

1152AU103

FUEL CONSERVATION AND ALTERNATE FUELS

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1. Preamble

This course enables learners to acquire knowledge in fuel conservation, fuel economy, alternate fuels and the changes in the engine design for handling them and understand various energy systems for use in the automobiles.

2. Pre-requisite

1151AU216 Automotive Fuels, Lubricants and Coolants

3. Links to other courses

- Automotive Emission & Control
- Automotive Electrical & Electronics

4. Course Educational Objectives

Students undergoing this course are expect to

- Understand the types of fuels and its physical and chemical properties.
- Distinguish between the Petrol and Diesel fuels with their properties and will the effect of these on to combustion.
- Learn in depth the various stages and performance and emission characteristics of liquid fuels (alcohols, bio diesels), gaseous fuels (H₂, CNG, LPG) and electric and hybrid vehicles.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
C01	Understand the fuel economy, the fuel conservation and the air fuel ratio, carburetors and various types of fuel injection system	K2
C02	Know the properties, performance and emission characteristics of liquid fuels like gasoline , alcohol , vegetable oils in both SI and CI engines	K4
C03	Know the properties, performance and emission characteristics of gaseous fuels like LPG, CNG, and HYDROGEN.	K4
C04	Know the modification of SI and CI engines for various alternative fuels.	K3
C05	Familiarize the electric , hybrid and solar powered vehicle	K4

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	M	L	H	H			M		L	L	H	M
CO2	H	H	M	L	H	M			M		L	L	H	H
CO3	H	H	M	L	H	M			M		L		M	H
CO4	H	H	H	L	H	H			M		L	L	H	M
CO5	H	H	H	L	H	H			M		L	L	H	M

H- Strong; M-Medium; L-Low

7. Course Content

UNIT I FUEL ECONOMY

L-9

Introduction - Air-Fuel Mixtures and Mixture Requirements - Analysis of Single Jet Carburetor - Exact Analysis of a Carburetor - Fuel Requirements of S.I. Engines. Devices to Meet the Requirements of an Ideal Carburetor, Petrol Injection System, Electronic Fuel Injection System and Rotary Gate Meters Fuel in Injection System. Requirements of a Diesel Injection System, Heat Release Pattern and Fuel Injection, Fuel Spray Patterns, S/V Ratio of Combustion Chamber and Surface Profile of Combustion Chamber.

UNIT II ALCOHOLS AS FUELS

L-9

Alternative Fuels - Availability of Different Alternative Fuels for Engines. Alcohols – Properties, Production Methods and Usage in Engines. Blending - Dual Fuel Operation - Surface Ignition, Spark Ignition and Oxygenated Additives. Modification Required for SI and CI Engines. Performance, Combustion and Emission Characteristics in Engines. Issues & Limitation in Alcohols.

UNIT III VEGETABLE OILS AS FUELS

L-9

Vegetable Oils and their Important Properties. Methods of Using Vegetable Oils – Blending, Preheating, Transesterification and Emulsification – Performance, Combustion and Emission Characteristics in Diesel Engines. Modification Required for SI and CI Engines. Issues & Limitation in Vegetable Oils.

UNIT IV HYDROGEN AS ENGINE FUEL

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Hydrogen – Properties, Problems, Production Methods, Storage and Safety Aspects. Issues & Limitation in Hydrogen. Methods of Using Hydrogen in Engines. Modification Required for SI and CI Engines. Performance, Combustion and Emission Characteristics In Engines.

UNIT V BIOGAS, NATURAL GAS AND LPG AS FUELS

L-9

Biogas, Natural Gas and LPG – Properties and Production Methods. CO₂ and H₂S Scrubbing in Biogas, Modifications Required for Use in Engines- Performance, Combustion and Emission Characteristics in Engines. Issues & Limitation in Gaseous Fuels.

TOTAL= 45

Periods

8. Text Book

1. Richard.L. Bechtold- Alternative Fuels Guide Book- SAE International Warrendale-1997.

2. Thipse.S.S., Alternative Fuels; Concepts, Technologies and Developments, Jaico Book Distributors, 2010
3. Gajendra Babu, M. K. and Subhramanian, K. A., Alternative Transportation Fuels, CRC Press, 2013

9. References

1. MaheswarDayal- Energy today & Tomorrow-I&B Horishr India_1982.
2. Nagpal-Power plant engineering- Khanna Pulisher-1991
3. SAE Paper No.840367,841333,841334,841156, Transactions,SAE, USA