

**UNIVERSITY OF NORTHERN COLORADO
COLLEGE OF NATURAL AND HEALTH SCIENCES
OFFICE OF EXTENDED STUDIES
SUMMER 2010**

**ENST 225-602: [Energy and the Environment](#)
(March 22 – June 21, 2010)**

Instructor Dr. Ruwang Sung
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Textbook **Energy -- Its Use and the Environment 4th Edition** by *Hinrichs and Kleinbach*
ISBN 0495010855

References

Plan B 3.0:

Mobilizing to Save Civilization By Lester R. Brown

Watch the Lecture: <http://www.youtube.com/watch?v=ZkR1IT4ZjU0&feature=related>

Download this book (pdf) at: <http://www.earth-policy.org/Books/PB3/Contents.htm>

Arithmetic, Population and Energy

By Dr. Albert Bartlett:

Watch the Lecture: <http://globalpublicmedia.com/lectures/461>

Course Description

The purpose of this course is to help you become familiar with the fundamental energy concepts and with common problems and solutions of energy production and use. Various types of energy and energy production will be discussed along with the appropriate laws of physics and examples in a real world, for example, energy use patterns in the U.S. compared with in a developing country, such as China. Environmental issues related to energy use will also be discussed. Some practical arithmetic calculations will be introduced for problem solving.

Objectives

1. Gain and demonstrate knowledge of basic energy and work concepts;
2. Become familiar with common forms of macroscopic energy including mechanical, thermal, chemical, electrical, radiant and nuclear;
3. Identify common sources of energy and their applications in modern society;
4. Be able to make a qualitative and quantitative analysis of issues related to energy, its production and its use;
5. Understand the possible drawbacks and benefits to the use of various energy sources

Format of Course

This class will be on the internet. It will utilize a web-based delivery system – EnhanceEdu. The course will consist of 24 lessons. Each lesson will include readings and some video clips. There will be 10 activities (mini-labs) where you will be asked to apply your knowledge to real

world situations. And each lesson will culminate in a short assignment quiz. In addition to the lessons, there will be one comprehensive research paper and a comprehensive online open book final exam.

Grade

A (> 90%) **B** (80% -- 89%) **C** (70% -- 79%) **D** (60% – 69%) **F** (below 60%)

■ Activities (10)	All Due April 23rd	20%
■ Assignments (24)	Check the due date online	35%
■ One research project (essay paper)	June 10th	25%
■ Comprehensive exam	April 27th	20%

Assignment includes questions emphasizing basic laws and principles, both conceptual and quantitative.

Activity involves the investigation of energy and the environment issues in everyday life, in the society and globally, compare energy use between different countries, for example between China and the U.S., as well as applying the scientific laws and principles for problem solving.

Research Project integrates all knowledge acquired from this course and applies it to one important issue in our world with personal in-depth view points and solutions.

Course Schedule

Lesson	Content	Reading	Online & Written Homework
1	Energy use patterns in the United States and countries like China and India	Read Ch. 1-A,B,C	Assignment 1, Activity 1
2	Calculation of energy reserve, production rate, lifetime	Read Ch. 1-D <i>Video Clip "Lifetime"</i>	Assignment 2
3	Population grow rate and calculation of doubling time	Read Ch. 1-E Read Dr. Bartlett's articles http://globalpublicmedia.com/lectures/461 <i>Video Clip "Doubling Time"</i>	Assignment 3, Activity 2
4	The forms of energy	Read Ch. 2-A, B	Assignment 4
5	Calculation of kinetic energy and potential energy	Read Ch. 2-D, E <i>Video Clip "Mechanical Energy"</i>	Assignment 5, Activity 3
6	Calculation of hydropower	Read Ch. 2-F, Ch. 12-F and "Focus on 12.4" page 418 <i>Video Clip "Mechanical Energy"</i>	Assignment 6, Activity 4
7	Primary energy source and end-	Read Ch. 3-C, D	Assignment 7,

