Course Syllabus for M.Sc. Engineering in Energy for Sustainable Social Development

**Sustainable Energy Planning and Policy Analysis**

(CORE COURSE 6)

Lecture: 3 hrs Year: I

Tutorial: 1hr Part: II

Energy plays a vital role in the socio-economic development of a country. In a developing country like Nepal, where energy poverty is high in rural areas, access to modern energy services is of utmost importance. In the present context global concern over climate change, energy and environmental issues remain of great importance to the policy-makers globally and continue to find growing awareness among the general populations of many developed and developing countries. As ideas of sustainable energy are taking root, new technologies are emerging. There is a strong awareness of the need for better harnessing of hydro and non-hydro indigenous renewable resources for sustainable development in the country. In many countries, policy- makers are proposing new energy and environmental policies that will attempt to assure a reasonable quality of life to future generations. This course provides the students to understand energy planning, analyzing energy systems economically and familiarizing with different energy policy options for better planning and sustainable policy development.

**Objectives**

1. To familiarize different energy carriers such as solid biomass, fossil fuels and renewable energy for providing energy services to the people
2. To focus on hydro and non-hydro renewable energy technologies for sustainable development
3. To have ample knowledge on energy services and energy demand, and energy supply and its conversion in society
4. To understand energy in the social context, and the nexus among energy, economy and environment
5. To understand energy systems analysis using different scenario developments
6. To get familiar with existing energy policies and to analyze different policy options to find out better energy policies for sustainable social development
7. **Introduction to sustainable energy, energy systems planning and analysis [2]**
8. **Energy Carriers: [4]**
	* Solid biomass energy
	* Fossil fuels
	* Renewable energy
	* Focus on renewable energy for sustainability
9. **Energy services, energy demand and energy supply: [12]**
* Energy functions/energy services
* Energy use in households
* Energy use in manufacturing industry
* Energy use in transportation
* Energy use in agriculture and service sectors
* Energy demand models
* Electricity production - hydro and other conventional power plants
* Electricity generation from non hydro- renewable such as solar and wind power plants
* Introduction to energy systems modeling
1. **Energy markets: [8]**
* Oil and oil products
* Coal
* Natural gas
* Electricity markets - hydro and non-hydro renewables such as solar PV,

Wind, etc.

1. **Energy in the social context: [4]**
* Energy and economy
* Social aspects of energy use
* Environmental and resource aspects of energy use
* Sustainable development
1. **Energy analysis and energy management: [4]**
* Energy analysis of energy users
* Degree- days
* Exergy analysis
* Pinch analysis
* Energy management
1. **Measuring energy efficiency and energy intensity [4]**
* What is energy efficiency?
* Options of improving energy efficiency
* Energy efficiency indicators
* Monetary energy intensity
1. **Methods for analysis of energy technologies [6]**
* General approach to the analysis of energy technologies
* Principles of cost benefit analysis: net present value
* Cost-benefit analysis: private perspective
* Cost-benefit analysis: social perspective
1. **Building energy scenarios: [8]**
* The scenario approach - planning in the context of uncertainty
* Modeling approaches for energy demand
* Modeling approaches for energy supply
* Pitfalls of scenario approach
* An overview of some energy scenario modeling frameworks
1. **Policies for efficient energy use and renewable energy: [8]**
* Barriers for energy efficiency improvement
* Policy instruments
* Policy instruments in the area of energy sector
* Energy Policy evaluations

**Text Books, Reference materials and Journals:**

1. Kornelis Blok, 2006. *Introduction to Energy Analysis*. Techne Press, Amsterdam, Netherlands.
2. Michael S. Hamilton, 2013. *Energy Policy Analysis*. M.E. Sharpe, Inc., New York, USA.
3. Jefferson W. Tester, E.M. Drake, M.J. Driscoll, M.W. Golay, and W.A. Peters, 2013. *Sustainable Energy: Choosing among options*. PHI Learning Pvt. Ltd., Delhi, India.
4. Ram M. Shrestha, J.S. Acharya, 2015. *Sustainable Energy Access Planning. A framework.* Asian Development Bank, Manila, Philippines.
5. Emanuela Colombo, S. Bologna, and D. Masera (ed.), 2013. *Renewable Energy for Unleashing Sustainable Development.* Springer International Publishing, Switzerland.
6. Mohan Munashinghe, 1990. *Energy Analysis and Policy: selected works*. Butterworth & Co. (Publishers), London, UK.
7. *Energy Policy (journal)*
8. *International Journal for Sustainable Energy (journal)*
9. *Energy for Sustainable Development (journal)*
10. *Renewable and Sustainable Energy Review (journal) and etc.*