

ChE-404A**ENERGY ENGINEERING
(OPEN ELECTIVE)****L T P C
4 - - 3****COURSE OBJECTIVES:**

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

1. 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**(12)**

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**(12)**

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

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

UNIT III**(12)**

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**(12)**

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

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.

UNIT V**(12)**

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)