



**C. U. SHAH UNIVERSITY**  
**Wadhwan City**

**FACULTY OF:** - Technology and Engineering  
**DEPARTMENT OF:** - Automobile Engineering  
**SEMESTER:** -VII  
**CODE:** - 4TE07AFE1  
**NAME:** – Alternate Fuels and Engines

**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE07AFE1	Alternate Fuels and Engines	4	0	2	6	5	30	1.5	70	3	---	20	30	150

**Objectives:**

- To impart knowledge of alternate fuels and the changes in the engine design for handling them and understand various energy systems for use in the automobiles.

**Prerequisite:**

- Basic knowledge of Automobile engines and Power transmission system of automobile.

**Course Outline:**

Sr. No.	Course Content	Hours
1	<b>Introduction:</b> Classification of alternate fuels and drive trains, need for alternative fuels, driving factors for alternate fuels, availability and properties of alternative fuels. Merits and demerits of alternative fuels, Implementation barriers for alternative fuels.	04
2	<b>Alcohol:</b> Sources of Methanol and Ethanol, methods of production. Properties of methanol & ethanol as engine fuels, Use of alcohols in S.I. and C.I. engines, performance of blending methanol with gasoline. Emulsification of alcohol and diesel. Dual fuel systems. Improvement / Change in emission characteristics with respect to % blending of Alcohol.	08
3	<b>Bio-diesel:</b> Different sources of vegetable oils use of straight vegetable oils in engine, Trans-etherification, bio-diesel, bio-diesel properties and standards, biodiesel blends. Engine performance and emission characteristics with use of biodiesel and its blends, worldwide trends in use of bio diesel.	08
4	<b>Hydrogen:</b> Hydrogen as a substitute fuel. Sources and methods of Production of Hydrogen, Storage and Transportation of hydrogen. Application and Advantages of hydrogen as fuel for IC engine/ hydrogen car. Layout of a hydrogen car. <b>Fuel Cells:</b> Concept of fuel cells based on usage of Hydrogen and Methanol. Power rating and performance. Heat dissipation, Layout of fuel cell vehicle.	05
5	<b>LPG, CNG and Biogas:</b> Properties of LPG, CNG and Biogas, Use in SI and CI engines, Engine modification. Performance, combustion and emission characteristics of LPG, CNG and biogas in SI and CI engines.	07

6	<b>Synthetic Fuels:</b> Di-Methyl Ether (DME), P-Series, Eco Friendly Plastic fuels (EPF), Biomass to liquid (BTL), Coal to liquid (CTL)	<b>05</b>
7	<b>Solar Powered Vehicles :</b> Solar cells for energy collection. Storage batteries, layout of solar powered automobiles. Advantages and limitations.	<b>06</b>
8	<b>Electric &amp; Hybrid Vehicles:</b> Layout of an electric vehicles, advantages & limitations. Systems components, electronic controlled systems, high energy and power density batteries. Types of hybrid vehicles	<b>08</b>
9	<b>Non-conventional I.C. Engine:</b> Introduction, Dual fuel / Multi fuel engine, stratified charge, adiabatic engine, Variable Compression Ratio engine, Free piston engine, Sterling engine, Wankel engine.	<b>08</b>

### Learning Outcomes:

- Study of this subject give thorough background of the alternate subjects and provide an overall view of the alternative power trains to the students.

### Books Recommended:

1. Alternate Fuels by **Dr. S. Thipse**, Jaico Publications.
2. Internal Combustion Engines by **Ganeshan**, Tata McGraw Hill.

### Reference Books:

1. Automotive Emission Control by **Crouse and Anglin**, McGraw Hill
2. Alternative Fuels: The Future of Hydrogen by **Michael F. Hordeski**, The Fairmont Press, Inc., 2008
3. Hydrogen fuel for structure transportation by **Joseph**, SAE, 1996.