	user's energy Calculation of energy conversion efficiency	<i>Video Clip "Energy Conversion"</i>	Activity 5
8	Basic units for energy and power and its conversion (joule, calorie, BTU, kwh)	Read Ch. 3-F Table 3.4	Assignment 8, Activity 6
9	Temperature scale and conversion	Read Ch. 4-C <i>Video "Temperature"</i>	Assignment 9, Activity 7
10	Definition of heat energy and heat transfer	Read Ch. 4-D <i>Video "Heat"</i>	Assignment 10
11	Definition of specific heat and latent heat CDE CMCS SCI.*- #1,2,5	Read Ch. 4-C <i>Video "Specific Heat".</i> <i>Video "Latent Heat"</i>	Assignment 11, Activity 8
12	Heat engine efficiency Ocean Thermal Energy Converter	Read Ch. 4-E, F	Assignment 12
13	Heating calculation for buildings	Read Ch. 5-A, B, C <i>Video "Heat Conduction Rate"</i>	Assignment 13, Activity 9
14	Electricity usage	Read Ch. 10-A, B	Assignment 14, Activity 10
15	Electric Force and Electric charge	Read Ch. 10 – Special Topic (Electrostatics) Read Ch. 10 – C <i>Video "Electric Force"</i>	Assignment 15
16	Electric current, voltage and resistance	Read Ch. 10-C, E, G <i>Video "Electric Circuit"</i>	Assignment 16
17	Electric power calculation	Read Ch. 10-H, I <i>Video "Electric Power"</i>	Assignment 17
18	Basics of nuclear physics Einstein's mass-energy equivalence	Read Ch. 13-A, B, D, F <i>Video "Nuclear Physics"</i>	Assignment 18
19	Nuclear fission energy	Read Ch. 13-H, Ch. 14-A, B <i>Video "Nuclear Energy"</i>	Assignment 19
20	Nuclear fusion energy	Read Ch. 16-A, B, C, D <i>Video "Nuclear Energy"</i>	Assignment 20
21	Electromagnetic wave spectrum	Read Ch. 4-D (3. Radiation)	Assignment 21
22	Blackbody radiation diagram Greenhouse effect and global warming	1. http://hyperphysics.phy-astr.gsu.edu/hbase/wien.html 2. http://www.ucar.edu/learn/1_3_1.htm	Assignment 22
23	Overview of fossil fuels	Read Ch. 7-C, D, E	Assignment 23
24	Photovoltaic and wind farm	Read Ch. 12-A, E	Assignment 24

Research Project

You must work independently. Before the end of this semester, you need to submit a one page proposal describing your project topic to include:

- Brief description of the project and objectives
- Background information (definition, data, known facts)
- Application of science we learned (for example, doubling time in population topic, efficiency in power generation, energy units, electrical power and energy calculation, etc.)
- Your observation, interview, comparison and analysis and your comments on how government, local officials and individuals are working together to deal with energy resource problems and environmental concerns.
- Quote your source of information clearly (published text or journals, web resources, interview location and time, etc.) You should use APA style when citing additional materials. See the following web site for information of APA style:

<http://www.ccc.comnet.edu/apa/>

You can choose one of the following issues to work on by focusing on one country, China (an major emerging economy) or the United States (a major mature economy), or compare the problems and solutions for the two countries.

Population Issue

- 1) Trace the history of the policy of one child per family from its inception and up to the present time. How does this affect both energy consumption and population growth? Has this policy succeeded in achieving its goals? If not, where and how has it fallen short?
- 2) What was the annual percent growth of China's/U.S. population when the policy was first put in place? What is the growth rate of China's/U.S.'s population today? What is China's/U.S.'s policy with regard to population size at present and over the next 50 years?
- 3) Is it anticipated that China/U.S. might have to have a policy of reducing its population size in order to move toward a sustainable society. Do all Chinese/American families today have access to family planning education and facilities? If not, are there plans to make family planning accessible to all families?
- 4) What fraction of China's/U.S.'s food is imported today? Has this fraction been increasing or decreasing? What are the plans for the future? Will the fraction increase or decrease?
- 5) What are the plans to make China/U.S. self-sufficient in food some time in the future? If so, when is this expected to happen? How many hectares of agricultural land are converted each year into suburbs of cities and towns? How does this conversion affect food production?
- 6) Is there a significant plan for re-forestation of large areas of China/U.S. that were once covered with forests? If so, what are the goals of the plan? What has been achieved so far toward re-forestation?

