

AE 424 ALTERNATIVE FUELS AND ENERGY SYSTEMS
(DEPT. ELECTIVE – V)

Course Description & Objectives:

This subject gives an idea about the depleting nature of the fossil fuels and the importance of tapping some alternatives to that and the various alternatives like solar, wind energy and the energy generation from hydrogen, fuel cells, bio conversion are introduced and a study about their production is given.

Course Outcomes:

On successful completion of this course students will be able to:

- 1. understand the fossil fuel and its effect on human health and environment.*
- 2. know about the use of alternative fuels and solar thermal system.*
- 3. understand the hydrogen gases and fuel cells.*
- 4. have knowledge on solar photovoltaic systems.*
- 5. understand the wind energy techniques, bioconversion applications.*

UNIT – I: Fossil fuel:

Impact of fossil fuel based systems, World scenario of Energy Resources, Indian Scenario of Energy Resources - new and renewable energy – sources and features.

Introduction to Alternate Fuels: Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, CNG.

UNIT – II: Use of alternative fuels:

Modification of engines required for use of alternative fuels. Engine performance and emission characteristics, Limitations and advantages. Solar Thermal System: Solar potential, Solar radiation spectrum, Solar radiation geometry, Solar radiation data, Radiation measurement, Technologies of thermal energy collection, Types of Solar Collectors, Collection efficiency.

UNIT – III: Hydrogen:

Properties of hydrogen with respect to its utilization as renewable forms of energy, sources of hydrogen, production, transportation, storage, application & economics of hydrogen.

Principle, Types, Full cell for Automotive application (PEM), PEM fuel cell stack construction, performance.

UNIT – IV: Solar Photovoltaic systems:

Operating Principle, Photovoltaic cell concepts, Photo-cell materials, Cell module array, Series and parallel connections, Applications & applications related to automobiles. Hybrid vehicles.

UNIT – V: Wind Energy:

Wind parameters and wind data, Power from wind, Site selection, Wind energy conversion systems and their classification, Construction and working of typical wind mill, characteristics of wind generators, Design considerations for wind mills.

Bioconversion: Introduction, biological & biochemical conversion, Energy plantation, Combustion and fermentation, anaerobic digester, Biomass gasification, Pyrolysis, various applications of Biomass energy, Bio-fuel – Relevance, types, and applications.

TEXT BOOKS:

1. B. P. Pundir, "Engine Emissions", 2nd ed., Narosa Publications, 1998.
2. E.F. Oberts, "Internal Combustion Engine and Air Pollution", 3rd ed., Harper & Row Publisher, New York, 2000.

REFERENCS:

1. A.W. Judge, "Carburetion and Fuel Injection System", 4th ed., Motor Manual, Vol. 2, The Caxton Pub. Co. Ltd., London.
2. H.H. Willard and Others, "Instrumental Method of Analysis", 2nd ed., CBS Publishers & Distributors, Delhi, 2002.
3. J.G. Giles, "Vehicle Operation & Testing" (Automotive Vehicle Technology Vol. 7), McGraw Hill, 1997.
4. G.B.S. Narang, "Automobile Engineering", 4th ed., CBS Publishers & Distributors, Delhi, 2004.
5. John k Pearson, "Improving air quality".
6. Richard L.Bechfold, "Alternative Fuels Guide Book", SAE International, Warrendale, 1997.