Conventional energy resources, the present scenario, scope for future development.

Coal: Origin, occurrence and reserves, classification, ranking, analysis and testing, coal carbonization, manufacture of coke, coal gasification, coal liquefaction.

UNIT II

Petroleum : Origin, occurrence and reserves, composition, classification, characteristics, explorationand production-.

Petroleum Refining : petroleum products, testing and analysis of petroleum products, Refinery processes- Distillation, cracking, reforming and alkylation, polymerization& isomerization.

UNIT III

Non-conventional energy sources - Solar energy : Solar energy, solar radiation, solar collectors-flat plate, concentrating (focusing and non-focusing)collectors, principles of heating and cooling, photo voltaic cells.

Wind energy : Basic principles, basic components, classification of WECS, types of wind machines (horizontal, vertical axis machines) Wind energy conversion systems- horizontal and vertical systems. Applications.

UNIT IV

Non-conventional energy sources - Ocean thermal energy : Introduction, OTEC (Closed and open OTEC cycles), applications. Geothermal energy - introduction, sources, hydrothermal resources (Liquid an

Bio-mass energy - Introduction, conversion techniques, classification and Types of biogas plants, Hydrogen energy - Introduction, hydrogen production, storage and applications. Fuel cells-introduction, classification, types, advantages and applications.

ChE-404A

COURSE OBJECTIVES:

1. To provide the knowledge about formation, classification, ranking, analysis, testing, carbonization, gasification and liquefaction of coal, manufacture of cock.

ENERGY ENGINEERING

(OPEN ELECTIVE)

- 2. To provide the knowledge about design, occurrence, composition, classification, exploration and production of petroleum, refining, testing and analysis of petroleum products.
- 3. To provide knowledge about the non -conventional energy resources sun and wind.
- 4. To provide knowledge about the non -conventional energy resources like ocean thermal, geothermal energy, biomass and fuel cells.
- 5. To provide knowledge about the energy storage and related problems in the world and its solutions.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

- understand the importance of environment and conservation of natural resources.
- 2. succeed in the competitive exams of energy industry.
- 3. utilize the non-conventional energies in place of conventional energies and its manufacture.
- 4. utilize the non- conventional energies in place of conventional energies and its manufacture.
- 5. maintain the sustainability in the environment.

UNIT I

d vapor dominated systems), applications.	
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UNIT V

Energy storage : introduction, storage systems. Mechanical energy storage - pumped hydroelectric, compressed air, fly wheel storage. Electrical storage - lead acid battery. Chemical storage- via hydrogen, ammonia, chemical reactions.Thermal energy storage - latent, sensible heat storage. Solar pond

Energy Conservation : Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery - recuperators, regenerators, pipes and pumps.

LEARNING RESOURCES:

TEXT BOOK(s):

- 1. Non-conventional energy resources by G. D. Rai, Khanna Publishers(2004).
- 2. Engineering chemistry by Jain & Jain 15 th edition.

REFERENCE BOOK(s):

- 1. Conventional Energy technology by S.B.Pandy, Tata McGraw Hill (1987)
- 2. Elements of Fuels , furnaces and refractories O.P.Gupta , Khanna publishers (2000)