

## UCLA Fall 2015

Env157: Energy, Environment and Development

*Time and Location:* Tue & Thu, 2-3:15 PM AM, Public Affairs 2214

*Instructor:* Deepak Rajagopal

*Office hours:* Tue 4-5 PM and Thu 9:30-10:30 AM

### Course description

This course is intended as a high-level introduction to concepts and tools essential to understanding the basic technical, socio-economic, environmental and policy dimensions of the various types of energy resources, their extraction and conversion technologies and their end uses. Through a combination of quantitative problem-solving, qualitative reasoning, and reading assignments, the course aims to develop a capacity to critically analyze the arguments that are being put forward by scientists, businesses and policy makers to address the energy related challenges we face today. Given the breadth of topics and the typically diverse disciplinary background of students this class attracts, different portions of the syllabi will already be familiar to different groups of students. This class aims to offer a new perspective on such familiar topics as well in addition to introducing you to new concepts.

**Course webpage:** <https://ccle.ucla.edu/course/view/15F-ENVIRON157-1>

### Assignments, exams and grading

The grading will be based on

- Homework assignments (35%)
  - Due at the beginning of class as hard copies. Late submissions will NOT be accepted.
  - The final assignment is an essay on a topic of your choice. Max 10 pages long, double spaced, 1" inch margins, 12 point font.
- Exams
  - Midterm (20%):
  - Final (40%): **Dec/10 Thursday 11:30 to 2:30 PM Public Affairs 2214**
- Class participation (5%)
  - Attendance is not compulsory but in order to not lose points you need to arrive on time and engage constructively during lecture. Using electronic devices for other purposes will lead to your losing class participation points.

To receive partial credit on home works and exams clearly show how you approached the problem and write legibly. Answer sheets written with pencil will not be graded.

### Academic integrity and ethics:

You can discuss concepts with your friends but must do your own homework. This will ensure you will be able to succeed in the examinations. Students should be aware of university guidelines on plagiarism and academic honesty, which will be strictly enforced. Refer [www.studentgroups.ucla.edu/dos/students/integrity/](http://www.studentgroups.ucla.edu/dos/students/integrity/)

### Course Materials and readings

Given the diverse nature of topics there is no single text. The references and readings for each lecture are outlined in the next page along with the lecture plan and they are all already posted to CCLE for you to download with two exceptions.

1. *The Quest: Energy, Security, and the Remaking of the Modern World*. By Daniel Yergin, Penguin Books, September 26, 2012, ISBN-13 # 9780143121947. You are expected to acquire a copy of the book. Daniel Yergin is a world-renowned analyst of international energy markets and a Pulitzer Prize winner for an earlier book on Energy titled the “The Prize”.

2. *Sustainable Energy – without the hot air* by Prof. David MacKay. This book will teach you how to do simple back of envelope calculations about the basic physical and engineering aspects of different energy sources and conversion technologies. A few chapters of this book will be taken up in our lectures. This book is freely available for download at <http://www.withouthotair.com/>

**Other useful references:**

Encyclopedia of Energy, *Edited by: Cutler J. Cleveland* © 2004 Elsevier Inc. The required papers from this work are already posted to CCLE. The entire volume is available at [http://www.knovel.com/web/portal/browse/display?\\_EXT\\_KNOVEL\\_DISPLAY\\_bookid=1714](http://www.knovel.com/web/portal/browse/display?_EXT_KNOVEL_DISPLAY_bookid=1714)

**Lecture Plan**

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Lec #	Date	Day	Topic	HW	Main reference	Readings
1	24-Sep	Th	Introduction and Historical perspective	1A	Smil 2000	Goldemberg 2004
2	29-Sep	T	Fossil resources - Coal		Paul 2004	Atlantic 2010Dec and Grubler 2004
3	1-Oct	Th	Fossil resources - Oil	1D	Economist 2013 Aug and Economist 2011 Jan	Quest Ch. 11 and 12, Grist 2010Aug
4	6-Oct	T	Tools - Thermodynamics and Combustion	2A	Flagan and Seinfeld	Quest 34, Bergerson 2004
5	8-Oct	Th	Fossil resources - Gas		NETL 2009 Exec. Summary and Chapters 1,2 and 5	Quest 16, Yergin 2010Apr
6	13-Oct	T	Tools - Financial Analysis I	2D	NREL 1995, Goulder and Stavins 2002	NYTimes 2012Apr, Rajagopal Blog
7	15-Oct	Th	Tools - Financial Analysis II	3A	Pearce 2006 Chapter 4	Quest 27 and Wolfram 2013Mar
8	20-Oct	T	Renewables - Solar/Wind/Storage		MacKay Book Chapter 6, Section III.B	Quest 29, 30, 35,
9	22-Oct	Th	Renewables - Bioenergy	3D	Rajagopal 2009, Ezzati 2004	Quest 33,
10	27-Oct	T	Renewables - Hydro/Geothermal		Lund 2006, ORNL 1993	Economist 2015Jan
11	29-Oct	Th	Nuclear		MacKay Book Chapter 24	Quest 18, Economist 2012Mar
12	3-Nov	T	<b>Mid term</b>			
13	5-Nov	Th	Tools - Microeconomics - I Markets		Fullerton and Stavins 1998	Solomon 2004 and Quest 19
14	10-Nov	T	Energy and Public policy I - Rationale and Instruments	4A	Rajagopal 2008	Quest 13, Yergin 2006 FA
15	12-Nov	Th	Tools - Microeconomics - II Policy analysis		EPA 2010 Chapter 4	Parry 2002, Economist 2012Apr
16	17-Nov	T	Energy and Public policy II - Decision criteria		Pearce 2006 Chapter	Lovins 1976, Landsburg 2010 and Reinhardt 2010
17	19-Nov	Th	Energy Efficiency and conservation	4D	Jaffe Newell and Stavins 2004 and Economist 2015Jan	Quest 31 and 32
18	24-Nov	T	Energy and Human Behavior		Rajagopal and Attari 2015	Thaler and Sunstein
19	26-Nov	Th	<b>Holiday</b>			
20	1-Dec	T	Policy innovations	5D	Stavins 1990	Quest Chapter 26 and Conclusion
21	3-Dec	Th	Wrap up		RFF 2005	Smil 2006
	10-Dec	Th	<b>Final Exam 11:30 to 2:30 PM at our usual classroom</b>			

The references and readings I have uploaded to CCLE begin with the same last name of the author(s) and the year/month of publication that are listed in the columns above. You should be prepared to answer both quantitative and qualitative questions based on the concepts in the references and readings in your Homeworks and exams.