

Course No.	:	ENR 133
Course title	:	Conventional Energy Infrastructure
Number of credits	:	4
Number of lectures-tutorial-practicals	:	56-0-0
Faculty Name	:	Dr. O P Rao

Course outline

This course deals with the energy infrastructure in place in the country for extraction and utilization of conventional energy sources- coal, oil & natural gas, nuclear and hydro. At the end of the course the students will be able to develop an understanding of occurrence and reserves of these energy sources, exploration and extraction methods, modes of transportation, refining into usable products, utilization technologies, pollution and control measures, organization structure, trading and pricing, laws, policies, initiatives and strategies, demand, production, supply, imports, safety and waste management, private sector participation and future programmes etc.

Evaluation procedure

- Assignments : 20%
- Two Minor Exams : 15% each
- Major Exam : 50%

Details of course contents and allotted time

Sr. No.	Contents	Allotted time (hours)
		Lectures
	COAL	
1.	Overview of Energy Sector	2
2.	Coal Basics Formation of coal, world and domestic reserves, coal types, coal characteristics and properties, quality of Indian coals	2
3.	Coal Exploration, Mining, Transportation Exploration techniques, mining methods, various modes of coal transportation	2
4.	Coal Utilization Technologies Uses of coal, coal utilization technologies, coal washing, pyrolysis, combustion, carbonization, gasification, liquefaction	4
5.	Environmental Aspects/Clean Use of Coal Environmental impacts of coal mining and combustion and control	4

Sr. No.	Contents	Allotted time (hours)
		Lectures
	measures, clean coal technologies, coal bed methane, ash utilization, commercial status of technologies	
6.	Organization of Coal Sector / Regulatory Issues Organization structure of coal sector in India, international coal trade, coal pricing, coal linkages, fuel supply agreement , equity / participation in mining in other countries, coal act	2
7.	Coal supply, Consumption and Demand Coal consuming sectors, consumption trends, future consumption projections, demand and supply of coal, imports of coal,	2
	OIL & NATURAL GAS	
8.	Basics Origin and mode of occurrences of petroleum, reserves of oil and natural gas world and India, natural gas fields	2
9.	Exploration & Extraction Petroleum exploration methods, extraction of petroleum, oil well, drilling, enhanced oil recovery, petroleum refining, distillation, cracking, major products of oil refineries, petroleum coke, natural gas processing	8
10.	Uses, Production, Demand, Imports, Environmental Aspects Use of petroleum products as fuels and feedstock, uses of natural gas, LNG, CNG, LPG, production and demand of petroleum and its products, imports, refining capacity and environmental aspects	2
11.	Organisation, Trading, Laws Organization of petroleum sector in India, marketing, pricing and taxation of petroleum products and gas International trading of Crude Oil/ Petroleum Products and Risk Management Linkage between International and Domestic developments Petroleum Laws (petroleum act), petroleum conservation, private sector participation	2 2 2
	NUCLEAR	
12.	Basics Basic concepts (radioactivity, nuclear reactions, fission, fusion), uranium and thorium reserves,	2

Sr. No.	Contents	Allotted time (hours)
		Lectures
13.	Nuclear Reactors Nuclear reactors and classification, Pressurized Water Reactors (PWR), Boiling Water Reactors (BWR), Pressurized Heavy Water Reactor (PHWR), Fast breeder reactor (FBR),	2
14.	Fuel Processing, Safety , Economics Nuclear fuel cycle, nuclear fuel reprocessing, safety & nuclear waste management, economics of nuclear power plants	2
15.	Organization, Strategy, Policy, Regulation Organization of nuclear sector, Department of Atomic energy(DAE), NPCIL, , AERB, BARC, Indian nuclear programme, atomic energy act, nuclear deal, NPT, IAEA, peaceful use of nuclear energy, strategy	6
	HYDRO	
16.	Basics & Technology Basic concepts, components of hydroelectric power plant, hydro potential and exploitation in India, major hydroelectric power plants in India,	2
17.	Economics, Policy, Organization, Regulation Economics of hydro, policies and initiatives of Government for promotion of hydropower, organizations involved in hydropower development,	2
18.	Environmental Issues, Myths etc Environmental issues, myths, constraints and problems, importance of hydropower, private sector participation	4

Suggested readings:

- Energy Technology, Rao.S, and Parulekar B.B Khanna Publishers
- Power Plant Engineering, Nag PK, Tata Mc Graw hill
- Arora,and Domkundwar S. A Course In Power Plant Engineering, Dhanpat Rai & Sons
- The Science & Technology of Coal and coal utilization,Edited by Bernard R Cooper and William A Ellingson, ISBN0-306-41436.8, Plennwell
- Petroleum and Coal, Pradip Kumar Das& Hrishikesh, ISBN 81-7533-042-2, MD
- The World Of Petroleum, Deshpande, B G
- Petroleum Exploration & Exploitation, Bhagwan Sahay, ISBN 81 7023 1620, Allied Publishers

- Natural gas in non technical language, Institute of Gas Technology, TN 880. N 2944 1999, Pennwell
- Nuclear Energy And Power Yadav, M S, SBS PUBLISHERS & DISTRIBUTORS PVT. LTD.
- Small and Mini Hydropwer system, Jack J Fritz, ISBN 0-07-022470-6, MC Graw Hill
- Water Power Engineering, MM Dandekar & KN Sharma, Vikas Publishing House,

Reference Books:

- Coal Energy System, Bruce G Miller, ISBN 0-12-497451-1, Elsevier Academic Press
- Coal Mining in India , S.P.Mathur, M.S.Enterprises, Bilaspur
- Petroleum Geology, Drilling and Production , Norman J Hyne, ISBN 0-87814-823-X, Pennwell
- Petroleum Refining, William L Leffler, ISBN 0-87814-776-4, Pennwell
- Gas Usage and Value, Dr. Duncan Seddon, ISBN 1-59370-073-3 , Pennwell Raymond L Murray, Nuclear Energy, Pergamon Press
- Small Hydropower Initiative and Private Sector Participartion, Alternate Hydro Energy Centre, IIT Roorkee
- Hydropwer-The use of water as an alternate source of energy, Charles Simeons, ISBN 0 08 023269 8 Pergamon press
- Douglas M Considine, Energy Handbook, Mc Graw Hill
- Encyclopedia of Energy, Editor in Chief- Cutler J Cleveland, 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