

Approval: 10th Senate Meeting

Course Name: Energy Economics

Course Number: HS 582

Credits: 3-0-0-3

Students intended for: B. Tech./M.S./Ph.D.

Elective or Compulsory: Elective

Semester: Odd or Even

Course preamble: Efficiency and sustainability of energy system are pre-requisites for Sustainable Development and the challenges to achieve this lie at the interface of technology innovation and human behavior. This course covers the economic principles that guide energy related behavior of both the producers and the consumers of energy. It begins with an orientation through recapitulation of building blocks that are extensively used in studying energy behavior. It then deals with various aspects of energy demand and supply and ponders over the contemporary issues related to energy access and energy security. By doing so, the course aims at broadening the vision of students while making any energy related decision as a technology developer, energy manager, entrepreneur, policy maker, researcher in future or simply for personal energy use in day to day activities.

Course outline:

Module I: Orientation (3 Hours)

- The rejuvenation of energy economics- with OPEC and the oil price shocks in 1970s and with climate change debates in 1990s
- Recapitulation of some basic concepts: behavior of consumer, producer, prosumer (production by consumer), elasticity, growth rate, resource rent, rate of discount, net and present value, internal rate of return, energy intensity

Module II: An introduction to energy resource (3 Hours)

- Classification of energy resource- depletable and non-depletable, primary and secondary, commercial and non-commercial
- Units, conversion factors and aggregations of energy flow
- Energy accounting framework-introduction to Energy Balance Statistics with example from India;

Module III: Basics of energy demand (15 Hours)

- Evolution of energy demand analysis;
- Economic foundations of energy demand – consumer demand for energy, producer demand (input demand) for energy;
- Introduction to analytical frameworks- accounting approach (decomposition analysis), econometric approach and techno-economic approach;
- Energy demand management;

- Rebound effect

Module IV: Basics of energy supply (15 Hours)

- Depletable primary energy resource- economics of exploration, optimal extraction rule, investment decision, resource production- coal, oil, natural gas; relation between discovery and production, depletion dimension;
- Economics of secondary energy supply (electricity);
- Economics of renewable energy supply- growth curve and rate of exploitation; drivers of renewable energy, cost features, support mechanism (feed-in-tariff, competitive bidding process, renewable obligations)
- New economic principle when conventional consumer-producer divide is blurred

Module V: Energy access (3 Hours)

- Energy use ladder;
- Indicators of energy poverty; Affordability
- Energy poverty and/or environmental protection – A critical analysis

Module VI: Energy Security (3 Hours)

- Indicators of energy security- dependence, concentration and diversity of supply; optimal level of energy dependence; Geopolitics
- Policies to enhance energy security – import restriction and diversification, diversification of fuel mix, energy efficiency improvement;
- Trade-off between energy security and climate change mitigation

Course reading:

Stevens, P. (2000). An Introduction to Energy Economics. In Stevens, P. (ed.) The Economics of Energy, Vol. 1, Edward Elgar, Cheltenham, UK.

Bhattacharyya, Subhes. C. (2011). Energy Economics: Concepts, Issues, Markets and Governance. Springer. London, UK. (Selected chapters)

Hartwick, J. M, and Olewiler, N. D.(1986). The Economics of Natural Resource Use. Harper and Row Publishers, New York, USA.

GEA, 2012: Global Energy Assessment - Toward a Sustainable Future, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria