

Indian Institute of Technology, Kanpur

Proposal for a New Course

2.	Energy resource management	2.1. Energy as an economic resource: scarcity, allocation, and trade-offs 2.2. Energy measurement: units, conversion, and energy intensity indicators 2.3. Energy accounting frameworks: national energy balances 2.4. Sustainable supply chain	5
3.	Economics of energy demand	3.1. Consumer theory foundations: utility maximization, indifference curves, budget constraints 3.2. Demand functions and own-price elasticity, income elasticity and cross-price elasticity 3.3. Sectoral energy demand: industry, transport, buildings, agriculture 3.4. Decomposition Analysis: IDA, LMDI 3.5. Behavioural economics: bounded rationality, status quo bias, present bias, nudges 3.6. Digitization and AI: impact on energy intensity and demand patterns	10
4.	Energy Supply: Quantitative assessment	4.1. Time value of money: discounting, NPV, IRR, decision criteria comparison metrics 4.2. Economic vs. financial appraisal: social discount rate, shadow pricing 4.3. Levelized Cost of Energy: methodology and technology comparison 4.4. Marginal Abatement Cost (MAC) curves: construction, interpretation, policy use 4.5. Sensitivity and Scenario Analysis	8
5.	Market and Policy instruments	5.1. Externalities in energy markets: negative externalities of fossil fuels, positive spillovers of RE; social cost of carbon 5.2. Carbon tariff and trading, CCTS, ETS 5.3. CBAM and trade policy implications 5.4. Regulatory frameworks and Command and Control 5.5. Fiscal incentives: PLI, RPO, tax credits 5.6. Just transition and energy poverty consideration	7
6.	Energy models	6.1. Taxonomy of energy models: bottom-up vs. top-down 6.2. LEAP and TIMES-MARKAL: simulation vs. optimization 6.3. Life Cycle Assessment (LCA) and GREET: full-cost accounting, externality integration	6

B) Pre-requisites, if any (*examples: a- PSO201A, or b- PSO201A or equivalent*): None

C) Short summary for including in the Courses of Study Booklet

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This course offers a systems-level perspective on the techno-economic drivers shaping the global and Indian energy transition, linking resource constraints, market structures, technological change, and climate imperatives. It prepares students to interpret real-world energy challenges using data-driven insights and analytical reasoning relevant for policy, industry, and research.

7. Recommended

books:

Textbooks

- Bhattacharyya, S. C. (2019). *Energy economics: concepts, issues, markets and governance*. Springer Nature.
- Vanek, F., Albright, L. D., & Angenent, L. (2008). *Energy systems engineering*. McGraw-Hill Professional Publishing.

Reference books

- Bala, B. K. (2022). *Energy Systems Modeling and Policy Analysis*. CRC Press.
- Giannakidis, G., Labriet, M., Gallachóir, B., & Tosato, G. (2015). Informing energy and climate policies using energy systems models. *Springer International Publishing, Switzerland. Doi, 10(1007), 973–978*.
- Halkos, G. (2023). *Modeling Energy-Environment-Economy Interrelations*. MDPI-Multidisciplinary Digital Publishing Institute.

8. Any other remarks:

Dated: 09/04/2026 Proposer: Deepika Swami

Dated: _____ DUGC/DPGC Convener: _____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated: _____