

Course No.	ENR 161
Course title:	Energy Economics
Number of credits	3
Number of lectures-tutorial-practicals	31-11-0
Faculty Name	Ms Anureet Sahi

***Course outline***

This course is designed to familiarize the student with the ways in which economic analysis can be brought to bear on energy issues. Students will learn (1) to identify the relevant economic questions concerning energy issues of interest to them, (2) to comprehend the economic arguments that bear on these issues, and (3) to evaluate these arguments in terms of their strengths and weaknesses. The course is organized around key economic concepts and their application to concrete energy issues. To analyze specific energy problems, it is important to assess which of the concepts are relevant and what weight should be given to each of them. Problem sets will be assigned and discussed to help develop these skills.

***Evaluation procedure***

- Term Paper : 40%
- Two Minor Exams : 15% each
- Major Exam : 30%

**Details of course contents and allotted time**

	Contents	Lectures / Tutorials
1.	<p><b><i>Fundamental Concepts of Energy: Energy Analysis</i></b></p> <p>a new field of study, fuel use survey, energy models, energy balances, the system boundary, energy and non-energy flows, commercial and non-commercial energy sources, energy industries and other industries, energy production and distribution, boundaries between flows and stocks, top-down and bottom-up balances, final energy use, useful energy, end-use by purpose, shorter period and regional balances</p>	<b>4</b>
2.	<p><b><i>Overview of Energy Markets:</i></b></p> <p>Integrated framework for energy pricing, basic pricing principles, short run versus long run marginal cost pricing, peak load and seasonal pricing.</p> <p>Energy Prices and Markets, Pricing of Exhaustible Resources, Economic regulation of energy markets.</p>	<b>6+2</b>

3.	<b><i>Energy Demand Analysis:</i></b> Drivers of energy demand, concepts of energy intensity and elasticity, statistical tools and techniques for demand forecasting, scenarios development, interpretation of results and policy implications.	<b>4+3</b>
4.	<b><i>Investment in Energy Resources:</i></b> Economics of discount rate, concept of net present value, incremental costs and benefits, cash flow analysis, private and social costs  Discussion on investing in energy projects, financial and economic analysis of energy technologies, short run and long run implications of conventional energy systems,	<b>6+3</b>
5.	<b><i>Economy-Energy-Environment Modeling</i></b> Quantitative modeling frameworks, review of various energy sector models, concepts in modeling energy resources, technological developments;  Energy modeling in the context of climate change	<b>6+3</b>
6.	<b><i>Energy Planning and Policy Making in India:</i></b> Organizational structure, key developments and changes in India's energy policies and planning in the context of energy efficiency and environmental concerns, regulatory frameworks and reforms across various energy sectors, success stories, failures and lessons learnt.	<b>5</b>

### **Basic Texts**

Thomas Tietenberg. Environmental and Natural Resource Economics, seventh edition, (Boston, MA: Addison Wesley, 2006).

Robert S. Pindyck and Daniel L. Rubinfeld, **Microeconomics**, 6<sup>th</sup> edition (Prentice Hall of India, 2005)

(here some basic text on energy economics is also required)

### **Illustrative Articles and Books**

"Energy," *Science*, Vol. 285, No. 5427 (30 July 1999), pp. 677-711.

Adelman, M.A. (2002): "World Oil Production and Prices 1947-2000," *The Quarterly Review of Economics and Finance*, 42: 169-191.

- Barretto, L., A. Makihira and K. Riahi (2003): "The hydrogen economy in the 21<sup>st</sup> century: a sustainable development scenario," *International Journal of Hydrogen Energy*, 28: 267-284.
- Ben Esty and Michael Kane. 2001. "Calpine Corp: The Evolution from Project to Corporate Finance," Harvard Business School Case: 201098.
- Bentley, R.W. (2002): "Global oil & gas depletion: an overview," *Energy Policy*, 30: 189-205
- Bohi, D. P. (1981): *Analyzing Demand Behavior: A Study of Energy Elasticities*, Johns Hopkins University Press.
- Brookes, Leonard (2004): "Energy efficiency fallacies – a postscript," *Energy Policy*, 32: 945-947.
- Butterfield, D.W. (2003): "Resource depletion under uncertainty: Implications for mine depreciation, Hartwick's Rule and national accounting," *Resources and Energy Economics*, 25: 219-238
- Cooper, John C. B. (2003): "Price elasticity of demand for crude oil: estimates for 23 countries," *OPEC Review*, 27:1-8.
- Dasgupta, Partha and Geoffrey Heal (1974): "The optimal depletion of exhaustible resources," *Review of Economic Studies*, Symposium on the Economics of Exhaustible Resources, 1974, pp. 3-28.
- David Berry. 2002. "The Market for Tradable Renewable Energy Credits," *Ecological Economics*. September; 42(3): 369-79.
- Devarajan, S. and A. C. Fisher (1981): "Hotelling's 'Economics of Exhaustible Resources': Fifty years later," *Journal of Economic Literature*, 19: 65-73.
- Duncan Austin and Craig Hanson. 2002. "Introducing Green Power for Corporate Markets: Business Case, Challenges, and Steps Forward," World Resource Institute Corporate Guide to Green Power Markets
- Grossman, Gene M. and Alan B. Krueger (1995): "Economic Growth and the Environment," *Quarterly Journal of Economics*, 110(2): 353-375.
- Haider, Ghazi M. (2000): "World oil reserves: Problems in definition and estimation," *OPEC Review*, 24: 305-327.
- Herring, Horace (1999): "Does energy efficiency save energy? The debate and its consequences," *Applied Energy*, 63: 209-226.
- Ibenholt, Karen (2002): "Explaining learning curves for wind power," *Energy Policy*, 30: 1181-1189.
- John Gourville and Kerry Herman. 2003. "Cape Wind," Harvard Business School Case 504055.
- Karen Palmer and Dallas Burtraw. 2004. "Electricity, Renewables, and Climate Change: Searching for a Cost-Effective Policy," RFF working paper,
- Nordhaus and Boyer (2000): *Warming the World: Economic Models of Global Warming*, MIT Press,
- Nordhaus, William (1979): *The Efficient Use Energy Resources*, Yale University Press.

Pindyck, Robert S. (1979): *The Structure of World Energy Demand*, MIT Press.

Pindyck, Robert, "The Optimal exploration and production of nonrenewable resources," *Journal of Political Economy*, 86: 841-861 (1978).

Robert Ristinen and Jack Kraushaar. 1998. *Energy and the Environment*, John Wiley & Sons.

Solow, Robert M. (1974): "Intergenerational equity and exhaustible resources," *Review of Economic Studies*, Symposium on the Economics of Exhaustible Resources, 1974, pp. 29-45

Tokimatsu, K., J. Fujino, S. Konishi, Y. Ogawa and K. Yamaji (2003): "Role of nuclear fusion in future energy systems and the environment under future uncertainties," *Energy Policy*, 31: 775-797

Vijay Vaitheeswaran (2001): "A Brighter Future? A Survey of Energy," *The Economist*, February 10, 2001.

William Nordhaus, "The Allocation of Energy Resources," *Brookings Papers*, No. 3 (1973), pp. 529-570