explore the issues in-depth and demonstrate your understanding of key issues in the field of energy planning. The papers and presentations will be graded differently than your undergraduate peers. H (High Pass) for graduate students is equivalent to A for undergraduate students.

Appropriate planning and time management significantly reduces stress at the end of the semester. Participation in class and timely completion of problem sets and other assignments is imperative.

Textbooks and Readings

The following textbooks are required for this class:

- John Randolph and Gilbert M. Masters. *Energy for Sustainability: Technology, Planning, Policy*. Island Press, Washington, D.C., 1 edition, June 2008 (henceforth RM)

The textbook is available at the University Bookstore and is on reserve at the Undergraduate library. The textbook contains a lot of information on the technology aspects of various types of energy production and distribution. Proficiency of these materials is not the goal of this course, however, they should be understood to a sufficient depth that would allow for better land use, transportation and environmental planning and policies.

Other books that are recommended (not required) for purchase are:

- Daniel Sperling and Deborah Gordon. *Two Billion Cars: Driving Toward Sustainability*. Oxford University Press, USA, January 2009
- Daniel Lerch. *Post Carbon Cities: Planning for Energy and Climate Uncertainty*. Post Carbon Press, April 2008
- Ferdinand E Banks. *Energy economics: a modern introduction*. Kluwer Academic, Boston, 2000

Most of the other readings are derived from journal articles and book chapters. These readings are posted on the Sakai. Usual copyright notices apply.

Very Tentative Schedule

Introduction & Administrative Details (Aug 20)

- RM Chapter 1

Production and Distribution of Energy

Patterns of Energy Use (Aug 25)

- RM Chapter 2
- Vaclav Smil. *Energy in world history*. Westview Press, Boulder, 1994(Chapter 6)
- Annual Energy Review 2011
- Executive Summary of the Annual Energy Outlook 2013

Fundamentals of Energy Science (Aug 27)

- RM Chapter 4

Economic Analysis of Energy (Sep 3)

- RM Chapter 5

Conventional Energy Production (Sep 8)

- RM Chapter 9 & 10

Shale Gas (Sep 10)

- R. D. Vidic, S. L. Brantley, J. M. Vandenbossche, D. Yoxtheimer, and J. D. Abad. Impact of Shale Gas Development on Regional Water Quality. *Science*, 340(6134), May 2013. PMID: 23687049
- Vikram Rao. *Shale gas: the promise and the peril*. RTI Press, Research Triangle Park, NC, 2012 (Chapter 1 & 5)

PS1 due Sep 13, 5PM

Field trip to the UNC Cogeneration plant (Sep 15)

Alternative Transportation Fuels (Sep 17) - Guest Lecture (Vik Rao, Research Triangle Energy Consortium)

Biofuels and Alternatives (Sep 22)

- RM Chapter 14

Photovoltaics & Other Solar Power (Sep 24)

- RM Chapter 11 & §12.8
- S. F Stromberg. Has the Sun Set on Solar Rights? Examining the Practicality of the Solar Rights Acts. *Natural Resources Journal*, 50:211–539, 2010

Wind Energy (Sep 29)

- RM Chapter 12 & §10.7
- Gijs Kuik, Bart Ummels, and Ralph Hendriks. Perspectives on wind energy. In K. Hanjalić, K. Van de Krol, and A. Lekić, editors, *Sustainable Energy Technologies*, pages 75–97. Springer Netherlands, Dordrecht, Netherlands, 2008
- Patrick DevineWright. Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy*, 8(2):125–139, April 2005

Federal, State and Local Frameworks

Land and Water Interactions with Energy (Oct 1)

- N. Kaza and M. Patane. The land use energy connection. *Journal of Planning Literature*, forthcoming
- Gordon Walker. Renewable energy and the public. *Land Use Policy*, 12(1):49–59, January 1995
- david pimentel, megan herz, michele glickstein, mathew zimmerman, richard allen, katrina becker, jeff evans, benita hussain, ryan sarsfeld, anat grosfeld, and thomas seidel. Renewable Energy: Current and Potential Issues. *BioScience*, 52(12):1111–1120, December 2002
- US Department of Energy. Energy demands on water resources: Report to the congress on interdependency of energy and water. Technical report, Sandia National Laboratories, 2006

