

UCH405: ENERGY RESOURCES

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3	1	2	4.5

Course Objective:

To study various types of conventional and non-conventional energy resources including solid, liquid and gaseous fuels.

Energy Scenario: Indian and global, Present and future energy demands, Energy crisis, Classification of various energy sources, Renewable and non-renewable energy sources, Pattern of energy consumption.

Solid Fuels: Coal: Origin, formation, analysis, classification, washing and carbonization, Treatment of coal gas, Recovery of chemicals from coal tar, Coal gasification, Liquid fuel synthesis from coal, Carbonization of coal, Briquetting of fines.

Liquid and Gaseous Fuels: Crude petroleum, Physical processing of crude petroleum, Fuels from petroleum, Storage and handling of liquid fuels, Natural and liquefied petroleum gases, Gas hydrates, Gasification of liquid fuels, Carbureted water gas.

Fuel Characterization: Viscosity, Viscosity index, Flash point, Cloud point, Pour point, Fire point, Smoke point and Char value, Carbon residue, Octane number, Cetane number, Aniline point and Performance number, Acid value, ASTM distillation, Calorific value, Proximate and ultimate analysis.

Alternate Energy Sources: Solar energy: Radiation measurement, applications and types of collectors and storage, Wind power, Geothermal energy, Tidal energy, Nuclear power, Fuel cells, Biogas, Biomass.

Laboratory Work:

Experiments on proximate and ultimate analysis of fuels, Orsat analysis, Surface tension, Cloud & pour point, Flash point, Viscosity, Melting point, Reid vapor pressure, ASTM distillation, Saponification value.

Course Learning Outcomes (CLO):

Upon completion of this course, the students will be able to:

1. analyze the energy scenario of the world.
2. carry out a comparative analysis of different types of coal, including their treatment, liquefaction and gasification.

3. compare the liquid and gaseous fuels sourced from petroleum including their characterization.
4. analyze the potential of alternate energy sources and their scope and limitations.
5. solve energy related problems related to combustion and non-combustion.

Text Books:

1. Rao, S. and Parulekar, B.B., *Energy Technology-Non-conventional, Renewable and Conventional*, Khanna Publishers (2000).
2. Gupta, O.P., *Elements of Fuel, Furnaces and Refractories*, Khanna Publishers (1996).
3. Rai, G.D., *Non-Conventional Energy Sources*, Khanna Publishers (2001).

Reference Books:

1. Brame J.S.S. and King J.G., *Edward Arnold "Fuel Solid, Liquid and Gases"* Edward Arnold (1967).
2. Sukhatme S.P, *Solar Energy - Principles of Thermal Collection and Storage*, Tata McGraw- Hill (1996).
3. I.S. Code 770, *Classification of Coal*.

Evaluation Scheme:

S. No.	Evaluation Elements	Weightage (%)
1	MST	25
2	EST	35
3	Sessional (May includes lab, tutorials/ assignments/ quiz's etc)	40