

CODE: AE304 Title: Alternative fuels and energy systems										
L	T	P	Credit	Area		CWS	PRS	MTE	ETE	PRE
3	0	2	4	DCC		15	25	20	40	-

**Objectives:** To understand the need for the alternative fuels and analyze the demand of energy for transportation and Industry, the requirement of fuels for use in IC engine, demand and availability of alternative fuels. To compare alternative fuel with present petro-fuels. To emphasize their advantages and limitations

Syllabus		Contact Hours
<b>Unit-1</b>	<b>Introduction:</b> Estimation of petroleum reserves - need for alternative fuels - availability and suitability to piston engines, Concept of conventional fuels, potential alternative fuels - ethanol, methanol, DEE/DME - hydrogen, LPG, Natural gas, producer gas, bio gas and vegetable oils - use in CI engines-merits and demerits of various fuels.	7
<b>Unit-2</b>	<b>Alcohol Fuels:</b> Properties as engine fuels - performance in SI engines - blends with gasoline and diesel - flexible fuel vehicle - Reformed alcohols - use in CI engines - emulsions	7
<b>Unit-3</b>	<b>Dual fuel systems</b> -spark assisted diesel engines –Surface ignition engines - ignition accelerators - combustion and emission characteristics in engines - emission characteristics.	7
<b>Unit-4</b>	<b>Gaseous Fuels:</b> Hydrogen - properties - use in CI engines-use in SI engines - storage methods - safety precautions. Producer Gas and biogas - raw materials - gasification - properties – cleaning up the gas - use in SI and CI engines, LPG & CNG - properties - use in SI and CI engines	7
<b>Unit-5</b>	<b>Vegetable Oils:</b> Conversion of vegetable oils as biodiesel –production techniques - standards and properties - performance and Emission characteristics, additives	8
<b>Unit-6</b>	<b>Electric and solar powered vehicles:</b> Layout of an electric vehicle- advantage and limitations - specifications - system component. Electronic Control system - high energy and power density batteries - hybrid vehicle - solar powered vehicles.	6
	<b>Total</b>	<b>42</b>

Reference Books:	
1	Osamu Hirao and Richard K. Pefley, Present and Future Automotive Fuels, John Wiley and Sons, 1988.ISBN: 047180259x
2	Keith Owen and Trevor Eoley, Automotive Fuels Handbook, SAE- Publications, , ISBN 978-0-7680-0052-81990
3	Richard L.Bechtold, Automotive Fuels Guide Book, SAE- Publications, 1997
4	Godfrey Boyle, “Renewable Energy”, Oxford University Press, 2004, ISBN: 9780199545339
5	

### Course Outcomes

CO1	To know about alternate fuels availability and suitability to engine
CO2	To understand about blending of fuels.
CO3	To analyze dual fuel system combustion and emission
CO4	To describe gaseous fuels, its production, storage, transportation and safety
CO5	To explain about vegetable oils production techniques - standards and properties - performance and Emission characteristics
CO6	To apply key knowledge of alternate fuel for variety of casestudies.

### CO-PO/PSOMatrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1
CO2	3	3	2	3	1	0	0	0	0	0	0	1	2	1	1
CO3	3	3	3	3	1	0	0	0	0	0	0	2	3	3	2
CO4	3	3	3	3	1	0	0	0	0	0	0	1	3	3	2
CO5	2	2	2	2	2	0	0	0	0	0	0	1	2	2	2