

Course title: Conventional energy and environmental implications				
Course code: ENR 112		No. of credits: 2	L-T-P: 30-0-0	Learning hours: 30
Pre-requisite course code and title (if any): NA				
Department: Department of Energy and Environment				
Course coordinator: Dr. Aviruch Bhatia		Course instructor(s): Dr. Aviruch Bhatia / Dr. Sapan Thapar		
Contact details: aviruch.bhatia@terisas.ac.in				
Course type: Core		Course offered in: Semester 1		
Course description				
The course discusses and analyse the role of energy in the development of India. The focus of the course is on the conventional energy sources & their conversion technologies as well as the environmental impacts including global climate change.				
Course objectives				
The objective of the courses is to develop understanding for the following:				
<ul style="list-style-type: none"> ▪ Utilization of conventional energy sources like- coal, oil & natural gas, nuclear and hydro. ▪ Environmental implications due to energy generation and use. 				
Course contents				
Module	Topic	L	T	P
1	Overview of Energy Sector	2	0	0
	COAL			
2	Coal Basics Formation of coal World and domestic reserves Coal types, coal characteristics and properties Quality of Indian coals	2	0	0
3	Coal Utilization Technologies Uses of coal Coal utilization technologies	2	0	0
4	Environmental Aspects and Clean Use of Coal Environmental impacts of coal mining and combustion and control measures Clean coal technologies Coal washing, pyrolysis, gasification, liquefaction, Coal bed methane, ash utilization Carbon capture and storage	6	0	0
	OIL & NATURAL GAS			
5	Basics Origin and mode of occurrences of petroleum Reserves of oil and natural gas world and India Natural gas fields	2	0	0
6	Uses, Production, Demand, Imports, Environmental Aspects Use of petroleum products as fuels and feedstock Uses of natural gas, LNG, CNG, LPG Oil Refining Environmental aspects of oil and natural gas	2	0	0
	NUCLEAR			
7	Basics Basic concepts (radioactivity, nuclear reactions, fission, fusion), uranium and thorium reserves, Nuclear Reactors	3	0	0

8	Fuel Processing and Safety Nuclear fuel cycle Nuclear fuel reprocessing, safety & nuclear waste management	2	0	0
	HYDRO			
9	Basic & Technology Basic concepts Components of hydroelectric power plant, hydro potential and exploitation in India Major hydroelectric power plants in India	2	0	0
10	Environmental Issues, Myths Environmental issues, myths, constraints and problems Importance of hydropower, private sector participation	4	0	0
11	Energy and Climate Change Linkages Energy and the climate change dimension, energy access, climate change and equity, international response to climate change, India's responses to climate change	3	0	0
		30	0	0
Evaluation criteria				
<ul style="list-style-type: none"> ▪ Assignments: (after completion of module 6) - 20% ▪ Written Test 1: (after completion of modules 1, 2, and 3) - 15% ▪ Written Test 2: (after completion of modules 4, 5, 6, and 7) - 15% ▪ Written Test 3: (at the end of the semester after completion of modules 11) - 50% 				
Learning outcomes				
At the end of the course the student will be able to				
<ul style="list-style-type: none"> ▪ To understand the energy systems.(Test 1) ▪ Quantify the scale of pollution from a conventional Energy source. (Test 2 and Test 3) ▪ Identify strength and weak-linkages in the energy systems. (Test 2 and Test 3) 				
Pedagogical approach				
A combination of class-room interactions, tutorials, assignments and projects.				
Materials				
Recommended readings				
Rao. S and Parulekar B.B., "Energy Technology", Khanna Publishers				
Bernard R Cooper and William A Ellingson, "The Science & Technology of Coal and coal utilization" Edited, ISBN0-306-41436.8, Plennwell				
Pradip Kumar Das & Hrishikesh, "Petroleum and Coal", ISBN 81-7533-042-2, MD				
Deshpande, B G, "The World of Petroleum"				
Yadav, M S, "Nuclear Energy and Power" SBS Publishers & Distributors Pvt. Ltd.				
Jack J Fritz, "Small and Mini Hydropwer system", ISBN 0-07-022470-6, MC Graw Hill				
Reference Books				
Bruce G Miller, "Coal Energy System", ISBN 0-12-497451-1, Elsevier Academic Press				
William L Leffler, Petroleum Refining, ISBN 0-87814-776-4, Pennwell				
Dr. Duncan Seddon, "Gas Usage and Value", ISBN 1-59370-073-3, Pennwell Raymond L Murray, Nuclear Energy, Pergamon Press				
Small Hydropower Initiative and Private Sector Participation, Alternate Hydro Energy Centre, IIT Roorkee				
Charles Simeons, "Hydropower-The use of water as an alternate source of energy", ISBN 0 08 023269 8 Pergamon press				

Douglas M Considine, Energy Handbook, Mc Graw Hill
Editor in Chief- Cutler J Cleveland, "Encyclopedia of Energy", Elsever Academic Press
Wiley Encyclopedia Series, Energy, Technology & Environment

Websites

coal.nic.in,
worldcoal.org,
petroleum.nic.in,
dae.gov.in
npcil.nic.in,
powermin.nic.in
nhpcindia.com

Additional information (if any)

Student responsibilities

Attendance, feedback, discipline: as per university rules.

Course reviewers

1. Mr. Surender Pratap, Director R & D, Petroleum Conservation and Research Association (PCRA), New Delhi
2. Dr. Ajay Kumar Singh, Central Institute of Mining and Fuel Research, Dhanbad
3. Dr. Sunil Singal, Senior Scientific Officer, Alternate Hydro Energy Centre, IIT Roorkee