Course title: Energy and Sustainable Development

Course code: PPS 155	**No. of credits:** 2	**L-T-P:** 28-02-00	**Learning hours:** 30

Pre-requisite course code and title (if any): None

Department: Department of Policy & Management Studies

Course coordinator(s): Dr. Gopal K. Sarangi	**Course instructor(s):** Dr. Gopal K. Sarangi, Dr. Sapan Thapar

Contact details: gopal.sarangi@terisas.ac.in

Course type: Core	**Course offered in:** 2nd Semester

Course description

Energy policies are vital for achieving sustainable development as they directly impact environmental sustainability, economic prosperity, and social equity. Energy is at the centre of achieving both the climate and the sustainable development goals that the world has committed to. At the same time ensuring its availability, efficient use and access is critically important to the growth and development of any country. The course is designed to enable the student to understand the challenges of understanding energy security, its complex interactions with the economy and society as well as the tools available to assess impact on multiple, often competing goals.

Learning objectives:

The objective of the course is to sensitize the student to the role of energy in society, the multiple means of meeting energy service demands, global energy linkages, emerging scenarios of vulnerability and the instruments and tools available for effective energy policy formulation. At the end of the course, the student will have an enhanced understanding of the need for an integrated energy policy and the impact of alternative policies on the energy security of a country and its populace. By the end of the course, the students will be able to:

- frame issues from a public policy energy and sustainability perspective
- create a matrix of cross-sectoral issues and linkages
- assess unintended outcomes and risks
- assess Policy implementation challenges
- have an understanding of path dependencies

Course content

Module	Topic	L	T	P
1.	**Foundation on Energy and Sustainability** • Comprehensive overview of different forms and sources of energy being used, particularly in the context of India • Distinction between primary and secondary forms of energy; Different units of measurement used conventionally and their equivalence. • Total energy mix of the country with regard to the availability of different forms of energy, distribution, supply mechanism and end-uses. • Linkages of Energy with Sustainable Development • Linkages of energy with other critical sectors health, education, water, agriculture, livelihood, urban, transport, and climate change	4	0	0
2.	**Energy Access, Poverty, Security, and Sustainability** • Energy transition issues and sustainability considerations such as transition to green energy regime, transition at different scales, etc. Case of coal transition in India, transition in DRE space, policy instruments level transitions • Energy Poverty and energy vulnerabilities: Concepts of energy poverty and energy access challenges in developing regions; Impact of energy access on health, gender, education, and economic opportunities. • Energy Security: Energy security and energy dependence at different levels in the society such as – household, community, company and a country; Geopolitics associated with energy security concerns; Trading and Transnational flow, issues of CBAM and energy, Control over strategic areas from an energy security perspective. • Gender and Energy: Examination of the gender dimensions of energy access and use; Empowering women through sustainable energy initiatives.	10	0	0

3.	**Energy Market, Pricing and Finance** • Energy demand and supply; Energy demand theories, elasticities of energy demand, energy demand at sectoral and aggregated level, demand side management (DSM) techniques; energy efficiency and energy demand, economic theories and principles of energy supply; economics of power generation both renewables and non-renewables; case studies from India • Changing structure and forms of energy market; different pricing principles; pricing under regulation; pricing under competition, pricing of energy and instruments of energy pricing in Indian context such as open access, green open access, bidding and auctions, pricing in open markets • Theories of energy finance, Source of energy financing, Energy project financing, Discounted cash flow analysis, Estimating Net Present Value (NPV), Estimating cost of capital, Financing of renewable energy, Renewable policy instruments and institutions for renewable energy and climate finance, Energy transition financing, financial risk management for energy projects, Carbon market as an instrument of climate finance.	10	0	0
4.	**Energy Case Studies and Business Models** • Analysis of case studies to examine linkages with other sectors, risks, dependencies, sustainable development, scale etc. For example: DRE cases studies and business models, Case studies and business models on energy pricing and market such as renewable energy certificate (REC) and Energy savings certificate (ESCerts), Case studies on green tariffs and green energy trading.	4	2	0
	Total	**28**	**2**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (20%)
- **Minor Test-2:** Case Study Presentation on select cases based on Module-4 (30%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will be:

1. equipped with the knowledge and skills necessary to navigate the complexities of energy systems in the context of sustainable development (All evaluations)
2. developing critical thinking and innovative approaches essential for contributing to the development of effective energy policies that address current challenges while promoting a sustainable future for all (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

- Statista. Energy consumption worldwide from 2000 to 2022, with a forecast until 2050, by energy source. https://www.statista.com/statistics/222066/projected-global-energy-consumption-by-source/
- Dar-Mousa, R. N., & Makhamreh, Z. (2019). Analysis of the pattern of energy consumptions and its impact on urban environmental sustainability in Jordan: Amman City as a case study. *Energy, Sustainability and Society*, *9*, 15. https://doi.org/10.1186/s13705-019-0197-0.
- Thomson, G. (2016). *Environment, Energy and Sustainable Development*. Syrawood Publishing House.
- Dunlap, R. A. (2018). *Sustainable Energy, 2nd edition*. Cengage.
- Collins, L. (2016). *Energy and Sustainability*. Callisto Reference.
- Mentel, G., & Majewski, S. (Eds.) (2023). *Energy Policy, Regulation and Sustainable Development*. MDPI AG.
- Zhironkin, S., & Rybar, R. (Eds.) (2022). Sustainable Development Processes for Renewable Energy Technology. MDPI AG.

- Vyas, D., & Gupta, R. K. (2020). *Bio-hydrogen Energy and Sustainable Development*. New Delhi: Daya Publishing House.
- Azad, K. A., & Sharma, S. (Eds.) (2016). *Clean Energy for Sustainable Development: Comparisons and Contrasts of New Approaches*. Academic Press.
- Kumar. J, C. R., & Majid, M. A. (2020). Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities. *Energy, Sustainability and Society*, *10*, 2. https://doi.org/10.1186/s13705-019-0232-1.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Gopal Sarangi

Course Reviewers

1. Prof. Atul Kumar, Professor of Energy Studies Programme, School of International Studies, Jawaharlal Nehru University, New Delhi, India.
2. Dr Arunabha Ghosh, Public Policy Expert & CEO, Council on Energy, Environment and Water (CEEW), New Delhi, India.

Additional Information

This Course outline was approved in the 60th Academic Council Meeting held on 24th December 2024 at TERI School of Advanced Studies, New Delhi.