Energy Politics (Oct 6)

- Timothy Mitchell. *Carbon democracy: political power in the age of oil*. Verso, London; New York, 2011 (Chapter 1 & 2)
- Robert Millward. The political economy of urban utilities. In Martin Daunton, editor, *The Cambridge Urban History of Britain*, chapter 11, pages 315–350. Cambridge University Press, Cambridge, 2001
- Jim Rossi. Trojan Horse of Electric Power Transmission Line Siting Authority, The. *Environmental Law*, 39:1015, 2009

“Energy Policy in the State” (Oct 8)- Guest Lecture (Anne Tazewell, NC Solar Center)

- RM Chapter 16

PS2 due Oct 10, 5PM

Group presentations (Oct 13 and 15)

Each group will present for about 10-15 min. Five groups will present in each class. The presentation schedule will be posted on the Sakai later.

Term Paper 1 due Oct 21, 5PM

Energy Consumption

Residential Energy Consumption (Oct 20)

- RM Chapter 6

Energy Planning for Campuses (Oct 22) (TBA)

Simulating Building Energy Consumption - eQuest Tutorial (Oct 27)

- James Hirsch & Associates, *eQuest Tutorial*(reference only)

No class on Oct 29. Instead, on Oct 31 a field trip to a Net Zero house in Durham (Aaron Lubeck, Trinity Design Build)

Transportation Energy use (Nov 3)

- RM Chapter 13

Alternative Transportation Technologies (Nov 5)

- Daniel Sperling and Deborah Gordon. *Two Billion Cars: Driving Toward Sustainability*. Oxford University Press, USA, January 2009 (Chapter 4, 5 & 9)

Planning for Electric Vehicles (Nov 10) (Brennan Bouma, TJCOG)

- Greater Triangle PEV readiness Plan

Energy in Freight (Nov 12)

- D. McCollum, G. Gould, and D. Greene. Greenhouse gas emissions from aviation and marine transportation: Mitigation potential and policies. Technical report, Pew Center on Global Climate Change, 2009
- Fatumata Kamakaté and Lee Schipper. Trends in truck freight energy use and carbon emissions in selected OECD countries from 1973 to 2005. *Energy Policy*, 37(10):3743–3751, October 2009
- Rommert Dekker, Jacqueline Bloemhof, and Ioannis Mallidis. Operations research for green logistics an overview of aspects, issues, contributions and challenges. *European Journal of Operational Research*, 219(3):671–679, June 2012

PS3 due Nov 14, 5PM

Interactions of Land Use and Transportation (Nov 17)

- TRB and BEES. Driving and the built environment: Effects of compact development on motorized travel, energy use, and co2 emissions. Special Report 298, National Research Council of the National Academies, Washington, D.C., 2009 (Chapters 5 & 6)

Energy Planning for Communities (Nov 19) (John Richardson, Chapel Hill)

- RM Chapter 15 & 18
- E. Sussman. Reshaping municipal and county laws to foster green building, energy efficiency, and renewable energy. *NYU Environmental Law Journal*, 16:1, 2008
- D. Peterson, E. Matthews, and M. Weingarden. Local energy plans in practice: Case studies of austin and denver. Technical Report NREL/TP-7A20-50498, National Renewable Energy Laboratory, Golden, CO, 2011

Energy Based Economic Development (Nov 24) (Sara Lawrence, RTI)

- Carley, S. and Lawrence, S. *Energy-Based Economic Development - How Clean Energy can Drive Development and Stimulate Economic*. Springer, New York, 2014(Chapters 1 & 7)

Group Presentations (Dec 1 and Dec 3)

Each group will present for about 15 min. The presentation schedule will be posted on Sakai later.

Term Paper 2 due Dec 6, 5PM (Exam Day)