

<b>Course title:</b> Energy: Science, technology and policy				
<b>Course code</b> NRC 183		<b>No. of credits:</b> 2	<b>L-T-P:</b> 30-0-0	<b>Learning hours:</b> 30
<b>Pre-requisite course code and title (if any):</b>				
<b>Department:</b> Natural and Applied Sciences				
<b>Course coordinator(s):</b>		<b>Course instructor(s):</b> Dr Sapan Thapar		
<b>Contact details:</b> sapan.thapar@terisas.ac.in				
<b>Course type:</b> Core		<b>Course offered in:</b> Semester 1		
<b>Course description</b> This course will cover a variety of topics related to energy demand, energy supply, transformation, global environmental consequences of energy consumption and production as well as some important issues in energy policy and regulation.				
<b>Course objectives</b> <ul style="list-style-type: none"><li>▪ To provide understanding of the complexity of energy and climate change issues.</li><li>▪ To understand the basic scientific principles of renewable energy applications.</li><li>▪ To understand the advantages and limitations of different renewable and non-renewable energy sources</li></ul>				
<b>Course content</b>				
<b>Module</b>	<b>Topic</b>	<b>L</b>	<b>T</b>	<b>P</b>
1.	<b>Introduction to Energy Analysis</b> Classification of energy sources, energy supply chain, sectoral energy demand, energy data/statistic, accounting energy uses, energy balance, organization of energy sector in India, national and global energy demand supply situation.	6	0	0
2.	<b>New and Renewable Energy</b> Types of renewable sources of energy, solar energy principles and applications, wind energy potential and conversion, biomass generation and its use as energy source, classification of hydropower schemes, classification of water turbine, tidal power, geothermal energy and ocean thermal energy conversion, policies and regulation for promotion of renewable energy	10	0	0
3.	<b>Conventional Energy Sources</b> Coal: formation of coal, coal reserve, types of coal, mining and transportation of coal, coal utilization technologies Hydrocarbons: Types of hydrocarbons, production and refining of various petroleum products, movement of petroleum products, sources of natural gas production & supplies, historical perspective of petroleum Industry in India Nuclear energy: Radioactivity, nuclear fission and fusion, nuclear reactors, India's nuclear energy programme	10	0	0
4.	<b>Energy and Climate Change Linkages</b> Energy and the climate change dimension, energy access, climate change and equity, international response to climate change, India's responses to climate change; Overview on energy efficiency initiatives in India Introduction to carbon market	4	0	0

	<b>Total</b>	<b>30</b>	<b>0</b>	<b>0</b>
<b>Evaluation criteria</b>				
<ul style="list-style-type: none"> <li>▪ Minor Test 1: 15%</li> <li>▪ Minor Test 2: 15%</li> <li>▪ Assignment/Tutorials: 20%</li> <li>▪ Major Test: 50%</li> </ul>				
<b>Learning outcomes</b>				
By the end of this course, the student will be able to:				
<ul style="list-style-type: none"> <li>▪ Identify and distinguish between various renewable and non-renewable energy sources</li> <li>▪ Explain the physical principles governing energy transformations using correct terminology</li> <li>▪ Describe the main features of the Indian energy system</li> <li>▪ Understand of the role energy has played and continues to play in human development</li> <li>▪ Identify selected policy and regulation that are required for large scale deployment of renewable energy</li> </ul>				
<b>Pedagogical approach</b>				
The course will be delivered through class room lectures. Relevant case studies shall be discussed in class so that students are introduced to the latest stage of development in the subject.				
<b>Materials</b>				
<b>Textbooks</b>				
<ol style="list-style-type: none"> <li>1. Kishore V.V.N. (Edited) (2008) Renewable Energy Engineering and Technology–A Knowledge Compendium, Published by TERI Press, New Delhi, pp 925.</li> <li>2. Block K., (2009). Introduction to Energy Analysis, Techne Press</li> </ol>				
<b>Reference books</b>				
<ol style="list-style-type: none"> <li>1. Twidell, J., &amp; Weir, T. (2015). Renewable energy resources. Routledge.</li> <li>2. Sukhatme S and Nayak J.K. (2008), Solar Energy: Principles of Thermal Collection and Storage, Third Edition, Tata McGraw Hill</li> <li>3. Klass D.L. (1998), Biomass for Renewable Energy, Fuels, and Chemicals, Academic Press, 1998</li> <li>4. Sarkar, S. (1989). Fuels and Combustion. Orient Blackswan.</li> <li>5. Kreith, F., Kreider, J. F., Principles of Sustainable Energy, CRC Press, 2011.</li> <li>6. TERI (2017). TERI Energy &amp; Environment Data Diary and Year Book 2015/16, The Energy and Resources Institute</li> <li>7. TERI, 2006. National Energy Map for India: Technology Vision 2030, The Energy and Resources Institute</li> <li>8. British Petroleum (2016), BP Statistical Review of World Energy</li> </ol>				
<b>Journals</b>				
<ol style="list-style-type: none"> <li>1. Energy</li> <li>2. Energy Policy</li> <li>3. Renewable Energy</li> <li>4. Renewable and Sustainable Energy Reviews</li> <li>5. Biomass and Bioenergy</li> <li>6. Energy for Sustainable Development</li> </ol>				

**Website**

1. Ministry of New and Renewable Energy, Government of India
2. Ministry of Coal, Government of India
3. Ministry of Petroleum and Natural Gas, Government of India
4. Ministry of Environment Forests and Climate Change, Government of India
5. NITI Aayog
6. United Nations Framework Convention on Climate Change

**Additional information (if any)****Student responsibilities**

The students are expected to submit assignments in time and come prepared with readings when provided.

**Course Reviewers**

The course is reviewed by the following experts.

1. Dr Pallav Purohit, Institute of Applied System Analysis, Vienna, Austria.
2. Dr Deepak Sharma, University of Technology Sydney, City Campus, 15 Broadway, Ultimo NSW 2007.