RCETMECHCC01 - Alternative Fuel And Applications

Course outcomes:

- Interpret the suitable alternative fuels like CNG and LNG.
- Explain the characteristics of alcohols in SI & CI engines.
- Analyze the various gaseous alternative fuels for IC engine applications.
- Determine various properties of bio fuel L 3 s and their significance in IC engines.
- Explain the concepts of Electrical vehicle, Fuel cell and solar cars.

Syllabus:

UNIT I

Introduction: Description about primary energy use sector and energy requirement for transportation sector, Requirement of transport fuels in India and share of various sources, Transportation need and economic and environmental impact of various transportation modes. Overview of engine technology and effect of fuel properties on advanced engine technologies: Efficiency and emission challenges and prevailing emission norms, Measures adopted for conforming these norms such as advances in engine fuel injection technology, exhaust gas recirculation, intake pressure boosting, engine control system and interrelation between various control parameters, after treatment technologies, Fuel Properties and specifications, Effect of fuel properties on pollutant formation mechanisms, Measurement methods

UNIT II

Alternative fuel acceptability factors: Well to wheel emission analysis, Modification requirements and migration route from conventional technology, Liquid and gaseous fuels, Fuels and engine material compatibility, Lubricating oil degradation, Multi fuel engines

UNIT III

Alcohol fuels (ethanol, methanol, butanol), availability and production technology, utilisation in SI and CI engines, material compatibility and lubricating oil effects; Biodiesel: Production method of esters (biodiesel) and hydrotreated vegetable oil (renewable diesel), application in diesel engines, blending with other fuels for performance improvement, material compatibility, lubricating oil degradation etc; Other liquid fuels: DME (di-methyl ether), Fischer-Tropsch liquids, GTL, BTL, CTL, fuel properties, availability, production technology, fuel injection, engine performance, emissions, combustion and material compatibility considerations.

UNIT IV

Biocatalysis (Products from Renewable resources). Bio catalysis –based synthesis of oligosaccharides, Composition, functionality and potential application of seaweed lipids, bio engineering and application of glucose polymers,bio transformation of oils to value added compounds.

UNIT V

Gaseous Hydrocarbon Fuels: LPG, LNG, compressed natural gas (CNG), Different engine utilisation methods in CI and SI engines, Fuel supply system, Performance and emissions studies, Emissions; Biogas, Fuel cell technology, Electric vehicles and battery requirement, Hybrid vehicle technology

Reference Text Books

1. Richard L. Bechtold, Alternate Fuels – Transportation Fuels for Today and Tomorrow, Society of Automotive Engineers (SAE) – 2002

2. AS Ramadhas (Eds.). Alternative Fuels for Transportation. Boca Raton: CRC Press Taylor & Francis Group ISBN1439819572; 2011

3. M.K. Gajendra Babu, K.A. Subramanian, Alternative Transportation Fuels: Utilisation in Combustion Engines, CRC Press – 2013