

COURSE: **JPG 1408S: CARBON-FREE ENERGY**
INSTRUCTOR: Danny Harvey
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LOCATION: SS2127
TIME Mon 4-6, occasional tutorials Mon (6:10 until 7:00 or longer if needed) in SS2127 (see schedule on reverse)

Outline

The course examines the options available for providing energy from the major carbon-free energy sources: solar, wind, biomass and nuclear, as well as through sequestration of carbon from fossil fuel sources. For each carbon-free energy source covered, the physical principles, physical or biophysical limits, efficiencies, and other constraining factors are discussed, as well as examples of current applications, current and projected future costs, and possible future scenarios. The course concludes by combining the main conclusions from JPG 1407F concerning the prospects for reducing energy demand through improved energy efficiency, with the conclusions drawn in this course concerning the feasibility of large-scale carbon-free energy, to generate scenarios of future greenhouse gas emissions, showing the range of possible consequences for global mean temperature, sea level rise, and ocean acidification.

Text

My own book, *Energy and the New Reality, Volume 2: C-Free Energy Supply* (Earthscan, April 2010), and is available in the university bookstore. Powerpoint files for each chapter are available on my website (<http://faculty.geog.utoronto.ca/Harvey/Harvey/publications.htm#pub>) (only the chapters indicated in the outline are needed)

Requirements

There will be 2 major computational assignments to give students a hands-on feel for the subject matter and to develop quantitative skills in a progressive manner. The assignments will involve using Excel spreadsheets. These assignments will be worth 20% each, and thus worth 40% of the final mark in total. In addition, graduate students will be given a short 3rd assignment worth 8%, for a total of 48% of the final mark based on assignments.

There will be one mid-term test and a 2-hour exam (with the exam covering only the second half of the term work), each be worth 26% of the final mark.

Penalty for late work:

5% per weekday.

Prerequisite: JPG 1407 or permission of instructor

Exclusion: JPG 1406

**JPG 1408S – Carbon-Free Energy
OUTLINE OF LECTURES**

Week Number	Topic	Winter 2011 Date
1	Wind	10 Jan
2	Wind	17 Jan
3	Biomass	24 Jan
4	Biomass	31 Jan
5	Biomass	7 Feb
6	Guest Lecture	14 Feb
7	Term Test	28 Feb
8	Solar	7 March
9	Solar	14 March
10	Nuclear	21 March
11	Carbon sequestration	28 March
12	Summary	4 April

JPG 1408F - PROBLEM SETS

PS #	Topic	Assigned	Due	Taken Up	% Contribution to final mark
1	Wind energy	17 Jan	7 February, in class	14 Feb	20
2	Solar energy	7 Mar	28 March, in class	4 Apr	20
3	Nuclear energy	4 April	11 April, my office	Available by 18 April	8

JPG 1408F – DATES OF MONDAY TUTORIALS (in SS2110)

Date	Activity
17 January	Hand out PS#1, explain first part
31 January	Explain second part of PS#1, answer questions on work in progress. Note: questions on the first part of PS#1 will not be answered after this date, so this date serves as a deadline for getting the first part largely finished.
14 Feb	Take up PS#1
7 March	Take up term test, hand out PS#2, explain first part
21 March	Explain second part of PS#2, answer questions on work in progress. Note: questions on the first part of PS#2 will not be answered after this date, so this date serves as a deadline for getting the first part largely finished.
4 April	Take up PS#2, hand out PS#3.