



ENERGY RESOURCES, ECONOMICS AND ENVIRONMENT

PROF. RANGAN BANERJEE

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INTENDED AUDIENCE : Masters students of Energy Systems Engineering. UG students of Mech, Elec, Chemical interested in Energy

COURSE OUTLINE :

This course will equip students with the tools necessary for economic analysis and quantification of impacts of energy systems. We will review the availability of energy resources and study methods for quantification of resource depletion and scarcity. The course will cover basic concepts in economics and their application to energy systems. Tools and techniques for project economics for an individual/company perspective and macro-decision making for society will be introduced. We will discuss basic concepts of welfare economics and environmental economics that are necessary for energy systems analysis and their environmental impacts.

ABOUT INSTRUCTOR :

Prof. Rangan Banerjee is the Forbes Marshall Chair Professor and Head of the Department of Energy Science and Engineering at the Indian Institute of Technology Bombay .He works on energy efficiency and renewable energy, modelling of energy systems, energy planning and policy

COURSE PLAN :

Week 1: Energy Flow Diagram ,Global Trends in Energy Use, India and World- Disaggregation by supply, end use, Energy and Environment, The Kaya Identity, Emission Factor

Week 2: Energy and Quality of Life, Energy Inequality, Energy Security, Introduction to Country Energy Balance assignment

Week 3: Energy Economics - Simple Payback Period, Time Value of Money- discount rate, Criteria for Assessing Energy Projects –(Net Present Value (NPV), Benefit/Cost Ratio (B/C), Inflation, Internal Rate of Return (IRR)

Week 4: Resources & Reserves Growth Rates in Consumption, Estimates of Duration of Fossil Fuels, McKelvey Diagram, Peak oil, Hubbert's model

Week 5: Materials used in renewable energy (Kuznet's Curve, Betting on the planet, Simon's Change), Non Renewable Energy Economics (Hotelling's Rule)

Week 6: Preferences and Utility, Utility and Social Choice

Week 7: Public and private goods / bads, Demand curves , Externalities

Week 8: Financing Energy – Debt/ Equity- Sources of funds, innovative financing models

Week 9: Input Output Analysis

Week 10: Primary Energy Analysis, Net Energy Analysis, Examples, Energy Cost of Energy, Life Cycle Analysis of Bioenergy

Week 11: Net Energy Examples, Energy Policy

Week 12: Energy Policy Examples, Practice problems solution