Energy Use Pattern

- 1) What is China's/U.S.'s Energy (for example), GDP, and Population growth chart in the last 20 years? What is its energy consumption per capita? What are China's/U.S.'s energy sources?

- 2) It is expected that world oil production will peak before 2010. What is China's/U.S.'s plan in dealing with the problems of oil supply after the peak has been passed? What have been changed in the use of energy and economic situation in the past 10-20 years?
- 3) What renewable energy sources are promoted locally? Examples. What are potentials and limitations in promoting renewable energy? What are the main electricity generation mechanisms? What are the new technologies applied to address efficiency issues?
- 4) What is meant by "sustainable development"? Give examples to show that in the energy use the development is not sustainable.

Environmental Issues

- 1) What provisions are made in the cities and towns for housing and jobs for the migrants from the agricultural areas? As the population of China/U.S. grows, what is happening to the supply of water for domestic use, agricultural use, and for maintaining the environment of the streams and rivers? What provisions are made in the cities and towns for housing and jobs for the migrants from the agricultural areas?
- 2) What does the government of China/U.S. see as today's most pressing environmental problem? What is the Chinese/American government doing to solve this problem? What does general public see as today's most pressing environmental problem? What are their views of solving this problem?
- 3) What is general public's attitude toward mass versus individual vehicle transportation? Why might this be different in different areas of the country (ie. rural vs urban)?

Library Services for Distance Education and Off-Campus Students: Obtaining Materials from UNC Libraries

Off-campus students residing within 50 miles of the UNC campus are required to come to the library and borrow materials in person. Students residing more than 50 miles from campus may request that materials be delivered to them. All requests must include complete citations. We will supply materials from the UNC Libraries, as well as materials from other libraries obtained via Interlibrary Loan. Articles will be delivered via email. Books will be mailed first class. Delivery time by U.S. postal service is approximately 1 week. It is the responsibility of the student to return books by the date due. UNC does not pay return postage on books. For information on document delivery, call (970) 351-1446.

Requests for materials may be made through the following methods:

Online: <http://www.unco.edu/library/forms/distancerequest.htm>

By email: library.ocp@unco.edu

By fax: (970) 351-2540

Students with Disabilities

Any student requesting disability accommodation for this class must inform the instructor giving appropriate notice. Students are encouraged to contact Disability Support Services at (970) 351-2289 to certify documentation of disability and to ensure appropriate accommodations are implemented in a timely manner.

Honor Code

All members of the University of Northern Colorado community are entrusted with the responsibility to uphold and promote five fundamental values: *Honesty, Trust, Respect, Fairness, and Responsibility*. These core elements foster an atmosphere, inside and outside of the classroom, which serves as a foundation and guides the UNC community's academic, professional, and personal growth. Endorsement of these core elements by students, faculty, staff, administration, and trustees strengthens the integrity and value of our academic climate.

UNC's Policies

UNC's policies and recommendations for academic misconduct will be followed. For additional information, please see the Dean of Student's website, Student Handbook link <http://www.unco.edu/dos/handbook/index.html>

Notice

The Office of Extended Studies reserves the right to cancel or reschedule courses based upon enrollment. Enrolled students will be contacted with information of any change.

Student Satisfaction Evaluation

Participants will be asked to evaluate the workshop for instructors' knowledge, interest and enthusiasm as well as providing additional information on classes or topics which you would like to see developed as a future offering from UNC.

Course Website Login Information for ENST 225 Go to website: <http://physics.unco.edu/physics/edu>

1. This site can be viewed with *Internet Explore* only.
2. Use your Bear number for both Student ID and Password at the first time, then enter your personal information, email address (**make sure your email works** !!) and change your password. If you have registered the course, but still can't login, email your Bear number to me.
3. Once you login into the course website, you should see the News and course syllabus immediately. Be sure to check the News frequently and familiarize yourself with Content, Assignment, Report, Forum and Communication.

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References

- [Online Dictionary](#)
- [Encyclopedia](#)
- [Unit Conversion](#)
- [Math Formula](#)
- [Scientific Calculator](#)

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