

**Approval: OTA in 3<sup>rd</sup> Convocation Meeting**

<b>Course Name</b>	<b>: Energy: Environment Policy and Law</b>
<b>Course Number</b>	<b>: EM604</b>
<b>Credits</b>	<b>: 3-1-0-4</b>
<b>Prerequisites</b>	<b>: None</b>
<b>Intended for</b>	<b>: B. Tech., M. Tech. (Energy Materials), M.S., and Ph. D.</b>
<b>Distribution</b>	<b>: Energy core for M. Tech. (Energy Materials) and elective for B. Tech., M.S., and Ph. D. students</b>
<b>Semester</b>	<b>: Odd/Even</b>

***Preamble:***

The course forms a core course for the M. Tech. (Energy Materials) degree program. The other courses in this basket include Mobile and Power Plant Systems, Materials for Energy Applications, and Experiments in Materials Science. Being a core course, this course will need to be taken by all students interested in pursuing M. Tech. (Energy Materials). Given its focus on energy, economics, law, and policy, this course will emphasize to students how energy technologies are tangled with economic development, business investment decisions, social needs, and political priorities. Thus, this course will form a natural pathway for students to critically assess the energy, economics, law, and policy issues related to specific technologies covered in other core and elective courses in the M. Tech. program.

***Course Outline:***

This course will start by reviewing fundamental concepts in engineering economics. These include concepts like estimation, supply, demand, discounting, pricing, depreciation, and simulation to capture uncertainty. Next, this course will turn towards economics of energy with a focus on concepts like payback-period, net present value, and benefit-cost analyses on energy investment projects. Finally, the last part of the course will deal with energy policy and environmental law with an emphasis to its evolution in India.

***Modules:***

- Module 1: Engineering Economics (14)  
Estimation, Supply, Demand, Cost, Elasticity, Pareto Efficiency, Welfare Economics, Social Discounting, Hyperbolic Discounting, Pricing, Borrowing, Depreciation, Taxes, Market Failure, Risk Modeling, Attitudes and Utility, Multi-Attribute Decisions and Stochastic Dominance, Monte Carlo Simulation, and Cost Effectiveness Analysis/Value of Life
- Module 2: Energy Economics (14)  
Unit cost calculation of power generation from different energy sources, Rules for investment in Energy sector, Payback period, NPV, IRR, ERR, and Benefit-cost analysis, Net Social Benefit (with Free riding concepts) and Rebound effects, Energy-GDP elasticity, Financing of energy systems, Energy – economy interaction, renewable and non-renewable sources of energy with their advantages and disadvantages on environment and climate change.
- Module 3: Energy Policy and Environmental Law (14)

Energy policy, Tariffs and subsidies, Taxes, National energy plan and five-year plans, Energy Models, Trend analysis, Costs of exploration and alternate energy, International energy supply, Energy Pricing, Environment interaction, Clean development mechanism, Overview of renewable energy policy in India, India's Plan for a domestic energy cap & trade scheme, and renewable energy credits. Federalism, Energy Regulation, Environmental law with a focus on Water (prevention & control of pollution) act 1974, Environmental protection act 1986, and effluent standards and ambient air quality standards. Legal Regimes Governing Primary Sources of Energy – Non – Renewable and Renewable, and Regulatory Framework concerning Electricity, Gas, Coal, and Renewable Energy.

***References:***

1. Tiwari, G. N., & Mishra, R. K. Advanced Renewable Energy Sources. Royal Society of Chemistry. 2011.
2. Tung Au, Thomas P. Au. Engineering Economics for Capital Investment Analysis. Prentice Hall; Fac Sub edition. 1991.
3. Robert T. Clemen, Terence Reilly. Making Hard Decisions with Decision Tools Suite. Cengage Learning. 2004.
4. Laurance R. Geri, David E. McNabb. Energy Policy in the U.S.: Politics, Challenges, and Prospects for Change. CRC Press. 2011.
5. Henry M. Levin, Patrick J. McEwan. Cost-Effectiveness Analysis: Methods and Applications. SAGE Publications, Inc. 2nd edition. 2000.
6. Rubin, Edward. Introduction to Engineering and the Environment. McGraw-Hill Science/Engineering/Math. 2000
7. For Indian Energy and Environment policy program and Act, please refer to the MNRE website: <http://www.mnre.gov.in/>
8. Mohammad Naseem, Energy Law in India, Wolters Kluwer, 2011.
9. Karen Makuch, Environmental and Energy law, Wiley, 2012.
10. SKL Chaterjee, Commentary on Electricity Laws in India, 1<sup>st</sup> ed., Delhi Law House, New Delhi, 2006.